
REEVALUATION OF THE STATUS OF WHIPTAILS (*ASPIDOSCELIS* SP.) BASED ON MUSEUM SPECIMENS COLLECTED BY BENJAMIN H. BANTA (1963–1965)

JAMES M. WALKER¹, LAUREN J. LIVO^{2,4}, AND JAMES. E. CORDES³

¹Department of Biological Sciences, University of Arkansas, 850 West Dickson Street,
Fayetteville, Arkansas 72701, USA

²1835 South Van Gordon Street, Lakewood, Colorado 80228, USA

³Division of Arts and Sciences, Louisiana State University Eunice, Louisiana 70535, USA

⁴Corresponding author; e-mail: LJLivo@aol.com

Abstract.—During 1963–1965 Benjamin H. Banta studied the faunal diversity of amphibians and reptiles in and near the Rocky Mountains in Colorado, USA, using pitfall traps along highways in difficult terrain in Fremont, Teller, Custer, and Pueblo counties. Banta reported trapping a lizard now known as the Colorado Checkered Whiptail (*Aspidoscelis neotesselatus*) among those lizards in his pitfall traps. We offer this report to celebrate his energetic multi-year study in general, to reidentify certain specimens he deposited in the collections of the San Diego Natural History Museum to endemic *Aspidoscelis neotesselatus* in Colorado, to identify the parts of his study areas in which whiptail lizards were captured, and to provide maps of his pitfall trapping sites. We note that his studies were conducted in areas of Colorado that substantially added to our knowledge of the geographical and elevational distributions of hybrid-derived triploid *A. neotesselatus* and its paternal progenitor gonochoristic Prairie Racerunner (*Aspidoscelis sexlineatus viridis*). We also confirm that there are no known specimens of diploid parthenogenetic *A. tessellatus* among the whiptail lizards we have examined from the counties sampled by Banta.

Key Words.—*Aspidoscelis neotesselatus*; *Aspidoscelis sexlineatus viridis*; Beulah Road; Colorado; Phantom Canyon; Wet Mountains

INTRODUCTION

We offer this report, in part, as a tribute to Benjamin H. Banta who conducted pitfall trapping projects in and near the Rocky Mountains in southeastern Colorado, USA, in 1963–1965. These studies resulted in the only substantial samples of triploid parthenogenetic Colorado Checkered Whiptail (*Aspidoscelis neotesselatus*) from three areas of Colorado: Phantom Canyon and Wet Mountains in Fremont County and Beulah Road in Pueblo County. Specimens of the Prairie Racerunner (*A. sexlineatus viridis*) obtained in his projects also documented its presence at record high elevations in a previously unstudied area in the Rocky Mountains.

Banta set up additional pitfall stations along two transects in El Paso County. While pitfall stations on one of the Prairie transects captured *A. sexlineatus viridis*, no *A. neotesselatus* were captured and elevational data were not associated with these samples (Banta 1965; Banta and Torbit 1965; Banta 1968), so these transects are not being discussed in this paper. A variety of amphibians and reptiles were

captured during these projects (Appendix Table 1). In addition to reptiles and amphibians, animals captured in pitfall traps included mammals and arthropods, with publications from these findings including two abstracts and a paper (Norris and Banta 1965; Tarr and Banta 1965; Armstrong et al. 1973).

It would be impossible to either overstate the dedication of Banta to the task or to overestimate the expenditure of energy required to dig-in the cans and glass jars at more than 200 sampling stations in difficult terrain, and to regularly visit the stations to remove and preserve specimens of amphibians and reptiles. Banta carried out the studies with students at Colorado College (Colorado Springs) to obtain data on the geographical and elevational distribution and composition of herpetofauna in areas, which will be referred to herein as Phantom Canyon, Wet Mountains, and Beulah Road. One of his contributions in these projects was that he collected what was identified as Common Checkered Whiptails (*Cnemidophorus tessellatus* = *C. tessellatus*) in quite unexpected areas for which there have been limited follow-up studies. More importantly, his Colorado

projects have not been adequately made known to the herpetological community, as only brief abstracts of presentations on the Colorado herpetofauna given by him at scientific meetings can be found in the literature (Banta 1964; Banta and Brechbuhler 1965; Banta and Kimmel 1965). Moreover, the actual identities of the specimens of the aforementioned species of whiptail lizards, as well as representatives of other taxa, have not been verified based on subsequent research (Hammerson 1999). We undertook this investigation to answer several questions pertaining to the collections by B.H. Banta: (1) were lizards identified as *C. tessellatus* actually specimens of triploid *A. neotesselatus* as described by Walker et al. (1997) and discussed by Reeder et al. (2002); (2) were specimens reported from Phantom Canyon collected in both Teller and Fremont counties or only in the latter; and (3) what were the actual stretches of highways along which pitfall traps were used?

MATERIALS AND METHODS

We located specimens of *Cnemidophorus* (= *Aspidoscelis*) from southeastern Colorado, USA, that had been deposited in the San Diego Natural History Museum (SDNHM) through the assistance of Joseph Collins. We obtained two loans of specimens collected by Banta and students from the SDNHM. We examined the lizards to identify pattern class, initially described by Zweifel (1965) and refined or described for *A. neotesselatus* by Walker et al. (1997) and Cordes and Walker (2006).

In 1963 and 1964, B.H. Banta and students undertook the labor-intensive Wet Mountains Project to sample the elevational and geographic distribution of amphibians and reptiles along the road in mountainous terrain south of the Arkansas River in southeastern Colorado. Starting on 26 June 1963, Banta established 72 sampling stations consisting of buried 4.7 L cans and 3.8 L wide-mouthed glass jars along a road beginning near Silver City, Custer County, and ending near Cañon City, Fremont County, and either extracted or deactivated the pitfalls on 24 October 1964 (Banta and Brechbuhler 1965).

In 1964 and 1965, personnel from Colorado College in Colorado Springs undertook the labor-intensive Phantom Canyon Project (Fig. 1) to sample the elevational and geographic distribution of amphibians and reptiles in that canyon in southeastern Colorado (Banta and Kimmel 1965). They removed amphibians and reptiles from buried 4.7 L cans and wide-mouthed 3.8 L glass jars at 96

sampling stations at odometer intervals of 0.32 to 1.6 km (usually at 0.64 km) along the Phantom Canyon road from Victor in Teller County then southward to the north side of the Arkansas River near Florence in Fremont County. Each sampling station at the higher elevations consisted of four buried 4.7 L cans; each sampling station at lower elevations consisted of two 4.7 L cans and a pair of 3.8 L wide-mouthed jars (Banta and Kimmel 1965).

