SYSTEMATICS AND DISTRIBUTION OF THE SKINKS ALLIED TO *EUMECES TETRAGRAMMUS* (SAURIA: SCINCIDAE)

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ABSTRACT. The distributions and relationships of the three species in the *Eumeces brevilineatus* Group, *E. brevilineatus, E. callicephalus,* and *E. tetragrammus* are re-evaluated. *E. brevilineatus* and *E. tetragrammus* are sympatric over a narrow zone in southern Texas, and intermediates in color pattern occur at some localities. The presence of intermediates and lack of other morphological differences between the two taxa suggest that gene exchange occurs in the area of contact.

The third member of the species group, *callicephalus,* is the most distinctive in scalation and color pattern. It is allopatric to the distributions of *brevilineatus* and *tetragrammus,* but populations of *brevilineatus* that are geographically nearest to the range of *callicephalus* contain some individuals with the distinctive traits of the latter form. The expression of these characteristics within the westernmost populations of *brevilineatus* is interpreted as evidence of former gene flow that was interrupted by Pleistocene alterations in the habitat and climate of the western Chihuahuan Desert.

The three nominal species of the *E. brevilineatus* Group are relegated to subspecies of *tetragrammus* (Baird). Salient features of coloration and scalation of the polytypic *tetragrammus* ally it with *anthracinus* and *septentrionalis* of the *E. anthracinus* Group. A total of 13 species groups in the genus are now recognized; a key to these groups and a list of the constituent species are provided.

RESUMEN. En su monografía del género *Eumeces,* Taylor (1935b) asignó tres especies de lagartijo escincidos a La Especie-Grupo *Eumeces brevilineatus: E. brevilineatus* de la parte norte de México y Tejas, *E. callicephalus* de la parte oeste de México y sur de Arizona, y *E. tetragrammus* de la parte nordeste de México y sur de Tejas. Las especies *E. brevilineatus* y *E. tetragrammus* fueron clasificadas por diferencias en deseño de las coloración, poseiendo *E. brevilineatus* bandas y rayas sobre el cuerpo más cortas que *E. tetragrammus.* Aún cuando las dos son escencialmente idénticas en sus escamas, Taylor las clasifico como especies diferentes porque el no encontró invididuos intermedios, y porque supuso la existencia de una área grande simpatrica en sus distribueiónes geográficas. Sin embargo, una revista de las distribuciónes de estas dos especies revela que su área de distribución geográfica simpátrica esta confinada a una zona estrecha en el sur de Tejas. Además, el examen de especímenes obtenidos hasta el presente, indica que rangos intermedios en coloración existen, y por eso, es posible que las dos formas intercambien material genético en la área de contacto.

El tercer miembro de las especie-grupo, *Eumeces callicephalus,* tiene una distribución geográfica que es alopatrica a las distribuciónes de *E. brevilineatus* y *E. tetragrammus. E. callicephalus* se localiza en elevaciones bajas y moderaciones al oeste de la Division Continental, desde la zona central de Jalisco hasta el Sur de Arizona. De los tres miembros del Grupo *E. brevilineatus, E. callicephalus* es el más distinto en sus escamas y coloración. Empero, poblaciones de *E. brevilineatus* que se encuentran más proximas en su posición geográfica a poblaciones de *E. callicephalus,* poseen individuous que tienen alguna de estas cualidades distintas de *callicephalus.* La expresión de estas caracteristicas dentro de las poblaciones más occidentales de *E. brevilineatus* es interpretada como evidencia de una distribución continua anterior, de poblaciones intermedias la cual fue interrupida recientemente por alteraciones Pleistocénicas en el habitat y clima de la parte norte del Desierto Chihuahuense.

