REDISCOVERED POPULATION OF MEXICAN PLATEAU
SPOTTED WHIPTAIL LIZARD, *ASPIDOSCELIS*
SEPTEMVITTATA (TEIIDAE), FROM MÉXICO, D.F.

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ABSTRACT.—Multiple surveys carried out by herpetologists in México, D.F., during the 1980s failed to find specimens of *Aspidoscelis septemvittata* (Squamata: Teiidae). However, 10 specimens were recently collected to the east of México, D.F., inside a protected area, Sierra de Santa Catarina. The Sierra de Santa Catarina has been heavily modified by human activity and habitation. Morphological and natural history information about the specimens are presented, as well as notes on locality.

Key words: *Aspidoscelis septemvittata*, *Teiidae*, *Squamata*, México, D.F., Sierra de Santa Catarina, conservation.

Aspidoscelis septemvittata ranges from Texas to the Mexican Plateau (Wright 1993) and is poorly represented in México, D.F. This species was observed in the Sierra de Guadalupe during the 1970s (Méndez de la Cruz et al. 1992). To our knowledge, no additional specimens have been reported since that study.

Over the last 20 years, several authors have suggested that *A. septemvittata* has been extirpated from México, D.F. (Casas-Andreu 1989, Méndez de la Cruz et al. 1992, Walker et al. 2001). The apparent eradication of *A. septemvittata* from México, D.F., was presumed to have occurred as a result of urban development.

México, D.F., as well as the metropolitan area, has changed dramatically, due to population growth and very rapid urban development. The human population increased from 1 million in 1920 to more than 20 million in 1990 (Ezcurra 1990). Urban development has had profound effects on the flora and fauna of the Basin of Mexico (Casas-Andreu 1989, Ezcurra 1990). Habitat destruction and/or alteration brought on by urban development probably accounts for the extirpation of *Aspidoscelis tessellata* (Walker et al. 1996).

During field work in México, D.F., in summer and fall 2002 and summer 2003, we collected 10 individuals of *A. septemvittata*. We caught the specimens east of México, D.F., within the Sierra de Santa Catarina (a protected

area). Unfortunately this locality, though protected, has still been heavily modified by human activity. The dataset from this study gives us a better understanding of the herpetofauna within México, D.F. This information also shows that saving habitat, even small parcels, within urban areas allows for some of these imperiled species to survive in small populations. Our study provides morphological data, natural history, and locality information on *A. septemvittata* in the hope that this information will further the protection of this species in these fragmented areas where natural habitat still exists. For our purposes, the taxonomic controversy surrounding *A. septemvittata* (Duellman and Zweifel 1962, Walker 1981a, 1981b, Wright 1993, Forstner et al. 1998, Walker et al. 2001, Reeder et al. 2002) is of little importance.

METHODS

The capture location of each specimen was noted, and the habitat was characterized and photographed. Snout–vent length (SVL) and tail length were measured with a plastic ruler (accurate to 1 mm). A digital caliper (accurate to 0.01 mm) was used to record head length, head width, head height, interlimb length, and femur length. Though sex and maturity were verified by dissection, our post-study observations determined that the taking of specimens

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Fig. 1. Sierra de Santa Catarina, México, D.F., showing the habitat where *Aspidoscelis septemvittata* was collected.

TABLE 1. Specimens of *Aspidoscelis septemvittata* collected at México, D.F. For abbreviations see text.

Museum	<i>n</i>	Date	Locality	Delegación	Source
AMNH 14221	2	June 1919	Villa de Guadalupe	Gustavo A. Madero	AMNH
AMNH 14224	5	June 1919	2 miles west Xochimilco	Xochimilco	AMNH
AMNH 15439–15443		May 1919			
ENCB 1897	1	June 1965	Santa Cruz Acalpixca	Xochimilco	ENCB
ENCB 3810	1	May 1967	Santa Cruz Acalpixca	Xochimilco	ENCB
CNAR 2404	1	Unknown	Villa de Guadalupe	Gustavo A. Madero	CNAR
CNAR 13329	1	September 2002	SSC	Tláhuac	This study
CNAR 13330–13331	2	October 2002	SSC	Tláhuac	This study
CNAR 14476–14482	7	July 2003	SSC	Tláhuac	This study

had little impact on the population. Males were considered sexually mature if they showed enlarged testes or convoluted epididymi (Goldberg and Lowe 1966). The presence of either vitellogenic eggs or distended oviducts was indicative of female maturity. Specimens were deposited at Colección Nacional de Anfibios y Reptiles (CNAR).

RESULTS

Distribution and Locality

The recently discovered population of *A. septemvittata* was found east of México, D.F.,

within the Sierra de Santa Catarina (SSC), a protected area. The SSC is located at Delegación Tláhuac on the México–Puebla Highway (CNAR-13329 location: 19°19'09"N, 98°58'35"W). Specimens were collected between 2305 and 2358 m above sea level. Within the study area, which is totally surrounded by human settlements, there are still some small fragments of the native xeric scrub vegetation (Fig. 1).