To date, four pattern classes have been described for *A. neotesselatus* (A, B, C, and D), two of which (A and C) pertain to our study. The vertebral line for lizards of pattern class A (Fig. 2) often is a short and straight vertebral line from the occipital scales to the level of the forelimbs followed by dashes; the dark fields have reduced spotting and barring between the relatively intact stripes, some of which extend onto the tail (Zweifel 1965). Lizards of pattern class C (Fig. 2) have a somewhat irregular zigzag and often interrupted vertebral line the length of the vertebral field and extensive barring on the dark fields between stripes which are not apparent on the tail although spots are usually present (Walker et al. 2012). We identified mixtures of *A. neotesselatus* pattern class A as characterized by Walker et al. (1997) and *A. sexlineatus viridis* (Fig. 2) in the samples from Phantom Canyon (approximate location 38.56944°N, 105.09091°W, NAD 83) and Wet Mountains (approximate location 38.34027°N, 105.23692°W, NAD 83) and only *A. neotesselatus* pattern class C in the sample from Beulah Road (approximate location 38.13880°N, 104.81612°W, NAD 83; Appendix Table 2). In some cases, we could not resolve minor discrepancies in number of specimens listed in publications, loan sheets, and SDNHM entries.

We employed the abbreviations and descriptions of meristic characters and data used to verify these identifications (Appendix Table 3). We arrayed all available specimens trapped by Banta and students into three geographically based samples of *A. neotesselatus* (Wet Mountains, Phantom Canyon, and Beulah Road; Fig. 1; Appendix Table 2) and three geographically based samples collected by us (Cañon City, Pueblo Lake, and Valco Ponds) for meristic comparisons (Appendix Table 3). Valco Ponds is now known as the Chain of Lakes component of Pueblo Lake State Park (Walker et al. 2024).

We accessed the JMP platform, Version 17 (SAS Institute Inc., Cary, North Carolina, USA) provided by the University of Arkansas for statistical processing. We compared meristic characters with Analysis of Variance (ANOVA). If ANOVA was significant, we

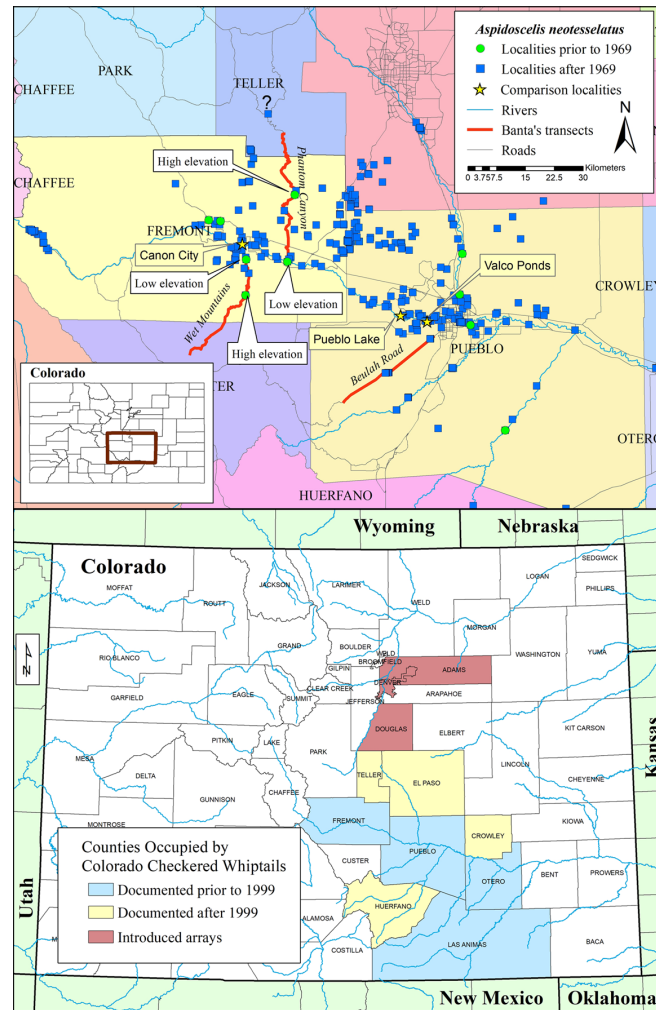


FIGURE 1. (Top) Approximate routes (in red) of Phantom Canyon, Wet Mountain, and Beulah Road for pitfall trap transects set up by B.H. Banta for capture of triploid parthenogenetic Colorado Checkered Whiptail (*Aspidoscelis neotesselatus*) in Fremont and Pueblo counties, Colorado, USA (there are no records from the study of captures of the species for traps in Teller and Custer counties). Green circles represent reports of this species from before 1969, including these transects. Blue squares are later reports. Yellow stars represent the locations of comparison localities in Appendix Table 3. Locality sources include museum records, literature records, iNaturalist reports, personal communications, and personal observations. (Bottom) Distribution by county of *Aspidoscelis neotesselatus* in Colorado showing counties with scattered arrays of the species. Blue indicates documentation of the known natural distribution of this species as of Walker et al. (1997), yellow indicates areas in the natural distribution documented after 1997, and red indicates known introduced arrays. Taylor et al. (2015) documented this species in Teller and El Paso counties as well as a single specimen from Douglas County. Livo et al. (2019) documented this species in Denver, Adams, and Crowley counties. Warfel et al (2021) documented this species in Huerfano County, and Livo et al. (2023) documented establishment of this species in Douglas County.

made pair-wise comparisons of characters between sites with Tukey Honestly Significant Difference (HSD) tests (Sokal and Rohlf 1981). We report means (± 1 standard error) and tests were with an α of 0.05. We present the results based on three of the projects of B.H. Banta conducted in Fremont and Pueblo counties as they pertain to *A. neotesselatus* pattern classes A and C. We also summarize his findings regarding the presence of *A. sexlineatus viridis* at high elevations in Fremont County.

RESULTS

Of the six species of lizards in pitfall traps in Phantom Canyon, by the end of the 1964 field season only two species were trapped more than twice: 294 specimens of Prairie Lizard (*Sceloporus undulatus erythrocheilus* = *S. consobrinus*) and 53 specimens of *C. tessellatus* (= *A. neotesselatus* A) as well as two *A. sexlineatus viridis* (Banta and Kimmel 1965). Specimens collected in 1965 bring the count for *A. neotesselatus* to 60 specimens, and for *A. sexlineatus*