A causa de estas observaciones e interpretaciones, la asignación taxonómica de los tres especies nominal del Grupo *E. brevilineatus* a subespecies de *Eumeces tetragrammus* (Baird) es recomendada. Rasgos salientes de coloración y escamación de la politipica *E. tetragrammus* claramente la une con *Eumeces anthracinus* y *E. septentrionalis* de el Especie-Grupo *E. anthracinus.* El Grupo *E. anthracinus* es una de las trece especie-grupos en el género *Eumeces,* y está asocido aprentemente con un grupo que incluye los escíncidos de Las Especies-Grupos *E. fasciatus* y *E. multivirgatus.*

INTRODUCTION

In E.H. Taylor's (1935b) monograph of the scincid genus *Eumeces,* the species were arranged into 15 species groups on the basis of shared color patterns and scalation features. One of the New World assemblages, the *E. brevilineatus* Species Group, included three species: *callicephalus* Bocourt, 1879, of Arizona and western Mexico, and *brevilineatus* Cope, 1880, and *tetragrammus* (Baird) 1858, of Texas and northern Mexico. In contrast to most other species groups erected by Taylor, species of the *E. brevilineatus* Group evinced a high

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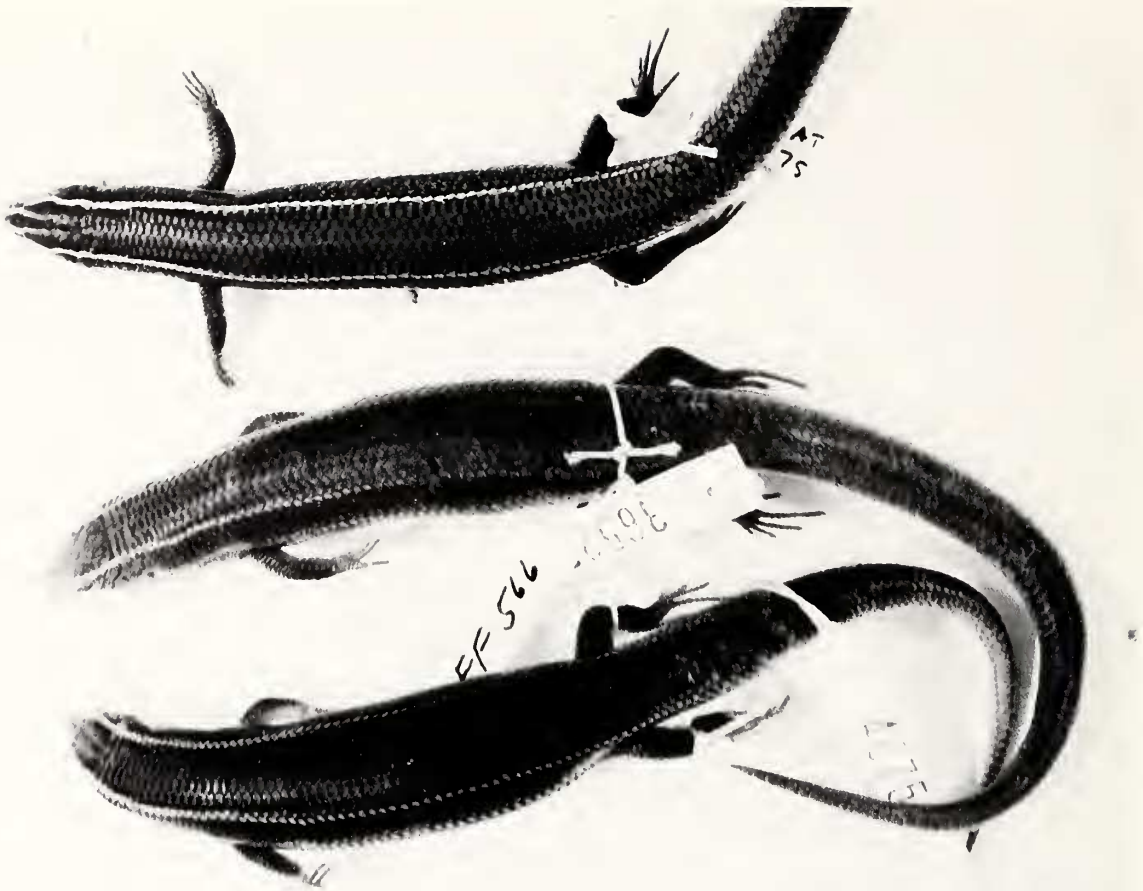

