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BODY TEMPERATURES OF THE MEXICAN LIZARD *SCELOPORUS OCHOTERANAE* FROM TWO POPULATIONS IN GUERRERO, MÉXICO

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Information on the thermal ecology of populations of the same species living in different habitats or elevations is needed if an understanding of the relative roles of physiology, thermal environments, and phylogeny in determining body temperatures in lizards is to be reached. Even among closely related species (e.g. congeners), there can be significant variation both in active body temperatures and in the extent to which body temperatures are influenced by environmental temperatures (e.g. *Sceloporus*; Lemos-Espinal, Smith, & Ballinger, in press). Body temperatures can even vary among populations of the same species, particularly when they occur in different habitats or at different elevations (Grant & Dunham, 1990; Van Damme, Bauwens, & Verheyen, 1990; Smith & Ballinger, 1994*b*; Lemos-Espinal & Ballinger, 1995).

The thermal ecology of the genus *Sceloporus* has been relatively well studied, and recent studies have expanded our knowledge to species from relatively unstudied regions of the genus' range (e.g. México) (see Lemos-Espinal, Smith, & Ballinger, in press for review). In this note, we report on an additional species of *Sceloporus* from México whose thermal biology has not been previously studied, *S. ochoteranae*. In addition, we compare two populations of *S. ochoteranae* from two distinct habitats and elevations.

One population was located in the Cañón del Zopilote north of Chilpancingo, Guerrero (600 m elevation), 14 km south of Mexcala, a small town on the Rio Balsas. The area is situated in arid tropical scrub (the most xeric portion of the Bosque Tropical Caducifolio of Rzedowski, 1988). Dominant vegetation includes the large cactus *Neobuxbaumia* sp., and trees such as *Bursera* spp. and *Acacia* sp. The area lies on the northern side of the Sierra Madre del Sur. There is a pronounced rainy season from late May until September at which time late afternoon and evening storms produce torrential rains. During the dry season the river is dry.

The other study population of *S. ochoteranae* was located in the Zitlala Mountains at km 1, rural road Acatlan-Zitlala, Guerrero (1250 m in elevation). This area is represented by the mountains located at the edge of a small cultivated valley. Some plant species observed in the area were *Pithecellobium dulce*, *Prosopis juliflora*, *Bursera* spp., *Acacia* spp., and *Mimosa* sp. The only crop observed in the mountains was *Zea mays*.

Lizards were captured by hand, noose, or rubber band. Body temperatures (T_b; to the nearest 0.1°C) were obtained using quick reading cloacal thermometers. Care was taken to prevent temperature from being influenced by handling; thus all lizards requiring extensive capture effort were excluded from temperature recording. Body temperatures were measured only from active lizards (i.e. foraging or basking), and were taken throughout the day. Air temperature (T_a; at 5 cm above substrate where lizard was first observed, using a shaded bulb to nearest 0.1°C) and substrate temperature (T_s; on substrate where lizard was first observed, using a shaded bulb to nearest 0.1°C) were measured at the site of capture. We also measured snout-vent length (SVL; to nearest mm) using a ruler.

We used linear regression analyses to determine the relationships between T_b and T_a, T_s, and SVL. Comparisons of T_b between sexes and between populations were made using analysis of covariance to control for the effect of environmental temperatures on T_b. Either T_a or T_s were used as covariate in the analysis of covariance, depending on which variable explained the larger portion of the variance in T_b (i.e. which regression had the higher r^2 value).

Lizards in the Cañón del Zopilote population had an average SVL of 44.5 $\pm$ 1.4 mm (N = 33; range = 28 - 62 mm). The average T_b was 34.1 $\pm$ 0.82°C (N = 34); average T_a and T_s were 27.0 $\pm$ 0.7°C (N = 34) and 29.2 $\pm$ 0.9°C (N = 34), respectively. Body temperatures in this population increased with T_a ($N = 34$, $r^2 = 0.38$, $P < 0.0001$; $T_b = 16.0 + 0.67T_a$). Body temperatures also increased with T_s, and T_s explained more variation in T_b than T_a ($N = 34$, $r^2 = 0.56$, $P < 0.0001$; $T_b = 14.2 + 0.68T_s$). The T_b of an individual in this population was not related to its SVL ($N = 33$, $r^2 = 0.009$, $P = 0.59$).

Males and females from the Cañón del Zopilote population did not differ significantly in T_b (ANCOVA with T_s as the covariate: $F_{1,31} = 0.80$, $P = 0.38$). Males had a mean T_b of 33.9 $\pm$ 1.2°C (N = 19), whereas females had a mean T_b of 34.3 $\pm$ 1.1°C (N = 15). The interaction between sex and T_s was not statistically significant, suggesting the slopes of the T_b on T_s regression did not differ between males and females and was therefore not included in the final ANCOVA model.

