The Arizona Striped Whiptail: Past and Present

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Abstract—*We surveyed historic and nearby collecting localities for* Aspidoscelis *(=* Cnemidophorus*)* arizonae *in Cochise and Graham Counties, Arizona, during spring and summer, 2000-2003.* Aspidoscelis arizonae *was present at or nearby all but one of the historic sites (seven of eight) that we surveyed located near Willcox (within 15 km), but not the type locality 65 km to the west at Fairbank, Cochise County, nor the Whitlock Valley 65 km to the northeast in Graham County. The Desert Grassland Whiptail,* A. uniparens*, was present at most sites unoccupied by* A. arizonae*, including the type locality; three sites were occupied by both taxa. Cattle grazing was apparent at virtually all sites occupied by either species;* A. arizonae *was associated with relatively open grasslands, whereas* A. uniparens *was often found in habitats with numerous invader shrubs (e.g., mesquite), regardless of grazing activity.*

Introduction

The Arizona Striped Whiptail, *Aspidoscelis arizonae*, has enjoyed a complex taxonomic history. Originally described by Van Denburgh (1896) based on a single specimen labeled "Fairbank, Cochise County, Arizona," it was relegated to synonymy with *A. perplexa* (= *inornata*) by Van Denburgh (1922) and noted as extirpated from the type locality some twenty years after its initial collection (Van Denburgh and Slevin 1913). Wright and Lowe (1965) rediscovered *A. arizonae* at Willcox Playa, Cochise County, Arizona, in 1962, and since that time it has been known from only a handful of localities near Willcox, and in the Whitlock Valley, Graham County, Arizona (Mitchell 1979; Wright and Lowe 1993; Rosen et al. 1996). Wright and Lowe (1965) recognized *A. arizonae* as a subspecies of the widely distributed Little Striped Whiptail, *A. inornata*; however, most recent workers have recognized *A. arizonae*.

Wright and Lowe (1965) and Rosen et al. (1996) suggested that *A. arizonae* was historically a desert grassland form distributed widely in southeastern Arizona that declined following alteration and reduction of habitat due to overgrazing and drought that began in the late 1800s. They also indicated that *A. arizonae* may have been replaced in these altered habitats by the unisexual form, *A. uniparens*, concordant with theoretical expectations about the reproductive advantage of parthenogenesis (e.g., Hulse 1981). Herein we report on surveys for whiptails in Cochise and Graham Counties during 2000, and 2002-2003. Presence of *A. arizonae*, *A. uniparens*, and other whiptails, as well as habitat characteristics in relation to grazing impacts were assessed for all historic collecting localities and nearby sites.

Materials and Methods

We obtained information about historic collecting sites for *A. arizonae* from publications (e.g., Wright and Lowe 1965) and museum records (i.e., Arizona State University, University of Arizona, and Museum of Vertebrate Zoology, University of California, vertebrate collections). Fieldwork was conducted during April through September 2000-2003. Sites near Willcox were visited and the following information recorded: (1) precise location (UTM; Garmin GPS 12 XL unit); (2) temperature (air temperature approximately 1.5 m above ground in shade); (3) time and duration of survey; (4) cloud cover; (5) general habitat characteristics (soil color and texture; numerically dominant perennial plants; apparent condition vis a vis grazing by cattle and sheep); and (6) all reptiles observed during survey efforts (typically 30 minutes per site). Sites were visited repeatedly within and across years to document consistency in presence/absence of *A. arizonae* and *A. uniparens*.

During surveys all individual lizards were followed closely until the observer obtained a clear visual image for identification (following Wright and Lowe 1993). We captured up to 15 specimens at each site in order to confirm visual taxonomic assignments and obtain tissues for future genetic analysis.

At 25 survey sites in Cochise and Graham Counties, Arizona, grazing impacts were assessed by surveying plants and cattle sign (dung) using modified belt transects (50 m by 2m width) in which substantive plants (greater than 10 mm stem diameter) were recorded using the criteria listed in appendix I. Grazing activity was assessed directly using dung pile counts along the plant survey transects. Specifically, all dung piles were scored along each plant transect (regardless of size or shape). All habitat assessment transects were completed between April 18 and July 10, 2003.

Results

Many specimens listed in various museum collections as *A. inornata* from Cochise County are likely misidentified *A. uniparens* (John Wright, personal communication). We examined all *A. inornata* (= *arizonae*) from Cochise County held at the MVZ (UC Berkeley), and found that only 7 of 29 were in fact *A. arizonae*. All of these were from within 5 km of Willcox; the remainder were *A. uniparens*. Interestingly,

many *A. uniparens* were collected by Law (at MVZ) in 1919 along state route 186 southeast of Willcox, revealing that this taxon has been present at sites within 10 km of Willcox for at least 80 years rather than having recently colonized these areas following overgrazing and habitat disturbance. Virtually all specimens of *A. arizonae* in the ASU and UA collections were properly identified, and from within 10 km of Willcox (appendix II).