Figure 1. Pattern variation in *Eumeces tetragrammus*. Top: Young adult (TCWC 45496; Querétaro: El Trapiche); Middle: Old adult with faded posterior striping (TCWC 36535; Texas: Hidalgo Co.); Bottom: Adult with broad neck lines (TCWC 40751; Coahuila: vic. Cuatro Cienegas).

degree of intraspecific variation in usually conservative scale features.

The systematic results of the present study served as a partial requirement for a Master's degree at Texas A&M University (Lieb, 1973), and were partly incorporated into Conant's (1975) field guide. Taxonomic arrangements appearing in the latter work thus anticipated the publication of the present account. Here I document the evidence and rationale for these proposed taxonomic conclusions and review the geographic distribution and morphological variation. Changes are proposed at the intragroup and intergroup levels within the genus.

MATERIALS AND METHODS

I have examined over 600 specimens of skinks of the *E. brevilineatus* Group. Data concerning individual and geographic variation were compiled on the following scalation features (terminology after Taylor, 1935b; Robinson, 1979): number of postmentals, presence of postnasals, contact of primary temporals and parietals, enclosure of interparietal by parietals, number of postlabials, number of longitudinal dorsal rows, number of latitudinal rows around midbody, number of nuchal pairs, number of supralabials, number of supraciliaries, and contact of prefrontals. In addition, data on individual, geographic, and where possible, ontogenetic variation in the following color pattern features were also collected (terminology after Dixon, 1969): expression of median light line, dorsolateral light lines, dark lateral stripes, lateral light lines, and upper secondary dark lines. Two aspects of gross morphology, axilla-groin/snout-vent length ratio and adpressed limb overlap, were also evaluated. This data base has been discussed elsewhere (Lieb, 1973), and only data relevant to the interpretation of relationships among *E. brevilineatus* Group taxa are presented here. Moreover, new data acquired since 1973 have also been incorporated

Figure 2. Pattern of *Eumeces brevilineatus* and intermediates with *E. tetragrammus*. Top: Typical short-lined pattern of *E. brevilineatus;* Middle: Sympatric zone intermediate form with lengthened body striping (TCWC 39265; Texas: McMullen Co.); Bottom: Possible intermediate from Sierra Madre foothills (MVZ 185746; Nuevo León: vic. Ranchitos).

into this study. Unless otherwise noted, all specimens cited by museum number have been examined by me.

RELATIONSHIPS BETWEEN *EUMECES BREVILINEATUS* AND *E. TETRAGRAMMUS*

Eumeces tetragrammus and *brevilineatus* are distinguished only by differences in the striped pattern on the body (Taylor, 1935b). They are much more similar morphologically to each other than either is to *callicephalus*. In strongly patterned *tetragrammus,* the striping consists of a dark lateral stripe bordered above and below by light lines (dorsolateral and lateral light lines). This stripe extends from the neck throughout the length of the body to the groin or base of the tail (Fig. 1). In *brevilineatus,* the same striping (lateral stripe, dorsolateral, and lateral light lines) terminates on the body just posterior to the shoulder (Fig. 2). In hatchlings, the dorsum may be as dark as the lateral stripe. In both *tetragrammus* and *brevilineatus,* the dorsal ground color becomes distinctly lighter than the lateral stripe with increasing age. In the largest skinks, the light lines may also fade, resulting in only faint traces of dorsolateral and lateral light lines. The striping may also be obscured on the posterior dorsum by prolonged tenure in formalin; such conversion of fully lined individuals of *tetragrammus* to morphs similar to *brevilineatus* has been observed in several specimens. Fortunately, even in the most blackened specimens, enough pattern usually persists to make positive identification possible.