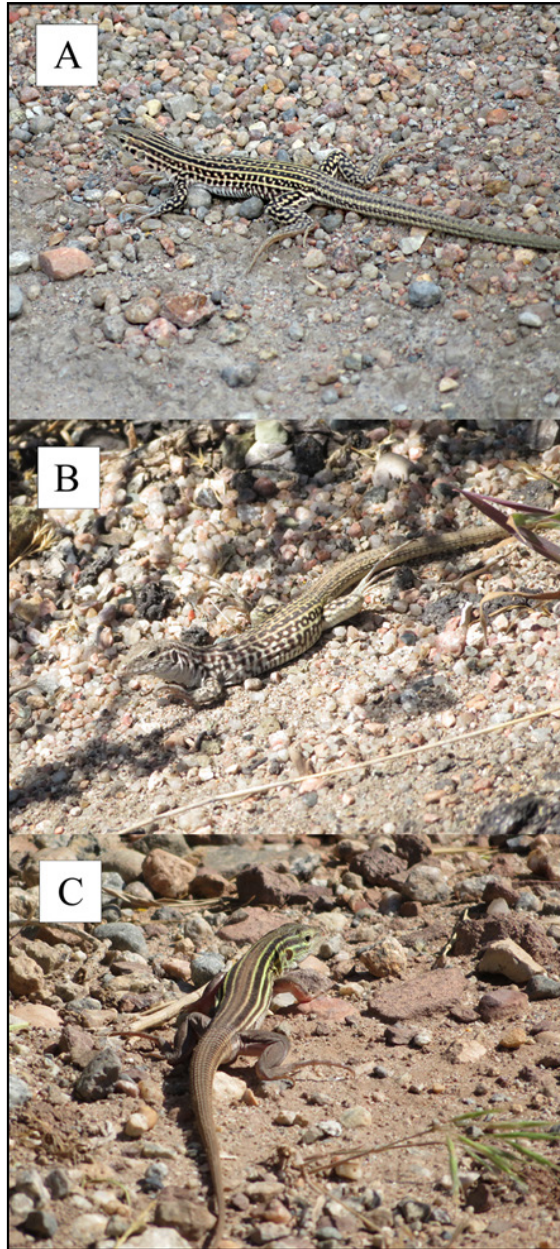


FIGURE 2. Representative photographs of *Aspidoscelis* sp. from the vicinity of transects of B.H. Banta in Colorado, USA. (A) *Aspidoscelis neotesselatus* pattern class A from near Florence, Pueblo County. (B) *Aspidoscelis neotesselatus* pattern class C from Beulah Road, Pueblo County. (C) *Aspidoscelis sexlineatus viridis* from western Fremont County. (Photographed by Lauren J. Livo).

to four specimens total (Appendix Table 2). Banta and Kimmel (1965) listed collection sites ranging from 1,585–3,109 m (5,200–10,201 ft) elevation for the 14 amphibian and reptile species collected along the Phantom Canyon transect (Appendix Table 1). Because these specimens in the SDNHM were not

accompanied by exact trapping location from along the Phantom Canyon road, there are no voucher specimens of *A. neotesselatus* by number known to have been trapped in Teller County. Catalog entries for the entire collection of *A. neotesselatus* A collected in Phantom Canyon in the SDNHM list each specimen as having originated in Fremont/Teller counties. Based on these catalog entries, the Phantom Canyon Project resulted in pitfall trapping of 62 specimens of *A. neotesselatus* A (Appendix Table 2), of which 53 were listed by Banta and Kimmel (1965) as originating between 1,585–2,103 m (5,200–6,900 ft), and four specimens of *A. sexlineatus viridis*, from between 1,615–2,011 m (5,300–6,600 ft). Phantom Canyon gains in elevation from the south in Fremont County to the north in Teller County, with an elevation of approximately 2,718 m (8,916 ft) at the Fremont/Teller county line. Because the maximum elevation for both *A. neotesselatus* (i.e., 2,103 m; 6,900 ft) and *A. sexlineatus viridis* (i.e., 2,011 m; 6,600 ft) observed in this canyon were well below the elevation at the county line, we infer that all specimens of these species were obtained in traps set in Fremont County.

We infer that *A. neotesselatus* A, which is a diurnal, ground-dwelling, exposed-substrate, sun-loving species (Walker et al. 2024) would most often enter a pitfall trap by accident, though mistaken use of it for a retreat is also possible. We used the Phantom Canyon results to better understand the size classes of lizards that entered the pitfall traps. There are 13 dates (24 June 1964 to 21 June 1965) listed during which from one to 11 individuals of *A. neotesselatus* A were removed from pitfall traps in Phantom Canyon (Appendix Table 2). Five or more lizards (i.e., five, seven, seven, eight, 10, and 11) were removed from traps on six dates, which included three lizards 40–49 mm snout-vent length (SVL), five 50–59 mm, three 60–69 mm, 12 lizards 70–79 mm, 22 that were 80–89 mm, and three 90–93 mm (Fig. 3).

Banta and Brechbuhler (1965) listed collection sites ranging from 1,700–2,499 m (= 5,580–8,200 ft) elevation for the 15 amphibian and reptile species collected along the Wet Mountain transect (Appendix Table 1). Because the maximum elevation for both *A. neotesselatus* (i.e., 2,072 m; 6,800 ft) and *A. sexlineatus viridis* (i.e., 2,286 m; 7,500 ft) observed along this road were below the elevation at the county line of 2,463 m (8,082 ft), we infer that all specimens of these two lizard species were obtained in traps set in Fremont County. Of the eight species of lizards in pitfall traps in 1963 and 1964, only three species

were trapped more than five times; 601 specimens of *Sceloporus consobrinus* (reported as *Sceloporus undulatus erythrocheilus* by Banta and Brechbuhler 1965), 47 triploid *A. neotesselatus* A (= *C. tessellatus* as reported by Banta 1964), and 46 *A. sexlineatus viridis* (Appendix Table 2). Based on SDNHM catalog entries there are 19 dates (between 26 June 1963 and 12 September 1964) listed on which one or more *A. neotesselatus* A were removed from pitfall traps in the Wet Mountains; 15 dates (from 28 June 1963 to 12 September 1964) are listed on which one or more *A. sexlineatus viridis* were removed from pitfall traps. Discrepancies between Banta (1964) and Appendix Table 2 are based on his misidentifications of a few lizards cataloged as *A. sexlineatus viridis* and/or some lizards that were not sent to SDNHM.

The Beulah Road Project, Pueblo County, yielded the specimens pitfall trapped along Colorado Highway 96 southward from the City of Pueblo to the community of Beulah at elevations that ranged from about 1,524 m (5,000 ft) near Pueblo to about 1,925 m (6,330 ft) near Beulah (Appendix Table 2). We have found no summary of the project in the literature, but SDNHM lists five reptile species recorded by Banta (Appendix Table 1). All of the whiptail lizards from the Beulah Road Project in the SDNHM were poorly preserved and formalin-blackened, but all of them represent a westward range extension for *A. neotesselatus* pattern class C, which is limited to the relatively small area in Pueblo County drained by the St. Charles River, which flows north to the Arkansas River (Walker et al. 1997).

DISCUSSION

Many of the taxa sampled during the collection efforts of B.H. Banta have undergone nomenclatural changes. For example, for the Colorado Checkered Whiptail and Prairie Racerunner, the genus *Cnemidophorus* used by Banta has been updated to *Aspidoscelis* (Reeder et al. 2002). The nomenclature for the *Sceloporus* species in Colorado has undergone revisions, but unfortunately because of the coarseness of sampling, the geographic boundaries between some species is uncertain. In his publications, Banta reported the *Sceloporus* species he sampled as *Sceloporus undulatus erythrocheilus*. The San Diego Natural History Museum lists these lizards as *S. tristichus* and iNaturalist lists lizards in this area as *S. consobrinus*, which is how we believe they should be assigned pending further research. We list the nomenclature to species level based on the

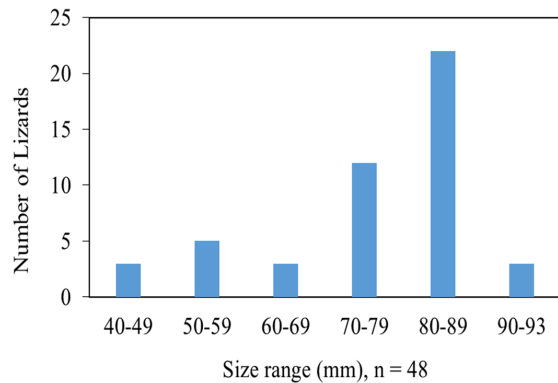


FIGURE 3. Distribution of size classes of Colorado Checkered Whiptails (*Aspidoscelis neotesselatus*) caught in Phantom Canyon, Colorado, USA, on transects set up by B.H. Banta.

geographic distribution and current usage of Crother et al. (2017; Appendix Table 1).