Historically, *A. arizonae* has been collected primarily along the eastern and northern edges of the Willcox Playa (ASU, UA, and MVZ collections). Only two historic sites are more than about 15 km from Willcox: the type locality at Fairbank (Van Denburgh 1896) about 65 km to the southwest, and the Whitlock Valley (discussed by Wright and Lowe 1993; a single specimen is housed at UA) about 65 km to the northeast.

A total of 111 person hours was spent surveying on a total of 25 days from April 20 through September 5, 2000; similarly, 41 person hours on eight days from June 24 through September 1, 2002, and 53 person hours on 12 days from April 18 through August 30, 2003. A total of 81 independent sites were surveyed in Cochise and Graham Counties. The majority of sites were heavily grazed, with ample sign (e.g., droppings, active trails, grazed shrubs and grasses) of persistent, recent grazing by cattle. Overall, *A. arizonae* were present at 12 sites, *A. uniparens* were present at 45 sites, *A. tigris* were present at 15 sites, and no whiptails were observed at the remaining 15 sites. Three sites were occupied by both *A. arizonae* and *A. uniparens*.

We observed *A. arizonae* at 10 sites, including all but one of the eight historic localities, in the vicinity of Willcox, and at two sites roughly 35 km to the north, near Bonita, Graham County (figure 1). One historic collecting locality, roughly 13 km north of Willcox, is now occupied by a housing development, and no whiptails were observed. Relatively large numbers of *A. arizonae* were observed at three sites: Twin Lakes Golf Course three km southwest of Willcox; along state route 186, seven km southeast of Willcox; and near Bonita, Graham County. At each of these sites more than 10 *A. arizonae* were visually confirmed within 30 minutes of field survey activity on several occasions. Like other collectors (e.g., Van Denburgh and Slevin 1913; Wright and Lowe 1965), we documented only *A. tigris* and *A. uniparens* at Fairbank, the type locality. The northern Whitlock Valley was occupied exclusively by *A. tigris* when surveyed in 2000, 2002, and 2003; it may be that other areas in this valley that were not accessible (private holdings) contain suitable habitat that we could not access (e.g., we could not access the precise locality near the Hackberry Ranch for the single *A. arizonae* in the UA collection, taken in 1983).

At one site (7 km southeast of Willcox), recognized as "area I" by Mitchell (1979), we found only *A. arizonae* (12 of 12 individuals captured) and no *A. uniparens*, just as Mitchell documented in 1975. We observed *A. uniparens* at a number of sites to the west, south, and north of Willcox Playa, and at many localities in eastern Cochise County. However, we found no evidence that *A. uniparens* was present at sites historically occupied by *A. arizonae* (except for the type locality, Fairbank; see below). *Aspidoscelis tigris* was found at rocky sites with creosote and other shrubs, rarely with *A. uniparens* and never with *A. arizonae*.

Habitat surveys were conducted at nine sites occupied by *A. arizonae* (one of the nine sites also had *A. uniparens*) and at one additional site occupied by *A. uniparens* and hybrids between *A. arizonae* and *A. uniparens* (table 1). Fifteen nearby additional sites (most were within 10 km of a site occupied