Historically *A. septemvittata* was present both north and south of the México, D.F., and a few specimens have been collected from this area in the past. According to American

TABLE 2. Characteristics of 10 specimens of *Aspidoscelis septemvittata* from Sierra de Santa Catarina, México, D. F. SVL = snout-vent length, TL = tail length, W = weight, HW = head width, HH = head height, HL = head length, IL = interlimb length, and FL = femur length; * = tail regenerated, ** = no available data.

Specimen no.	Sex	Condition	SVL	TL	W	HW	HH	HL	IL	FL
CNAR 13329	male	neonate	38	76	1.2	5.8	4.6	10.4	16.1	**
CNAR 13330	male	neonate	41	94	1.7	6.5	5.7	11.6	18	7.5
CNAR 13331	male	neonate	35	63	0.8	5.5	4.2	9.8	15	5.9
CNAR 14476	male	adult	90	204	19.5	12.1	11.7	21.3	48.5	14.9
CNAR 14477	male	juvenile	68	166	8.0	9.3	8.1	18.2	31.4	11.9
CNAR 14478	male	adult	78	189	14.3	11.4	10	19.2	40.4	15
CNAR 14479	male	adult	84	208	18.5	12.1	11.2	21.6	39	14.9
CNAR 14480	female	adult	73	173	11.0	**	**	**	**	**
CNAR 14481	female	adult	71	112*	8.5	9.45	8.3	17.4	37.4	12.3
CNAR 14482	male	adult	91	208	25.3	12.8	12.4	22.9	41.6	17.1

Museum of Natural History (AMNH), the first record of this species corresponds to 7 specimens from La Villa de Guadalupe and Xochimilco that were collected in 1919 (Table 1). The only specimen cataloged in an official collection from México (CNAR) was also collected at La Villa de Guadalupe. However, few data (collector, date of collection, exact locality, etc.) were included with the preserved specimen. Also, 2 specimens collected from Santa Cruz Acalpixca, Xochimilco, that were deposited at the Escuela Nacional de Ciencias Biológicas del Instituto Politécnico Nacional (ENCB) were accidentally discarded from the collection because of mislabeling, lack of data, and misidentification. Therefore, the most recent confirmed specimens of *A. septemvittata* are from 1919.

Morphology and Natural History

Ten specimens captured during our study ranged in size from 35 to 91 mm SVL (Table 2). Three neonate males were collected in September and October 2002 (35, 38, and 41 mm SVL); the 2 smallest had navel scars. In July 2003, a juvenile male (68 mm SVL), 4 adult males (78, 84, 90, and 91 mm SVL), and 2 adult females (71 and 73 mm SVL) were collected. The adult males showed testes with convoluted epididymi. All adult females presented distended oviducts.

Dorsally, all individuals (including juveniles) had multitudes of dots arranged into 7 distinct stripes. All specimens in our collection possess vertebral stripes, with the majority of specimens (7 of 10) showing bifurcation within these midsagittally located stripes (Fig. 2). Adult males have a red throat color and a black-blue ventral color, while females possess regions of white with dots (red or black) on the throat and ven-

tral surface. Due to our small sample size (mainly females), sexual dimorphism of the body and head were not evaluated statistically. However, mean SVL (85.8 mm, $s_{\bar{x}} = 3.0$ mm) and mean weight (19.4 g, $s_{\bar{x}} = 2.3$) of adult males were greater than those of females (72.0 mm, $s_{\bar{x}} = 1.0$; 9.8 g, $s_{\bar{x}} = 1.3$), suggesting that there is sexual dimorphism in this species (Fig. 2; Table 2).

DISCUSSION

According to several studies, *A. septemvittata* was extirpated from México, D.F., 20 years ago as a consequence of urban activities (Casas-Andreu 1989, Méndez de la Cruz et al. 1992, Walker et al. 2001). The discovery of the SSC population suggests that the distribution of *A. septemvittata* within México, D.F., was more extensive than originally thought.

Unfortunately, the newly discovered SSC population may soon become extinct due to extensive human population growth and anthropogenic activities. The minimal impact of this study was not significant to the population. According to a decree (Gaceta Oficial del Distrito Federal 2003), the SSC is a protected area created in 1994 and includes roughly 576 ha of natural habitat. The area is a refuge for a large number of species of flora and fauna that are included on the national Red List. The SSC is totally surrounded by human settlements, some of which have illegally invaded the protected area. Human invasion impact has reduced the usable habitat by approximately 8.3% (Gaceta Oficial del Distrito Federal 2003). For example, the habitat of *A. septemvittata* has been fragmented for agricultural activities (e.g., growing corn, oats, beans, peaches, etc.), which eliminate native vegetation.

Fig. 2. Dorsal pattern in *Aspidoscelis septemvittata* from Sierra de Santa Catarina, México, D.F.: (A) CNAR-14482,

B

adult male, SVL 91 mm; (B) CNAR-14481, adult female, SVL 71 mm.

The newly discovered SSC population has additional importance as it may represent the southern distributional limit of this lizard species (Duellman and Zweifel 1962, Walker et al. 2001). Peripheral populations may exhibit unique morphologic and genetic characteristics that make these populations valuable elements for conservation, and the locations of these peripheral populations may represent sites of future speciation events (Lesica and Allendorf 1995).