The lizards we have identified as specimens of *A. neotesselatus* A obtained by B.H. Banta in Phantom Canyon were the northernmost records of natural occurrence for the species at the time in Colorado. We attribute the first definitive records for *A. neotesselatus* in Teller County (Fig. 1), identified as such, to the report of Taylor et al. (2015). While Taylor et al. (2015) provide a high elevation record of 2,138 m (7,014 ft.) for *A. neotesselatus*, it only exceeds the Phantom Canyon high elevation record of 2,103 m (6,900 ft) by 114 m (374 ft). Of the lizards trapped in Phantom Canyon, lizards of 40–69 mm SVL (n = 11, 22.9%) were trapped far less often than lizards of 70–93 mm (n = 37, 77.1%). The numbers of individual *A. neotesselatus* A trapped within Phantom Canyon and along the Wet Mountain transect indicates that its conservation status during the study period was not that of an either scarce or threatened biological entity.

Since the time of the sampling efforts of B.H. Banta, *Aspidoscelis neotesselatus* remains common in Fremont and Pueblo counties. As of 17 February 2025, iNaturalist recorded 104 observations for this species in Fremont County, including records from the vicinity of both Phantom Canyon and Wet Mountain transects, and 252 observations in Pueblo County, although none of these were in the vicinity of the Beulah Road transect. Areas north of the Arkansas River in Fremont County, including localities in the vicinity of the Phantom Canyon transect, have been intensively investigated, and museum specimens collected were used in the description of *A. neotesselatus* as a species separate from *A. tessellatus* (Walker et al. 1997). As with the *A. neotesselatus* sampled from Phantom Canyon and

Wet Mountain transects, all members of this species from eastern Fremont County are representatives of pattern class A. Variation in pattern class affiliation for *A. neotesselatus* from western Fremont County are discussed in Taylor and Livo (2023). Representatives of *A. neotesselatus* of pattern classes A, B, and C occur in Pueblo County. These pattern class arrays are largely allopatric, with pattern class B in eastern Pueblo County, pattern class C south of the Arkansas River along the St. Charles River drainage, and pattern class A from Pueblo and to the west.

The *A. neotesselatus* sampled by Banta from Beulah Road all belonged to pattern class C. While museum specimens have been collected since the time of the work by Banta from many locations in Pueblo County (e.g. Walker et al. 1997, Taylor et al. 2006), none were collected from along the Beulah Road transect. One of us informally surveyed areas along Beulah Road for *A. neotesselatus* finding lizards of pattern class A just southeast of Pueblo City limits and lizards of pattern class C in the vicinity of Rock Creek Hill, about 16 km northeast of Beulah. Because Beulah Road collection efforts did not note any lizards of pattern class A, either the area these lizards currently occupy was not sampled by Banta, or they were not present at the time of his sampling. Banta may have obtained his pattern class C lizards from the vicinity of Rock Creek Hill, where lizards of pattern class C currently occur, but he may also have obtained his samples from other, unknown, sites along the highway.

The continuing success of arrays of *A. neotesselatus* can be inferred in part by the expansion of the documented natural range as well as by the thriving introduced arrays to the north in the South Platte River drainage (Livo et al. 2019). One iNaturalist observation (Record 89832477) in Teller County, indicated with a question mark in Figure 1, may represent a waif translocated to a popular tourist town much higher in elevation (2,961m) than the high elevation record of 2,138m reported by Taylor et al. (2015) for *A. neotesselatus* in the same county. A brief survey of the area after we became aware of this report did not reveal any *A. neotesselatus* at the site.

Presence of *A. sexlineatus viridis* at a high elevation of 2,286 m (7,500 ft) in the Wet Mountains (Fig. 4) is remarkable given the fact that it is also one of the most widely distributed and abundant saurians at lower elevations in Great Plains habitats in almost all Colorado counties (Fig. 4) east of the Rocky Mountains (Hammerson 1999) and in many other states. In eastern Colorado, it is absent only

from Broomfield city and county, a small county consolidated from portions of adjacent counties in 2001 after commercial and suburban development had already altered much of the landscape. An iNaturalist record of *A. sexlineatus viridis* for Teller County (iNaturalist record 152286694) and another for Gilpin County (iNaturalist record 240426739) may represent waifs inadvertently translocated to sites at elevations considerably higher than where this species is found elsewhere. After we became aware of the Teller County report of *A. sexlineatus viridis*, we briefly surveyed the area but found no lizards. Only four *A. sexlineatus viridis* were collected along the Phantom Canyon transect (Appendix Table 2), suggesting that in this area the species was present at relatively low population levels compared to the Wet Mountain Transect, where 46 *A. sexlineatus viridis* were collected (Banta and Brechbuhler 1965). Banta did not collect any *A. sexlineatus viridis* along the Beulah Road transect.

Despite the documented ability of *A. sexlineatus viridis* to occupy a variety of habitats over a wide range of elevations, since the 1960s and the work of Banta and colleagues (Banta and Brechbuhler 1965; Banta and Kimmel 1965), this species appears to have been nearly extirpated from Fremont County and is much less frequently encountered in Pueblo County than the congeneric *A. neotesselatus*. Inquiries to biologists have not resulted in any reports of this species in Fremont County except for an unverified observation with no associated locality information available. One of us reported on a newly discovered population of *A. sexlineatus viridis* in far western Fremont County (Livo et al. 2021) at an elevation of 2,072 m (6,801 ft.), notable for being the westernmost locality documented for this species; the single Fremont County record of *A. sexlineatus viridis* on iNaturalist (record 82898684) is from the same locality. There have been no recent observations of *A. sexlineatus viridis*, such as on iNaturalist, for this species at the historic localities of Wet Mountains and Phantom Canyon, although recent observations of *A. neotesselatus* for eastern Fremont County are plentiful and *A. sexlineatus viridis* persists to the east in Pueblo County.