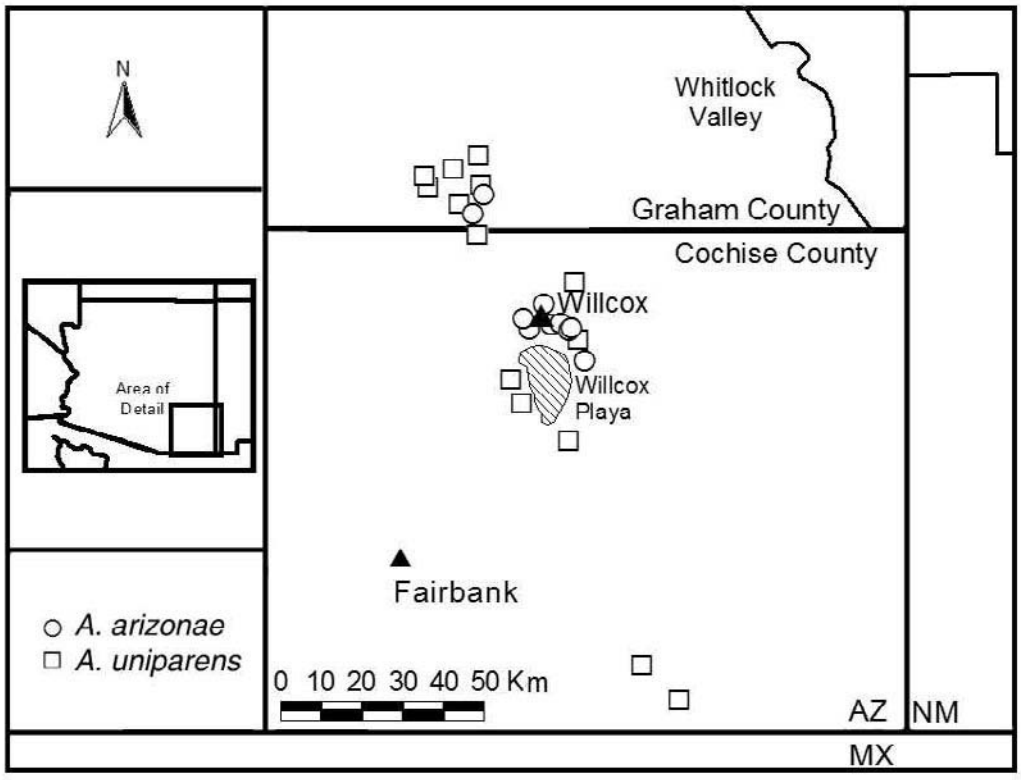

Figure 1—Sites surveyed for habitat characteristics in Cochise and Graham Counties, Arizona, in 2003 (see tables 1 and 2 for additional data from these sites). Sites for *Aspidoscelis arizonae* (circles) represent all known localities surveyed; sites for *A. uniparens* (squares) represent only 15 of 45 sites.

Table 1—Habitat survey scores for sites occupied by *Aspidoscelis arizonae* (sites 1-8); only *A. uniparens* and hybrids were present at site 9, and both *A. arizonae* and *A. uniparens* were present at site 10. Grass = index (1-5) based on criteria in appendix 1; Mesquite, shrubs and dung represent counts. N = number of 50 X 2 m belt transects recorded at each site. Sites are plotted in figure 1.

UTM	Grass	Mesquite	Shrubs	Dung	N
1: 596467 E; 3597780 N	2	0	13	1	2
2: 594203 E; 3593212 N	2	3	4	9	2
3: 609018 E; 3571324 N	5	3	1	0	3
4: 606019 E; 3565061 N	3	0	4	4	4
5: 610680E; 3566457 N	5	0	4	10	4
6: 612521 E; 3566861 N	5	2	5	0	2
7: 614376 E; 3565044 N	5	0	1	7	2
8: 614824 E; 3565459 N	4	1	5	5	3
9: 617576 E; 3557783 N	5	3	0	3	4
10: 604809 E; 3567878 N	4	4	2	0	4

by *A. arizonae*) with only *A. uniparens* were surveyed for comparative habitat characteristics (table 2). Sites occupied by *A. arizonae* were significantly higher in grass cover indices (MW U = 116.5, P = 0.019), and lower in both mesquite (MW U = 45.0, P = 0.09) and invader shrub counts (MW U = 35.0, P 0.026) than sites occupied by *A. uniparens*. However, the sites did not differ in current grazing index scores (i.e., dung counts; MW U = 72.5, P = 0.888).

Discussion

We documented the presence of *A. arizonae* at ten sites (including seven of eight historic sites) we visited within 10 km of Willcox, and discovered two disjunct populations approximately 37 km north of Willcox, near Bonita, Graham County (figure 1). Further, we found no evidence that *A. uniparens* has increased in abundance at a site (rte 186, 7 km southeast of Willcox) close to an area of sympatry studied by Mitchell in the 1970s (Mitchell 1976, 1979). With the exception of the type locality at Fairbank, we documented the presence of *A. arizonae* at (or nearby) most all of the historic localities near Willcox that we visited during each survey year (2000-2003). We were unable to confirm the presence of *A. arizonae* at the disjunct site in the Whitlock Valley 60 km to the northeast (discussed in Wright and Lowe 1993), although we did document previously unrecorded populations about 37 km north of Willcox near Bonita, Graham County, Arizona.

The observation that the (single) type specimen of *A. arizonae* was collected at Fairbank (approximately 65 km southwest of Willcox), a site where it does not occur today, is central to the hypothesis that *A. arizonae* was historically more widespread in southeastern Arizona (Wright and Lowe 1965). However, there is reason to suspect that the collecting locality for the type specimen was assigned in error. The

Table 2—Habitat survey scores for sites occupied by *Aspidoscelis uniparens*. Grass = index (1-5) based on criteria in appendix 1; mesquite, shrubs and dung represent counts. N = number of 50 X 2m belt transects recorded at each site. Sites are plotted in figure 1.

