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Duration of Attachment by Mites and Ticks on the Iguanid Lizards *Sceloporus graciosus* and *Uta stansburiana*

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ABSTRACT: Duration of attachment was determined for the mites *Neotrombicula californica* and *Geckobiella texana* and the tick *Ixodes pacificus* on the iguanid lizards *Sceloporus graciosus* and *Uta stansburiana* from southern California. *Neotrombicula californica* infestations lasted approximately 1 wk. Attachment of *Ixodes pacificus* larvae and nymphs lasted approximately 8 days on *S. graciosus* and 16 days on *U. stansburiana*. *Geckobiella texana* remained attached to *S. graciosus* for 5 days and to *U. stansburiana* for 28 days.

Key words: *Ixodes pacificus*, Ixodidae, *Neotrombicula californica*, Trombiculidae, *Geckobiella texana*, Pterygosomatidae, *Ophionyssus natricis*, Macronyssidae, *Sceloporus graciosus*, *Uta stansburiana*, Iguanidae, infestation, prevalance, attachment.

While infestations of mites and ticks on reptiles have long been known (Frank, 1981), the duration of time spent on the host has been little studied. In this note we report the duration of attachment for the chigger *Neotrombicula californica* (Trombiculidae), the mite *Geckobiella texana* (Pterygosomatidae), and the tick *Ixodes pacificus* (Ixodidae) on the sagebrush lizard (*Sceloporus graciosus*) and the side-blotched lizard (*Uta stansburiana*) from southern California. We have previously described the histopathology of lesions produced by these ectoparasites on *U. stansburiana* (Goldberg and Bursey, 1991).

Lizards were collected by hand-held noose in the San Gabriel Mountains (Los Angeles County, California, USA). One hundred *Sceloporus graciosus* were collected on Windy Gap Trail (elevation 1,889 m; 34°21′N, 117°48′W) in the Crystal Lake area in April and May 1990. *Sceloporus graciosus* averaged 56.0 mm snout–vent length (SVL), range 32 to 70 mm SVL. One hundred twenty-six *Uta stansburiana* were collected at Strawberry Peak (elevation 1,878 m; 34°17′N, 118°07′W) off California Highway 2 in February to May 1990. *Uta stansburiana* averaged 50.4 mm SVL, range 40 to 59 mm SVL. Representative slides of ticks from *U. stansburiana* were deposited in the U.S. National Tick Collection (Georgia Southern University, Statesboro, Georgia 30460, USA; Accession numbers 119772 and 119773). Additional specimens were sent to the U.S. National Parasite Collection (Beltsville, Maryland 20705, USA; Accession numbers 80963, 80964, 80965 for *G. texana*, *O. natricis* and *N. californica*, respectively, from *S. graciosus*; 81457, 81458, 81459 and 81460 for *I. pacificus*, *N. californica*, *G. texana* and *O. natricis*, respectively, from *U. stansburiana*).

On the day of capture, the number, identity and location of mites and ticks were determined with the aid of a dissecting microscope. Lizards were then placed in separate 250 ml glass jars and maintained at 24 C in the laboratory (Department of Biology, Whittier College, Whittier, California 90608, USA) for the duration of the study. *Geckobiella texana* were counted daily, but the other ectoparasites were counted at 4 day intervals.

At capture, 92% (92 of 100) of *S. graciosus* and 60% (75 of 126) *U. stansburiana* were infested with *N. californica*. Monthly sample size, prevalence and intensity of *N. californica* infestations are presented in Table 1. *Uta stansburiana* is active much earlier in the year than *S. graciosus*. When the two lizard populations were compared on day of capture, there was a significant difference with greater prevalences of *N. californica* on *S. graciosus* ($\chi^2 = 30.42$, 1 df, $P < 0.01$).

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TABLE 1. Prevalence and intensity (range) of *Neotrombicula californica* on *Sceloporus graciosus* and *Uta stansburiana*.

Month	*Sceloporus graciosus*		*Uta stansburiana*	
	Prevalence	Intensity	Prevalence	Intensity
February	—	—	100% (4/4)	41 (30–74)
March	—	—	62% (21/34)	7 (1–34)
April	95% (37/39)	40 (10–93)	58% (39/67)	8 (1–46)
May	90% (55/61)	20 (1–66)	52% (11/21)	14 (1–72)

Infestations in both species lasted approximately 1 wk (Table 2). By day 8 the mean number of chiggers remaining was 1.5 on *S. graciosus* and 0.9 on *U. stansburiana*. Chiggers were found most often on the upper and lower eyelids, around the tympanic membrane and in the gular region.

Fifteen percent (15 of 100) of *S. graciosus* and 29% (37 of 126) of *U. stansburiana* were infested with *I. pacificus* at capture. Prevalence and intensity of *I. pacificus* are presented in Table 3. Both larvae and nymphs were present; no adults were found. Adult *I. pacificus* are typically found on mammals (Furman and Loomis, 1984). There was a significant difference in prevalence of *I. pacificus* when the two lizard populations were compared on day of capture with greater numbers on *U. stansburiana* ($\chi^2 = 6.49$, 1 df, $P < 0.05$). By day 12 the mean number of ticks remaining was 0.5 on *S. graciosus* and 1.0 on *U. stansburiana* (Table 4). Ticks remained longer on *U. stansburiana* (approximately 16 days) than *S. graciosus* (approximately 8 days). Ticks were most commonly attached to the gular regions or the outer edge of the tympanic membranes.