Even in Pueblo County, however, *A. sexlineatus viridis* may be declining in at least some areas. For example, we observed *A. sexlineatus viridis* but no *A. neotesselatus* at Runyon State Wildlife Area in Pueblo in 2001 (pers. obs.). During several visits to the same area between 2017 to 2023, only *A. neotesselatus* were present (pers. obs.). It is possible that *A.*

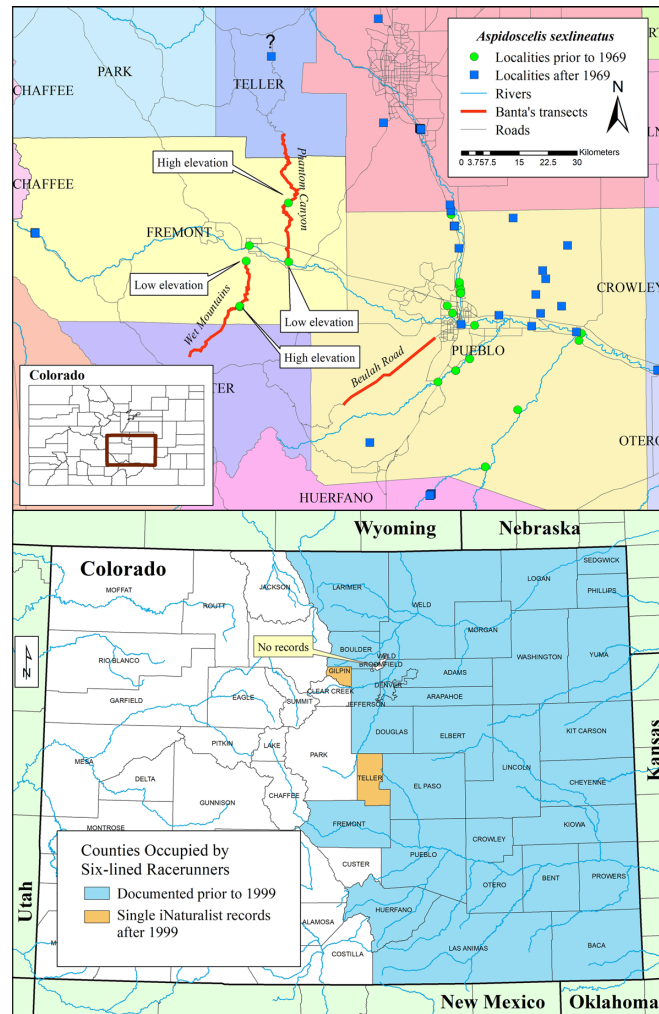


FIGURE 4. (Top) Approximate routes (in red) of Phantom Canyon, Wet Mountain, and Beulah Road for pitfall trap transects set up by B.H. Banta. Prairie Racers (*Aspidoscelis sexlineatus viridis*) were captured in Fremont County, Colorado, USA (there are no records of the species from traps along Beulah Road in Pueblo County). Green circles represent reports of this species from before 1969, including these transects. Blue squares are later reports. Locality sources include museum records, literature records, iNaturalist reports, personal communications, and personal observations. (Bottom) Distribution by county of *Aspidoscelis sexlineatus viridis* in Colorado. Blue indicates documentation of the known natural distribution of this species as of Hammerson (1999) and orange indicates possible introduced individuals (iNaturalist record 240426739 for Gilpin County and iNaturalist Record 152286694 for Teller County).

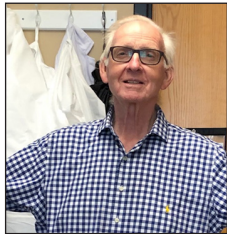
neotesselatus is displacing *A. sexlineatus viridis*, because although the two species have similar clutch sizes (Taylor et al. 2006), the larger *A. neotesselatus* produces all-female progeny and so has double the potential rate of reproduction over time. Without the efforts of Banta and his students, we would be largely unaware of the former presence of *A. sexlineatus viridis*, and current apparent absence of this common species in this part of its extensive range. Compared to *A. neotesselatus*, where the known distribution has expanded considerably, the known distribution of *A. sexlineatus viridis* in Colorado has undergone only minor changes.

Acknowledgments.—We are grateful to the late Joseph Collins (Center for North American Herpetology), for assistance in locating the specimens collected in southeastern Colorado by Benjamin H. Banta. We examined the specimens via loans provided by Bradford Hollingsworth of the San Diego Natural History Museum. The University of Arkansas provided electronic access to JMP software for statistical treatments. We thank iNaturalist and the many individuals who have shared their invaluable observations on that platform. Steve Wilcox assisted with fieldwork and preparation of figures 1, 3, and 4.

LITERATURE CITED

- Armstrong, D.M., B.H. Banta, and E.J. Pokropus. 1973. Altitudinal distribution of small mammals along a cross-sectional transect through the Arkansas River watershed, Colorado. *Southwestern Naturalist* 17:315–326.
- Banta, B.H. 1964. A preliminary account of the herpetofauna of the Wet Mountains, Custer and Fremont Counties, Colorado. *Journal of the Colorado-Wyoming Academy of Science* 5:49–50.
- Banta, B.H. 1965. A preliminary report of the herpetofauna of a seven mile transect of the Black Forest, El Paso County, Colorado. *Journal of the Colorado-Wyoming Academy of Science* 5:55–56.
- Banta, B.H. 1968. The recent herpetofauna of the transect of prairie in El Paso County, Colorado. *Journal of Herpetology* 2:181–182.
- Banta, B.H., and W.S. Brechbuhler. 1965. The recent herpetofauna of a transect of the northern Wet Mountains, Custer and Fremont Counties, Colorado. *Journal of the Colorado-Wyoming Academy of Science* 5:57.
- Banta, B.H., and P. Kimmel. 1965. A preliminary report upon the herpetofauna of Phantom Canyon, Pikes Peak Ranges, Teller and Fremont Counties, Colorado. *Journal of the Colorado-Wyoming Academy of Science* 5:56.
- Banta, B.H., and C.A. Torbit, Jr. 1965. The herpetofauna of a four mile transect of prairie in El Paso County, Colorado, obtained in 1963 and 1964. *Journal of the Colorado-Wyoming Academy of Science* 5:53.
- Cordes, J.E., and J.M. Walker. 2006. Evolutionary and systematic implications of skin histocompatibility among parthenogenetic teiid lizards: three color pattern classes of *Aspidoscelis dixonii* and one of *A. tessellatus*. *Copeia* 2006:14–26.
- Crother, B.I., J. Boundy, F.T. Burbrink, K. de Queiroz, D.R. Frost, R. Highton, J.B. Iverson, E.L. Jockusch, F. Kraus, K.L. Krysko, et al. 2017. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. 8th Edition. *Herpetological Circular* No. 43, Society for the Study of Amphibians and Reptiles. 102 p.
- Hammerson, G.A. 1999. *Amphibians and Reptiles in Colorado*. 2nd Edition. University Press of Colorado, Niwot, Colorado, USA.
- Livo, L.J., H.D. Johnson, and S. McMullen. 2021. Geographic Distribution: *Aspidoscelis sexlineatus viridis* (Prairie Racerunner). *Herpetological Review* 52:576.
- Livo, L.J., T.L. Wilcox, and J. Kellner. 2023. A newly established array of *Aspidoscelis neotesselatus* (Colorado Checkered Whiptail) in Douglas County, Colorado, USA. *Herpetological Review* 54:362–364.
- Livo, L.J., T.L. Wilcox, and H.L. Taylor. 2019. Established arrays of triploid, parthenogenetic *Aspidoscelis neotesselatus* (Colorado Checkered Whiptail) in Denver and Adams counties, Colorado: evidence of untapped ecological potential. *Herpetological Review* 50:690–694.
- Norris, T.M., and B.H. Banta. 1965. The small mammal fauna sampled along a four mile section of prairie in El Paso County, Colorado, in 1963 and 1964. *Journal of the Colorado-Wyoming Academy of Science* 5:54–55.
- 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.
- Sokal, R.R., and F.J. Rohlf. 1981. *Biometry*. 2nd Edition. W.H. Freeman and Company, New York, New York, USA.
- Tarr, J.S., and B.H. Banta. 1965. Preliminary remarks on the occurrence of familial categories of Araneae (Arthropoda: Arachnida) at biweekly intervals from pitfall traps along a four mile stretch of prairie in El Paso County, Colorado in 1963 and 1964. *Journal of the Colorado-Wyoming Academy of Science* 5:54.
- Taylor, H.L., and L.J. Livo. 2023. Origins of multiple color-pattern classes in an array of parthenogenetic *Aspidoscelis neotesselatus* (Colorado Checkered Whiptail) and ecological implications. *Herpetological Review* 54:17–26.
- Taylor, H.L., B.A. Droll, and J.M. Walker. 2006. Proximate causes of a phylogenetic constraint on clutch size in parthenogenetic *Aspidoscelis neotesselata* (Squamata: Teiidae) and range expansion opportunities provided by hybridity. *Journal of Herpetology* 40:294–304.
- Taylor, H.L., L.J. Livo, D.J. Martin, W.R. Maynard, A. Estep, R. Clawges, D. Roth, J. Kellner, and T. Jackson. 2015. New northern distribution records for pattern classes A, B, and D of *Aspidoscelis neotesselata* (Colorado Checkered Whiptail) in Colorado, and biogeographic sources of northern colonists. *Herpetological Review* 46:312–319.