Taylor (1935b) found no evidence of intergradation between *tetragrammus* and *brevilineatus,* but his distributional data suggested a substantial zone of geographic sympatry in Texas. Later (Taylor, 1943) he reported a specimen of *brevilineatus* from Tamaulipas, Mexico, thus indicating an expanded zone of overlap with *tetragrammus* that included not only southern and central Texas (from Burnet Co. southward), but also a large section of northeastern Mexico. This broad zone of overlap was further substantiated by Smith

Figure 3. Hatchling *Eumeces tetragrammus* (TCWC 41555–61) from a clutch found with a fully lined female, 2 mi. W Bruni, Webb Co., Texas (TCWC 39271). Note the dark coloration and the incomplete expression of the dorsolateral light lines. Photograph by Richard J. Baldauf.

(1946), who provided distribution maps that indicated overlap; Brown (1950), who reported a specimen of *tetragrammus* from Bexar Co., Texas (immediately south of the Edwards Plateau), and specimens of *brevilineatus* from Cameron and Hidalgo cos. (in the lower Rio Grande Valley); Conant (1958), who published distribution maps indicating the overlapping ranges; Anderson (1962), who reported a specimen of *brevilineatus* from San Luis Potosí; Holman (1968), who reported a Pleistocene fossil *tetragrammus* from Kendall Co. (on the Edwards Plateau); Raun and Gehlbach (1972), who published a county distribution map for *brevilineatus* in Texas with a record for Cameron Co. (probably that of Brown, 1950), and examined specimens from Hidalgo Co. Raun and Gehlbach (1972) also accepted the Bexar Co. *tetragrammus* record, rejected literature records for western and northern Texas, and doubted the validity of the central Edwards Plateau Burnet Co. record.

Strecker (1909a) reported *tetragrammus* from an isolated locality in Burnet Co., to the north of the range. Taylor (1935b) questioned this record, apparently a single specimen in the Strecker Museum. The specimen is not now in the museum nor are there records that it was preserved, retained or exchanged (pers. comm., D. Lintz, Strecker Museum). It could have been a misidentified *septentrionalis*. The two forms are superficially similar, and it is clear elsewhere that Strecker (1908, 1909b; Strecker and Williams, 1927) could not readily distinguish the two.

Taylor (1943) reported a very small specimen of *brevilineatus* from the coastal plain of Tamaulipas. This individual (UIMNH 22443) was found to be a desiccated hatchling of *tetragrammus* in which the light lines are poorly defined and partially obscured by skin creases. Hatchlings often have such truncated light lines (Fig. 3).

Brown (1950) did not cite specimen numbers or museums for Texas records, and the reports of *tetragrammus* from Bexar Co. and *E. brevilineatus* from Hidalgo and Cameron cos. are unverifiable. I have not seen specimens of *tetragrammus* from Bexar Co., but I have examined a series of *brevilineatus* reportedly from Cameron Co. (FMNH 27215–17). Brown could have utilized these specimens, as he did examine some FMNH holdings. These, however, are the only representatives of the short-lined form from the lower Rio

Grande Valley seen by me. The specimens examined in the B.C. Brown private collection from Hidalgo Co. that were catalogued as *brevilineatus* (BCB 2402, 2 specimens) are aged *tetragrammus* with faint light lines. Similarly, Anderson's (1962) record of *brevilineatus* for San Luis Potosí (AMNH 66999) is a specimen of *tetragrammus* that has been overpreserved in formalin.

The allocation of a Pleistocene fossil to *tetragrammus* was based upon dentary tooth characters (Holman, 1968). Although I have not examined the fossil material (Univ. Texas Bureau Econ. Geol. 40450-1666), the allocation is dubious in that study of several cleared and stained specimens of both taxa does not corroborate Holman's observed differences in the spacing and robustness of the teeth. Furthermore, even if *tetragrammus* occurred in the area during the Pleistocene, it does not now occur there.