Enormous controversy exists about the taxonomy of this species (Duellman and Zweifel 1962, Walker 1981a, 1981b, Wright 1993, Forstner et al. 1998, Walker et al. 2001, Reeder et al. 2002). On the basis of its morphology and scutellation, Duellman and Zweifel (1962) indicated that for several populations (including México, D.F.), the ranges of variation and geographic distribution are so poorly known that *A. septemvittata* is not given a formal taxonomic status. The dark fields are spotted within the SSC population; moreover, the largest individuals retain their stripes, a pattern that is morphological evidence of its taxonomy because this characteristic is shared with both the La Villa de Guadalupe population and the Xochimilco population (Duellman and Zweifel 1962). However, further molecular studies are necessary to evaluate the taxonomic status of *A. septemvittata* from México, D.F.

Although a project now exists that is concerned with understanding the natural history of *A. septemvittata* and factors that affect its distribution at the SSC, no plan or study includes an effective conservation procedure that would save this lizard and other fauna and flora within the SCC. Therefore, we hope that the authorities of México, D.F., will take action to significantly reduce the human activities that are slowly destroying the biodiversity of the SSC.

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LITERATURE CITED

- CASAS-ANDREU, G. 1989. Los anfibios y reptiles y su estado de conservación en el Valle de México. Pages 117–123 in A.R. Gio, I. Hernández, and E. Sains, editors, *Ecología Urbana*. Sociedad Mexicana de Historia Natural, México, D.F.
- DUELLMAN, W.E., AND R.G. ZWEIFEL. 1962. A synopsis of the lizards of the *sexlineatus* group (Genus *Cnemidophorus*). Bulletin of the American Museum of Natural History 123:155–210.
- EZCURRA, E. 1990. De las chinampas a la megalópolis: el medio ambiente en la cuenca de México. Fondo de Cultura Económica, Serie “La Ciencia desde México,” México, D.F.
- FORSTNER, M.R.J., J.R. DIXON, J.M. FORSTNER, AND S.K. DAVIS. 1998. Apparent hybridization between *Cnemidophorus gularis* and *Cnemidophorus septemvittatus* from an area of sympatry in southwest Texas. *Journal of Herpetology* 32:418–425.
- GACETA OFICIAL DEL DISTRITO FEDERAL. 2003. Decreto que modifica el área natural protegida “Sierra de Santa Catarina”, zona sujeta a conservación ecológica, ubicada en las Delegaciones Tláhuac e Iztapalapa, Distrito Federal, México.
- GOLDBERG, S.R., AND C.H. LOWE. 1966. The reproductive cycle of the western whiptail lizard (*Cnemidophorus tigris*) in southern Arizona. *Journal of Morphology* 118:543–548.
- LESICA, P., AND F.W. ALLENDORF. 1995. When are peripheral populations valuable for conservation? *Conservation Biology* 9:753–760.
- MÉNDEZ DE LA CRUZ, F.R., J.L. CAMARILLO R., M. VILLAGRÁN SANTA CRUZ, AND R. AGUILAR CORTEZ. 1992. Observaciones sobre el *status* de los anfibios y reptiles de la Sierra de Guadalupe (Distrito Federal-Estado de México). *Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología* 63:249–256.
- REEDER, T.W., C.J. COLE, AND H.C. DESSAUER. 2002. Phylogenetic relationships of whiptail lizards of the genus *Cnemidophorus* (Squamata: Teiidae): a test of monophyly, reevaluation of karyotypic evolution, and review of hybrid origins. *American Museum Novitates* 3365:1–61.
- WALKER, J.M. 1981a. Systematics of *Cnemidophorus gularis*. I. Reallocation of populations currently allocated to *Cnemidophorus gularis* and *Cnemidophorus scalaris* in Coahuila, Mexico. *Copeia* 1981:826–849.
- . 1981b. Systematics of *Cnemidophorus gularis*. II. Specific and subspecific identity of the Zacatecas whiptail (*Cnemidophorus gularis semiannulatus*). *Copeia* 1981:850–868.
- WALKER, J.M., J.E. CORDES, AND H.L. TAYLOR. 1996. Extirpation of the parthenogenetic lizard *Cnemidophorus tessellatus* from historically significant sites in Pueblo County, Colorado. *Herpetological Review* 27:16–17.
- WALKER, J.M., J.A. LEMOS-ESPINAL, J.E. CORDES, H.L. TAYLOR, AND H.M. SMITH. 2001. Allocation of populations of whiptail lizards to *septemvittatus* Cope,

- 1892 (Genus *Cnemidophorus*) in Chihuahua, México, and the *scalaris* problem. *Copeia* 2001:747–765.
- WRIGHT, J.W. 1993. Evolution of whiptail lizards (Genus *Cnemidophorus*). Pages 27–82 in J.W. Wright and L.J. Vitt, editors, *Biology of whiptail lizards* (Genus *Cnemidophorus*). Oklahoma Museum of Natural History, Norman, OK.
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