- Taylor, H.L., R.J. Rondeau, and J. Sovell. 2006. Alternative ontogenetic pathways to color pattern Class B in a newly discovered population of parthenogenetic *Aspidoscelis neotesselata* (Squamata: Teiidae). *Herpetological Review* 37:40–44.
- Walker, J.M., J.E. Cordes, and H.L. Taylor. 1997. Parthenogenetic *Cnemidophorus tesselatus* complex (Sauria: Teiidae): a neotype for diploid *C. tesselatus* (Say, 1823), redescription of the taxon, and description of a new triploid species. *Herpetologica* 53:233–259.
- Walker, J.M., L.J. Livo, and J.E. Cordes. 2024. Triploid parthenogenetic *Aspidoscelis neotesselatus* (Colorado Checkered Whiptail): persistence in fragmented urban habitat. *Western Wildlife* 11:1–5.
- Walker, J.M., H.L. Taylor, G.J. Manning, J.E. Cordes, C.E. Montgomery, L.J. Livo, S. Keefer, and C. Loeffler. 2012. Michelle's Lizard: identity, relationships, and ecological status of an array of parthenogenetic lizards (Genus *Aspidoscelis*: Squamata: Teiidae) in Colorado, USA. *Herpetological Conservation and Biology* 7:227–248.
- Warfel, T., J. Warfel, and H. Johnson. 2021. Geographic Distribution: *Aspidoscelis neotesselatus* (Colorado Checkered Whiptail). *Herpetological Review* 52:83–84.
- Zweifel, R.G. 1965. Variation in and distribution of the unisexual lizard, *Cnemidophorus tesselatus*. *American Museum Novitates* 2235:1–49..



JAMES M. WALKER is Professor of Biological Sciences, University of Arkansas, Fayetteville, Arkansas, USA. Since earning B.S. and M.S. degrees from Louisiana Tech University, Ruston, USA, and Ph.D. from the University of Colorado, Boulder, USA, he has engaged in teaching, research, and service at the University of Arkansas (1965-present) and has collaborated with numerous scientists on the biology and systematics of whiptail lizards (genera *Aspidoscelis* and *Cnemidophorus*: Family Teiidae). His graduate students have completed theses and dissertations on a variety of amphibian and reptile species. (Photographed by Shilpa Iyer).



Lauren J. Livo for several years conducted research on the Boreal Toad (*Anaxyrus boreas*) in collaboration with the Colorado Division of Wildlife. After receiving a Ph.D. from the University of Colorado, Boulder, USA, she continued her work on the Boreal Toad as a Post-Doctoral Fellow at the University of Colorado. Subsequent to retiring, she has been documenting the geographic distribution and phenology of amphibian and reptile species in Colorado, especially that of various introduced species including Pond Sliders (*Trachemys scripta*), Colorado Checkered Whiptails (*Aspidoscelis neotesselatus*), and Chihuahuan Spotted Whiptails (*A. exsanguis*). (Photographed by Steve Wilcox).



JAMES E. CORDES is a Professor of Biology at Louisiana State University (LSU) Eunice, Louisiana, USA. He received B.S. and M.S. degrees from Texas State University, San Marcos, USA, and Ph.D. from the University of Arkansas, Fayetteville, USA. He has been the recipient of 15 annual Endowed Professorships funded by Opelousas General Hospital and awarded by LSU, Eunice, to study the genetic relationships of parthenogenetic teiid lizards through skin-graft experiments. Since 1984, he has undertaken > 90 field expeditions to México, Arizona, Colorado, New Mexico, Oklahoma, Texas, and Utah, USA, to collect live parthenogenetic whiptail lizards for laboratory experiments and preserved voucher specimens of numerous species for ecological and systematic studies. (Photographed by Travis Webb).

APPENDICES

APPENDIX TABLE 1. Species captured at pitfall trap arrays from the collection of B.H. Banta. Total sample sizes in parentheses following species name. Nomenclature to species level based on geographic distribution and current usage as of Crother et al. (2017) used for listed taxa. Species listed are Western Tiger Salamander (*Ambystoma mavortium*), Woodhouse's Toad (*Anaxyrus woodhousii*), Northern Leopard Frog (*Lithobates pipiens*), Western Chorus Frog (*Pseudacris maculata*), Plains Spadefoot (*Spea bombifrons*), Colorado Checkered Whiptail (*Aspidoscelis neotesselatus*), Six-lined Racerunner (*Aspidoscelis sexlinatus*), Ornate Box Turtle (*Terrapene ornata*), Eastern Collared Lizard (*Crotaphytus collaris*), Common Lesser Earless Lizard (*Holbrookia maculata*), Greater Short-horned Lizard (*Phrynosoma hernandesi*), Many-lined Skink (*Plestiodon multivirgatus*), Great Plains Skink (*Plestiodon obsoletus*), Prairie Lizard (*Sceloporus consobrinus*), Prairie Rattlesnake (*Crotalus viridis*), Plains Hog-nosed Snake (*Heterodon nasicus*), Coachwhip (*Masticophis* [= *Coluber*] *flagellum*), Gophersnake (*Pituophis catenifer*), Plains Black-headed Snake (*Tantilla nigriceps*), and Terrestrial Gartersnake (*Thamnophis elegans*).