The county-based maps and distributional summaries of Raun and Gehlbach (1972) were based upon literature records, examined specimens, and in some cases, museum catalogue files. The presumed distributional errors for *brevilineatus* of Brown (1950) were thus perpetuated, and other museum records from the lower Rio Grande Valley of Texas were also accepted. Besides the BCB specimens from Hidalgo Co. mentioned above, a misidentified series from this county at a second museum (TCWC 18169–73, 18176–82, verified as *tetragrammus* by me) was also apparently utilized by Raun and Gehlbach (1972) for the *brevilineatus* distribution map.

Thus, extant material with acceptable locality data indicate that the major area of sympatry of *brevilineatus* and *tetragrammus* occurs in the coastal plain of southern Texas, north of the Rio Grande Valley and south of the Edwards Plateau escarpment. Plotting of locality data (Fig. 4) further suggests that actual sympatry in southern Texas occurs only in the vicinity of the Nueces River drainage system, from the mouth of the river west and then north to the edge of the Pleateau. The two forms may also occur together in the Rio Grande drainage in the vicinity of Laredo (Webb Co.). There is a specimen of *brevilineatus* from this area (UMMZ 114253), and Werler (1951) reported on the hatchlings of a clutch of eggs from a female *tetragrammus* from Laredo (specimens not examined). Nevertheless, these regions mark the northernmost limit of the range of *tetragrammus,* and the southern extent of the Gulf Coastal Plain populations of *brevilineatus. E. brevilineatus* do occur in northern Mexico, but are known only from the Sierra del Nido of Chihuahua and the Coahuila Folded Belt of Coahuila and Nuevo León. These populations occur in rocky habitats within pinyon-juniper, oak woodland, or piedmont areas similar to those in western Texas. Within the northern Chihuahuan Desert, *brevilineatus* may occur in low desert mountain ranges where the appropriate mesic habitats are found. On the other hand, *tetragrammus* are primarily associated with the coastal plain lowlands, particularly riparian or mixed grassland-brushy areas with sandy substrata. Toward the southern part of its range in Mexico, the species also occurs in rocky habitats in the foothills of the Sierra Madre Oriental and in the isolated coastal plain ranges of Tamaulipas (Sierra de Tamaulipas, Sierra San Carlos). The distributional ranges of *tetragrammus* and *brevilineatus* should make contact in northeastern Nuevo León, in areas where the foothill habitats of the Coahuila Folded Belt and northern Sierra Madre abut those of the Tamaulipan Coastal Plain. However, only two specimens are known from this region. Their significance is discussed below.

A presumably disjunct population of *tetragrammus* occurs in the Cuatro Cienegas Basin of Coahuila (Zweifel, 1958); the four specimens from this population (AMNH 77316, TCWC 40750–52) are all from riparian or other mesic habitats in the floor of the basin. The two adult specimens are distinctive in having comparatively wide dorsolateral light lines on the neck (Fig. 1), and a dorsal ground color of a pale shade of gray or gray-brown. The other two specimens are juveniles with coloration and color pattern similar to other *tetragrammus* populations; the scalation of all four individuals is fairly typical of the species (Table 1). *E. brevilineatus* is known to occur in a low mountain range approximately 75 km (air) north of the Cuatro Cienegas area, but because of the habitat specificity described above, such desert range populations are almost certainly isolated from the riparian enclave of *tetragrammus* in the Cuatro Cienegas Basin. The occurrence of a disjunct population of *tetragrammus* in this basin is thus interesting in a biogeographic sense, but does not appear to represent sympatry with *brevilineatus.* Other taxa of obvious Tamaulipan affinities are also found in the Cuatro Cienegas area (e.g., the snakes *Drymarchon corais* and *Drymobius margaritiferus*), as are riparian species with close relatives in the Gulf Coast lowland/Salado River drainage to the east (see Morafka, 1977).