Lizards in the Zitlala Mountain population had an average SVL of 44.9 $\pm$ 0.8 mm (N = 57; range 31 - 59 mm). The average T_b was 34.1 $\pm$ 0.2°C (N = 57), and the average T_a and T_s were 23.2 $\pm$ 0.3°C (N = 57) and

28.1 ± 0.5°C (N = 57), respectively. Body temperatures in this population increased with T_a (N = 57, r^2 = 0.19, P = 0.0007; T_b = 25.3 + 0.38T_a); however, little of the variation in T_b was explained by T_a. Body temperature was also positively related to T_s in this population (N = 57, r^2 = 0.08, P = 0.04), but, as with T_a, very little variation was explained. The T_b of an individual in this population was not related to its SVL (N = 57, r^2 = 0.03, P = 0.17).

Males and females from the Zitlala Mountain population did not have significantly different T_b's (ANCOVA with T_a as the covariate: $F_{1,54}$ = 0.03, P = 0.87). Males had a mean T_b of 34.1 ± 0.3°C (N = 42), whereas females had a mean T_b of 34.0 ± 0.5°C (N = 15). The interaction between sex and T_a was not statistically significant, suggesting the slopes of the T_b on T_a regression did not differ between males and females and was therefore not included in the final ANCOVA model.

Individuals from the two populations appear to have very similar T_b's. Indeed the mean T_b's are identical: 34.1 ± 0.8°C (N = 34) for the Cañón del Zopilote population and 34.1 ± 0.2°C (N = 57) for the Zitlala Mountain population. However, when compared using ANCOVA with T_a as the covariate, the populations have statistically significantly different T_b's ($F_{1,88}$ = 11.1, P = 0.001). Comparing the least squares means of these population generated by the ANCOVA, the Cañón del Zopilote (32.7 ± 0.5°C) has a lower mean T_b than the Zitlala Mountain population (34.9 ± 0.4°C). The interaction between population and T_a was not statistically significant, suggesting the slopes of the T_b on T_a regression did not differ between the populations and was therefore not included in the final ANCOVA model.

The mean T_b's of the two populations of *S. ochoteranae* (c. 34°C) are well within the range of T_b's previously reported for lizards in the genus *Sceloporus* (28.9°C in *S. variabilis*, Benabib & Congdon, 1992; and 37.5°C in *S. horridus*, see Lemos-Espinal, Smith, & Ballinger, in press, for review). Body temperatures of individuals in the Cañón del Zopilote population of *S. ochoteranae* appear to be influenced to a greater extent by environmental temperatures than T_b's of individuals in the Zitlala Mountain population (i.e. had slope of T_b on T_a regression closer to one and larger r^2 values). Definite assignations of thermoconformity and thermoregulation could not be made because appropriate null models (see Hertz, 1992) could not be generated to directly assess the extent of thermoregulation in these populations of lizards.

In both populations of *S. ochoteranae*, males and females did not differ in mean T_b. Within the genus *Sceloporus*, whether or not the body temperatures of males and females are the same or different appears to depend on the species being considered. Indeed, males and females have been found to have the same T_b in several species (*S. gadoviae*, Lemos-Espinal, Smith, & Ballinger, in press; *S. grammicus*, Lemos-Espinal & Ballinger, 1995; *S. jarrovi*, Smith & Ballinger, 1994*b*; *S. virgatus*, Smith & Ballinger, 1994*a)*, but males have also been found to have higher T_b's than females (*S. cyanogenys*, Garrick, 1974; *S. scalaris*, Smith, Ballinger, & Congdon, 1993), and lower T_b's than females (*S. undulatus*, Gillis, 1991).

The two populations of *S. ochoteranae* living in different habitats and different elevations appear to have the same absolute preferred T_b (c. 34°C); however, when the ambient temperature is considered, individuals in the Zitlala Mountain population appear to have a higher mean T_b than individuals in the Cañón del Zopilote population (i.e. least squares means are different). These results suggest that both populations physiologically "prefer" or are active at the same absolute T_b, but that because of differences in the ambient conditions, Zitlala Mountain individuals must maintain a higher T_b relative to ambient temperatures than do individuals in the Cañón del Zopilote. In other studies on populations of the same species living along an elevational gradient, or in different habitat types, the results concerning T_b differences are mixed. In some species, T_b's differ between populations at different altitudes or in different habitats (e.g., Grant & Dunham, 1990; Van Damme, Bauwens, Verheyen, 1990; Smith, Ballinger, & Congdon, 1993; Smith & Ballinger, 1994*b*), whereas in other species T_b's do not differ between populations at different altitudes or in different habitats despite differences in environmental temperatures (Adolph, 1990; Lemos-Espinal & Ballinger, 1995; Smith & Ballinger, 1995).

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