Locality (source)	Amphibia	Reptilia
Beulah Road, Pueblo County (SDMNH records reported for Banta as collector)		<i>Aspidoscelis neotesselatus</i> (16), <i>Plestiodon obsoletus</i> (3), <i>Sceloporus consobrinus</i> (24), <i>Crotalus viridis</i> (1), <i>Heterodon nasicus</i> (1)
Black Forest, El Paso County (Banta 1965)	<i>Ambystoma mavortium</i> (15), <i>Anaxyrus woodhousii</i> (4), <i>Lithobates pipiens</i> (2), <i>Pseudacris maculata</i> (audible)	<i>Phrynosoma hernandesi</i> (4), <i>Thamnophis elegans</i> (1)
Peyton Road, El Paso County (Banta and Torbit 1965)	<i>Ambystoma mavortium</i> (16), <i>Spea bombifrons</i> (31)	<i>Terrapene ornata</i> (3), <i>Aspidoscelis sexlinatus</i> (57), <i>Holbrookia maculata</i> (149), <i>Phrynosoma hernandesi</i> (2), <i>Plestiodon multivirgatus</i> (305), <i>Sceloporus consobrinus</i> (4), <i>Crotalus viridis</i> (4), <i>Holbrookia maculata</i> (149), <i>Heterodon nasicus</i> (9), <i>Pituophis catenifer</i> (7), <i>Holbrookia maculata</i> (7)
Phantom Canyon, Fremont and Teller counties (Banta and Kimmel 1965)	<i>Ambystoma mavortium</i> (12), <i>Anaxyrus woodhousii</i> (5), <i>Spea bombifrons</i> (14)	<i>Aspidoscelis neotesselatus</i> (53), <i>Aspidoscelis sexlineatus</i> (2), <i>Crotaphytus collaris</i> (2), <i>Phrynosoma hernandesi</i> (1), <i>Plestiodon obsoletus</i> (1), <i>Sceloporus consobrinus</i> (294), <i>Crotalus viridis</i> (3), <i>Masticophis</i> (= <i>Coluber</i>) <i>flagellum</i> (1), <i>Pituophis catenifer</i> (1), <i>Tantilla nigriceps</i> (2), <i>Thamnophis elegans</i> (1)
Wet Mountains, Custer and Fremont counties (Banta and Brechbuhler 1965)	<i>Ambystoma mavortium</i> (31), <i>Anaxyrus woodhousii</i> (6), <i>Spea bombifrons</i> (2)	<i>Aspidoscelis neotesselatus</i> (47), <i>Aspidoscelis sexlineatus</i> (46), <i>Crotaphytus collaris</i> (8), <i>Holbrookia maculata</i> (8), <i>Phrynosoma hernandesi</i> (6), <i>Plestiodon multivirgatus</i> (2), <i>Plestiodon obsoletus</i> (7), <i>Sceloporus consobrinus</i> (601), <i>Crotalus viridis</i> (7), <i>Masticophis</i> (= <i>Coluber</i>) <i>flagellum</i> (1), <i>Pituophis catenifer</i> (4), <i>Thamnophis elegans</i> (4)

Herpetological Conservation and Biology

APPENDIX TABLE 2. Dates and numbers of Colorado Checkered Whiptail (*Aspidoscelis neotesselatus* = *ASNE*) and Prairie Racerunner (*Aspidoscelis sexlineatus viridis* = *ASSE*) specimens removed from pitfall traps along Beulah Road (Pueblo County) and Wet Mountains and Phantom Canyon (Fremont County), Colorado, USA, in 1963, 1964, and 1965 by B.H. Banta and students. These records are cataloged in the San Diego Natural History Museum (SDNHM).

Date	<i>ASNE</i>	<i>ASSE</i>	SDMNH records for <i>ASNE</i>	SDMNH records for <i>ASSE</i>
Beulah Road				
4 September 1963	2		61358, 61361	
5 June 1964	1		61363	
17 June 1964	1		61349	
24 June 1964	2		61348, 61354	
4 July 1964	4		61350, 61352, 61356, 61357	
15 July 1964	2		61351, 61355	
17 July 1964	2		61353, 61362	
31 July 1964	1		61359	
21 August 1964	1		61360	
Sum for Beulah Road	16	0		
Phantom Canyon				
24 June 1964	7		61767, 61769, 61771, 61777, 61780, 61795, 61801	
30 June 1964	8		61761, 61763, 61766, 61778, 61779, 61781, 61803, 61804	
7 July 1964	10	1	61764, 61768, 61770, 61772, 61773, 61776, 61782, 61797, 61800, 61802	62244
14 July 1964	5		61760, 61765, 61774, 61775, 61794	
21 July 1964	1		61798	
28 July 1964	1		61762	
15 August 1964	10		61784-61788, 61790, 61793, 62017, 62019, 62020	
23 August 1964	7		61783, 61789, 61791, 61792, 61799, 61805, 62018	
13 September 1964	1		62021	
27 September 1964	1		61796	
18 October 1964	1	1	61753	62243
7 June 1965	1	1	61759	62022
21 June 1965	2	1	61752, 61754	62023
No date	5		68415-68419	
Sum for Phantom Canyon	60	4		
Wet Mountains				
26 June 1963	1	3	61848	62135, 62150, 62152
10 July 1963	1	2	61841	62148, 62149
		1		62133
23 July 1963	2	5	61813, 61816	62132, 62142, 62160, 62163, 62166
11 August 1963	6	4	61814, 61824, 61828, 61830, 61842, 61844	62134, 62139, 62153, 62157

APPENDIX TABLE 2, continued

Date	<i>ASNE</i>	<i>ASSE</i>	SDMNH records for <i>ASNE</i>	SDMNH records for <i>ASSE</i>
17 August 1963	1		61826	
24 August 1963	2	5	61836, 61846	62151, 62159, 62161, 62162, 62168
26 August 1963	2		61807, 61817	
29 August 1963	1		61825	
7 September 1963	2		61829, 61835	
12 September 1963	1		61819	
21 September 1963	1	2	61818	62147, 62154
26 September 1963	1		61820	
3 May 1964		1		62144
23 May 1964	6		61812, 61834, 61840, 61845, 61847, 61849	
6 June 1964		3		62137, 62143, 62146
20 June 1964	1	2	61811	62131, 62140
4 July 1964	6	2	61808-61810, 61815, 61839, 61843	62138, 62145
1 August 1964		3		62136, 62141, 62164
12 August 1964	1		61833	
17 August 1964	2	1	61832, 61837	62130
29 August 1964	6	3	61806, 61821-61823, 61831, 61838	62158, 62165, 62167
12 September 1964	1	2	61827	62155, 62156
Sum for Wet Mountains	44	39		
Grand total	120	43		