What would otherwise be a reasonably clear-cut habitat difference between the two species breaks down south of the Edwards Plateau in south-central Texas. In this area, and southward into the zone of sympatry with *tetragrammus, brevilineatus* occupy non-rocky brushland, grassland, and riparian habitats that are essentially identical to those utilized by *tetragrammus.* Moreover, within this area of sympatry, color pattern intermediates have been observed. In the intermediates, the body striping pattern extends posterior to transverse dorsal row 30 and terminates at or before the midbody region (Fig. 2). In *brevilineatus* outside the sympatric zone, such elongated stripes do not occur. In *tetragrammus,* both within and outside of the sympatric zone, the body striping is continuous from neck to groin, although it may be somewhat faded posterior to the midbody in old adults (Fig. 1). As mentioned earlier, some *tetragrammus* hatchlings have shortened body lines. In these individuals, however, the fully lined pattern seems to develop ontogenetically before a snout-vent length of 45 mm is reached. Even though most small juveniles of *tetragrammus* are fully lined, the allocation of individual skinks to intermediate status is thus possible only for adults and subadults over 45 mm in snout-vent length.

In a series of six specimens from southern Live Oak Co. (TAIC), one is fully lined (*tetragrammus,* No. 117), four are "short" lined (*brevilineatus,* 258.1–.2, 123.2–.3), and the sixth is intermediate (123.1). A second sample, a series of five individuals from the northwestern edge of the sympatric zone in south-central Uvalde Co. (TCWC), contains one *tetra-*