UTM	Grass	Mesquite	Shrubs	Dung	N
1: 615356 E; 3577106 N	1	2	15	4	2
2: 602564 E; 3553288 N	3	10	11	0	2
3: 604798 E; 3547324 N	1	4	25	6	2
4: 638296 E; 3475562 N	5	3	1	3	2
5: 630466E; 3483931 N	3	4	5	0	2
6: 595206 E; 3607484 N	2	1	13	1	4
7: 595953 E; 3600345 N	2	2	9	1	2
8: 585197 E; 3599891 N	3	3	5	3	4
9: 584312 E; 3602417 N	5	0	0	15	4
10: 590114 E; 3604199 N	1	2	12	4	2
11: 595296 E; 3588058 N	2	5	4	0	2
12: 595296 E; 3588058 N	1	1	16	4	3
13: 591540 E; 3595647 N	1	4	30	8	2
14: 616443 E; 3563040 N	4	1	6	11	3
15: 614629 E; 3538446 N	4	4	4	4	3

W. W. Price expedition used Fairbank as a base in southeastern Arizona in 1894; many other herpetological specimens (e.g., exclusively high elevation, montane forms) likely collected elsewhere were labeled "Fairbank" (Phil Rosen, personal communication). Additionally, the creosote/acacia dominated community near Fairbank, although presumably altered relative to its historic state, is not a habitat typically occupied by *A. arizonae*. We are aware of no other historic collecting localities in which *A. uniparens* has replaced *A. arizonae*. The evidence reviewed here, including consistent distributions among these taxa, indicates that if wide-spread decline of *A. arizonae* with replacement by *A. uniparens* occurred, it was prior to 1900, and that their current distributions in Cochise County appear relatively stable at least over the past fifty years.

Rosen et al. (1996) suggested that *A. uniparens* might be competitively superior to *A. arizonae*. Mitchell's (1976, 1979) analysis indicated that these two taxa are nearly identical with respect to diet, and thus if resources are limiting, and the unisexual *A. uniparens* has a reproductive advantage (Hulse 1981), then it might replace the bisexual *A. arizonae* over time in zones of overlap. Rosen et al. (1996) observed sympatric populations of *A. arizonae* and *A. uniparens* west of Willcox in 1993. Although we focused primarily on simple assessments of presence and absence, we could find no evidence that *A. arizonae* has declined and been replaced by *A. uniparens*; it appears that *A. arizonae* is persisting in historic localities identified in the 1960s (e.g., sites 3-7 km west and southwest of Willcox). Independent of high levels of grazing apparently maintained throughout the region, our simple surveys suggest that *A. arizonae* is at least as abundant at the twelve sites where we observed it in 2000-2003 as *A. uniparens* is at the nearby sites it occupies. Perhaps most significantly, the continued presence of *A. arizonae* at a "pure" site surveyed by Mitchell (1976) adjacent to an area occupied by *A. uniparens*, in spite of heavy grazing throughout the region, indicates a lack of competitive exclusion of *A. arizonae* by *A. uniparens* in some grazed habitats. Interesting, the collections by Law held at the MVZ, obtained in 1919, reveal the long-standing presence of *A. uniparens* in this area 8-25 km southeast of Willcox, which is certainly ample time for this taxon to have expanded and replaced nearby populations of *A. arzionae*.

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Appendix I.

Criteria for scoring habitat characteristics of sites (per 50 X 2 m transect). (1) Grass cover index: 1 = no bunch grasses present; 2 = 1-10 bunch grasses (primarily *Sporobolus* spp.) present; 3 = 11-49 bunch grasses present; 4 = 50-99 bunch grasses present; 5 = Æ 100 bunch grasses present. Each individual grass "clump" was counted, regardless of diameter, height, or condition; (2) Mesquite counts: number of plants. Each plant with any above ground vegetative part within the two m belt was counted; (3) Creosote counts: number of plants. Each plant with any above ground vegetative part within the two m belt was counted; (4) Invader shrub (primarily *Gutierrezia* spp., *Hymenoclea* spp., and *Isocoma* spp.) counts: number of non-mesquite/creosote shrubs. Each plant with any above ground vegetative part within the two m belt was counted; (5) Current grazing index: number of dung piles. Each discrete pile (i.e., contiguous), regardless of size, was counted.

Appendix II.

Specimens examined (MVZ, UA, ASU): MVZ: 7894-7898, 7900-7909, 7911-7918, 49852, 61753, 67091, 67093, 149966, 206988; UAZ: 05421-05440; 05444-05451; 05460-05462; 05476-05488; 06719-06721; 10915-10918; 13695-13722; 15553; 16818-16832; 18547; 18584; 19087; 19421; 23588; 25350-25351; 25361-25365; 25370-25372; 25389-25400; 25406; 25408-25414; 25501-25518; 33041-33044; 44628; 44638-44723; 50052-50053; 5212