Appendix Table 3. Comparisons of samples of *Aspidoscelis neotesselatus* from Banta's study sites in the San Diego Natural History Museum (SDNHM) collection with samples in the University of Arkansas Department of Zoology (UADZ) collection. Mean (\pm standard error), range of values, and sample size (n) for nine meristic characters and two ratios compared include counts of granular scales around mid-body from the lateral longitudinal row of ventral scales on the right side of the body to those on the left side of the body (GAB); scales in a relatively straight line between the occipital scales of the head and the first row of caudal scales (OR); percentage of the scales from occipital to first caudal scales represented by scales around midbody (GAB/OR); scales between the paravertebral stripes at mid-body (PV); percentage of the number of granular scales around mid-body located between the paravertebral stripes at midbody (PV/GAB); femoral pores of both sides summed (FP); sub-digital lamellae of the longest toe of the left pes (SDL); circumorbital scales of both sides summed (COS); lateral supraocular granules of both sides summed (LSG); interlabial scales of both sides summed (ILS); and supraocular scales of both sides summed (SO). *F* and *P* values calculated by JMP statistical software. Only means for each character followed by all different superscript letters are significantly different at $P < 0.05$ (Tukey HSD).

Character	<i>A. neotesselatus</i> A					<i>A. neotesselatus</i> C	Test Results
	Canon City	Phantom Canyon	Wet Mountains	Pueblo Lake	Valco Ponds	Beulah Valley	
	Fremont County	Fremont/Teller Co.	Fremont County	Pueblo County	Pueblo County	Pueblo County	
	UADZ	SDNHM	SDNHM	UADZ	UADZ	SDNHM	
GAB	79.6 \pm 0.56 ^{BC} 75–83 (21)	78.6 \pm 0.37 ^C 74–85 (48)	80.6 \pm 0.43 ^B 76–84 (36)	76.3 \pm 0.67 ^D 72–81 (15)	77.5 \pm 0.55 ^{CD} 70–82 (22)	85.2 \pm 0.81 ^A 82–88 (10)	$F_{5,146} = 19.04, P < 0.001$
OR	198.0 \pm 1.19 ^A 189–207 (21)	193.3 \pm 0.79 ^B 181–205 (48)	195.7 \pm 0.91 ^{AB} 178–205 (36)	185.3 \pm 1.41 ^B 177–192 (15)	187.2 \pm 1.16 ^B 172–204 (22)	191.6 \pm 1.73 ^{BC} 184–197 (10)	$F_{5,146} = 16.35, P < 0.001$
GAB/OR	40.2 \pm 0.31 ^C 37.9–42.1 (21)	40.6 \pm 0.20 ^C 37.8–44.3 (48)	41.1 \pm 0.23 ^C 39.1–43.7 (36)	40.9 \pm 0.36 ^{BC} 39.6–42.9 (15)	41.5 \pm 0.30 ^B 38.9–44.5 (22)	44.5 \pm 0.44 ^A 41.6–47.3 (10)	$F_{5,146} = 14.83, P < 0.001$
PV	7.7 \pm 0.17 ^{AB} 6–9 (21)	7.5 \pm 0.11 ^B 6–9 (48)	7.7 \pm 0.13 ^B 6–11 (36)	6.7 \pm 0.20 ^C 5–8 (15)	7.5 \pm 0.16 ^B 7–8 (22)	8.5 \pm 0.24 ^A 8–9 (10)	$F_{5,146} = 7.55, P < 0.001$
PV/GAB	9.7 \pm 0.22 ^{AB} 7.5–11.5 (21)	9.6 \pm 0.15 ^A 7.4–12.2 (48)	9.6 \pm 0.17 ^{AB} 7.3–13.4 (36)	8.7 \pm 0.26 ^B 6.6–10.8 (15)	9.7 \pm 0.22 ^A 8.5–11.4 (22)	9.9 \pm 0.32 ^{AB} 9.1–11 (10)	$F_{5,146} = 2.44, P = 0.037$
FP	39.7 \pm 0.38 ^{AB} 37–42 (21)	39.6 \pm 0.25 ^{AB} 37–43 (48)	40.7 \pm 0.29 ^A 36–44 (36)	38.5 \pm 0.45 ^{BC} 35–41 (15)	39.5 \pm 0.37 ^{AB} 34–43 (22)	37.3 \pm 0.55 ^C 35–43 (10)	$F_{5,146} = 2.44, P = 0.037$
SDL	35.9 \pm 0.24 ^A 34–38 (21)	35.4 \pm 0.16 ^{AB} 34–37 (48)	35.3 \pm 0.18 ^{AB} 34–37 (36)	34.5 \pm 0.28 ^{BC} 32–36 (15)	33.7 \pm 0.23 ^{BC} 31–36 (22)	35.4 \pm 0.34 ^{AB} 34–37 (10)	$F_{5,146} = 11.36, P < 0.001$
COS	11.8 \pm 0.33 ^{AB} 9–15 (21)	11.6 \pm 0.22 ^B 9–14 (47)	12.4 \pm 0.25 ^{AB} 9–18 (36)	12.5 \pm 0.39 ^{AB} 9–14 (15)	13.0 \pm 0.32 ^A 10–19 (22)	12.8 \pm 0.48 ^{AB} 11–16 (10)	$F_{5,145} = 3.32, P = 0.007$

APPENDIX TABLE 3, continued

Character	<i>A. neotesselatus</i> A				<i>A. neotesselatus</i> C		Test Results
	Canon City	Phantom Canyon	Wet Mountains	Pueblo Lake	Valco Ponds	Beulah Valley	
	Fremont County	Fremont/Teller Co.	Fremont County	Pueblo County	Pueblo County	Pueblo County	
	UADZ	SDNHM	SDNHM	UADZ	UADZ	SDNHM	
LSG	22.5 ± 0.65 ^{AB}	22.3 ± 0.43 ^A	23.2 ± 0.49 ^A	19.7 ± 0.77 ^{BC}	19.6 ± 0.63 ^C	19.0 ± 0.93 ^C	$F_{5,145} = 7.67, P < 0.001$
	19–28 (21)	16–28 (47)	18–28 (36)	15–24 (15)	8–28 (22)	16–27 (10)	
MS	13.9 ± 0.24 ^A	12.1 ± 0.16 ^B	12.4 ± 0.18 ^B	13.8 ± 0.28 ^A	12.3 ± 0.23 ^B	12.7 ± 0.34 ^{AB}	$F_{5,145} = 11.18, P < 0.001$
	12–16 (21)	10–14 (47)	11–15 (36)	13–16 (15)	11–16 (22)	12–14 (10)	
ILS	32.7 ± 1.08 ^D	27.3 ± 0.72 ^{CD}	29.8 ± 0.82 ^{BC}	34.2 ± 1.27	31.4 ± 1.05 ^{AB}	24.3 ± 1.56 ^D	$F_{5,145} = 9.18, P < 0.001$
	24–52 (21)	16–35 (47)	16–49 (36)	29–41 (15)	26–53 (22)	18–31 (10)	