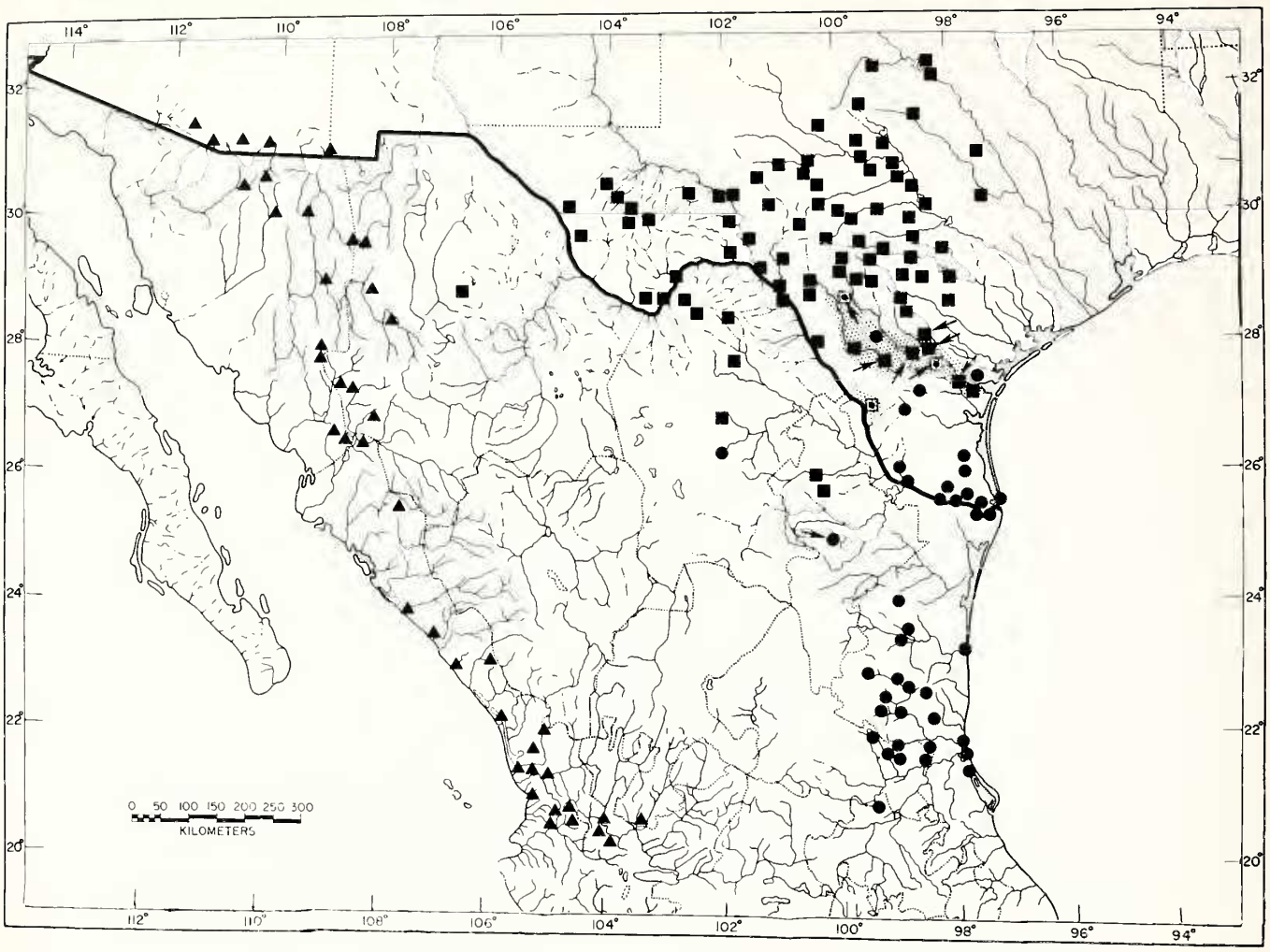

Figure 4. Distribution of *Eumeces brevilineatus* Group taxa in southwestern North America. Circles indicate *Eumeces tetragrammus;* squares *E. brevilineatus;* triangles *E. callicephalus.* Stippled areas mark the regions of presumed sympatry between *brevilineatus* and *tetragrammus,* the circle within squares indicating localities where both forms are known to occur together, and arrows indicating populations that contain intermediate forms (see text).

grammus (44175), two *brevilineatus* (44173–74), and two intermediates (44171–72). The fully lined individual (a female) was taken under a rock in copulo with one of the short-lined males (R.A. Thomas, pers. comm.). The two lizards obligingly repeated their act in the laboratory for photographs (Fig. 5), and the eight subsequent eggs produced only fully lined offspring (TCWC 44176–83).

Other intermediates between *brevilineatus* and *tetragrammus* are known from individual specimens collected in Jim Wells Co. (KU 8812), LaSalle Co. (TAIC 643), Live Oak Co. (TCWC 10537), and McMullen Co. (LACM 134855, TCWC 39265, TNHM 28836); their occurrence spans most of the coastal plain drainage of the Nueces River. In addition to the typical short-lined specimens of *brevilineatus* from Live Oak (TAIC) and Uvalde (TCWC) cos., other short-lined individuals within the Nueces drainage have been examined from Dimmit Co. (KU 8195), McMullen Co. (TCWC 39266–67), Nueces Co. (TCWC 18175), and elsewhere in Live Oak Co. (TCWC 10535–36, 10538). A fully lined *tetragrammus* is known from Frio Co. (CM 10558). Over the entire Nueces River drainage area, the total observed numbers of fully lined, intermediate, and short-lined individuals were 3, 9, and 13, respectively. Although the short-lined form seems to predominate, there are still relatively few specimens available from this poorly sampled region.

As mentioned previously, another area of potential contact of *tetragrammus* and *brevilineatus* is in northeastern Nuevo León. Only two specimens (MVZ) are known from this region, both from the same locality about 35 km SE of Ciudad Monterrey. One specimen (185745) is a typical fully lined *tetragrammus,* the other (185746) has the shortened light lines that are typical of the condition in south Texas intermediate populations (Fig. 2). In this "intermediate" specimen, however, there are distinct traces of a complete dark

Table 1. Geographic variation in six characters for the nominal forms of *Eumeces tetragrammus*. Frequencies are followed (in parentheses) by sample sizes. Letters correspond to geographic regions mapped in Figure 6. Asterisks indicate a condition that is expressed on at least one side of the head.