TABLE 2. Mean number and prevalence of *Neotrombicula californica* on 92 captive *Sceloporus graciosus* and on 75 captive *Uta stansburiana* at four day intervals.

Day	*Sceloporus graciosus*			*Uta stansburiana*		
	Number of chiggers/lizard		Prevalence	Number of chiggers/lizard		Prevalence
	Mean	(Range)	%	Mean	(Range)	%
0	30.5	(1–93)	100	8.4	(1–72)	100
4	20.9	(0–90)	90	4.7	(0–36)	77
8	1.5	(0–14)	61	0.9	(0–7)	34
12	0.4	(0–3)	18	<0.1	(0–1)	2

Eight percent (8 of 100) of *S. graciosus* were infested with *Ophionyssus natricis*; none were found on *U. stansburiana*. These mites are highly mobile and wander freely over the body. We were unable to estimate the length of time they remained on their hosts. One *Geckobiella texana* was found on *S. graciosus*; it remained attached for 5 days. Twelve *G. texana* were found on nine *U. stansburiana*: the mean attachment time was 28.3 days.

Melvin et al. (1943) reported that *Trombicula alfreddugesi* remained attached for an average of 30 days and a maximum of 65 days on horned lizards (*Phrynosoma* sp.). Jones (1950) reported that *Trombicula autumnalis* fed on its bird and mammal hosts for 3 to 5 days. Frank (1981) reported larval trombiculids fed on reptiles for 2 to 10 days. Loomis and Stephens (1973) suggested that *Neotrombicula harperi* remained on its lizard hosts for as long as three months. Because we were only able to measure attachment time from the day of capture, we consider our data to represent a minimum attachment time. *Neotrombicula californica* remained attached for approximately the same length of time on both *S. graciosus* and *U. stansburiana*. We have previously reported maximum numbers of *N. californica* at the beginning of the spring activity period (Goldberg and Bursey, 1991) which suggests to us that

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TABLE 3. Prevalence and intensity (range) of *Ixodes pacificus* on *Sceloporus graciosus* and *Uta stansburiana*.

Month	*Sceloporus graciosus*		*Uta stansburiana*	
	Prevalence	Intensity	Prevalence	Intensity
February	—	—	0% (0/4)	—
March	—	—	21% (7/34)	2 (1–5)
April	21% (8/39)	4 (1–8)	43% (29/67)	2 (1–5)
May	11% (7/61)	2 (1–5)	5% (1/21)	1

lizards acquire their infestations during the winter inactivity period. The greater prevalences and mean intensities of *N. californica* on *S. graciosus* as compared to *U. stansburiana* may be related to the longer period of inactivity of *S. graciosus*. A portion of the *U. stansburiana* population is active during February and March (Goldberg and Bursey, 1991). In contrast, *S. graciosus* in the San Gabriel Mountains enters hibernation in early October and remains inactive until March (Goldberg, 1975). Thus, chiggers have a longer time to infest inactive *S. graciosus*.

We found significantly more male lizards were infested with *I. pacificus* than female lizards; 10 of 15 infested *S. graciosus* and 32 of 41 infested *U. stansburiana* were males ($\chi^2 = 14.6$, 3 df, $P < 0.01$). We attribute these differences to increased movement by males during the spring breeding season. A male moving frequently through his territory has a greater chance of acquiring ticks than does a more sedentary female.

It is not clear why ticks should remain attached longer to *U. stansburiana*. A similar pattern was seen for *G. texana* which also remained longer on *U. stansburiana*. We assume the answer to this may lie in host physiology. Wright et al. (1988) reported decreased engorgement times in mice with repeated exposure to the chigger *Eutrombicula cinnabaris*. *Uta stansburiana* has a life expectancy of 1.1 to 1.4 yr (Tinkle, 1967) while *S. graciosus* has a life span of approximately three years (Tinkle, 1973) and is thus a potential host for a much longer period of time. Whether a similar phenomenon exists in lizards has to our knowledge, not been examined.

Our finding of 29% prevalence for *U. stansburiana* infested with *I. pacificus* in this study versus a 16% prevalence in 1989 (Goldberg and Bursey, 1991) for lizards of the same population during the same season one year later suggests there may be considerable annual variation in tick prevalence for a given population. These differences may reflect yearly variations in precipitation and/or temperature. It has been shown that tick life histories are intimately associated with climatic cycles (Auffenberg and Auffenberg, 1990) and lack of precipitation has been correlated with a decrease in chiggers (Loomis and Stephens, 1973).

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TABLE 4. Mean number and prevalence of *Ixodes pacificus* (larvae and nymphs) on 15 captive *Sceloporus graciosus* and on 37 captive *Uta stansburiana* at four day intervals.

Day	*Sceloporus graciosus*			*Uta stansburiana*		
	Number of chiggers/ lizard		Prevalence	Number of chiggers/ lizard		Prevalence
	Mean	(Range)	%	Mean	(Range)	(%)
0	2.7	(1–7)	100	2.0	(1–6)	100
4	2.2	(0–7)	87	1.7	(0–5)	93
8	0.7	(0–4)	40	1.5	(0–5)	78
12	0.5	(0–3)	33	1.0	(0–4)	61
16	<0.1	(0–1)	6	0.7	(0–4)	51
20	—	—	—	0.1	(0–1)	17
24	—	—	—	0.7	(0–1)	7

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