	Postmental divided	Postnasals present*	Interparietal enclosed	Primary temporal contacts parietal*	Postlabials single*	Nuchal Y-mark present
A: NE Mexico *tetragrammus*	0.10 (51)	0.04 (51)	0 (51)	0.18 (50)	0.03 (39)	0 (42)
B: Cuatro Cienegas *tetragrammus*	0 (4)	0 (4)	0 (4)	0.25 (4)	0.25 (4)	0 (4)
C: South Texas *tetragrammus*	0.15 (74)	0.01 (74)	0 (73)	0.19 (72)	0.06 (71)	0 (68)
D: Sympatric zone	0.03 (33)	0.10 (32)	0 (24)	0.25 (24)	0.03 (31)	0 (13)
E: West-central Texas *brevilineatus*	0.05 (151)	0.07 (149)	0.02 (149)	0.21 (149)	0.14 (139)	0.01 (68)
F: East-central Texas *brevilineatus*	0.18 (33)	0.21 (33)	0.03 (33)	0.30 (33)	0.26 (35)	0 (23)
G: Coahuila–West Texas *brevilineatus*	0.17 (47)	0.09 (45)	0.04 (47)	0.31 (45)	0 (47)	0.60 (47)
H: Sierra del Nido *brevilineatus*	0 (4)	0 (4)	0.33 (3)	0.67 (3)	0.33 (3)	0.25 (4)
I: USA–NW Mexico *callicephalus*	0.96 (80)	0.58 (79)	0.64 (80)	0.67 (76)	0.99 (67)	0.87 (61)
J: West Mexico *callicephalus*	0.59 (41)	0.83 (41)	0.89 (38)	0.87 (39)	0.96 (28)	0.77 (30)

lateral stripe extending posterior to the termination of the light lines. Such extension of the dark lateral band was not observed in any of the southern Texas intermediates, although such a characteristic could be obscured in some individuals by a long period of preservation. Nevertheless, in the absence of more information on the distribution of short-lined forms in the region, the assignment of the specimen to intermediate status is provisional.

Evidence for conspecificity of the forms *tetragrammus* and *brevilineatus* arises from the following observations: 1) the extremely close morphological similarity between the two forms in southern Texas; 2) the apparent lack of behavioral pre-mating isolating mechanisms where the two occur in sympatry; and 3) the presence of color pattern intermediates in the sympatric zone. This evidence is further supported by the lack of significant overlap in the distributions of the two forms, and by a lack of ecological segregation in the principal area of geographic contact and sympatry.

Alternatively, the two forms could be acting as parapatric species that only rarely hybridize. As noted before, copulation of a short-lined male and a long-lined female were observed under field and laboratory conditions, and that the resultant offspring were all fully lined. Assuming that the short-lined individual was indeed the male parent, then the expression of the long-lined pattern of *tetragrammus* would seem to be dominant over the short-lined pattern of *brevilineatus*. Such a dominance relationship in the inheritance of color pattern, however, does not readily explain how the intermediate condition arises, or why there is an apparent preponderance of short-lined individuals in the sympatric zone. On the other hand, should the gene pools of *brevilineatus* and *tetragrammus* be separated by post-mating isolating mechanisms, then the presence of occasional intermediates in the contact zone might represent sterile F_1's incapable of backcrossing to the parental stocks.

My studies on *brevilineatus* and *tetragrammus* clarify some aspects of the relationships of the two forms (particularly in distribution), but offer little in the way of an objective decision as to their specific status. From the material I have examined and the characters I have inspected, I feel that for the present the two nominal forms should be considered subspecies of a single species. Full resolution of their status, however, will require larger samples from the contact zone and a complete genetic analysis of the populations involved.

DISTRIBUTION AND STATUS OF *EUMECES CALLICEPHALUS* BOCOURT

When compared with both *tetragrammus* and *brevilineatus*, *callicephalus* differs significantly in several aspects of cephalic scutellation. These characters are as follows (frequencies of *tetragrammus* and *brevilineatus* in parentheses, respectively; $N > 100$ in all cases): postmental scale divided, 0.91 (0.14

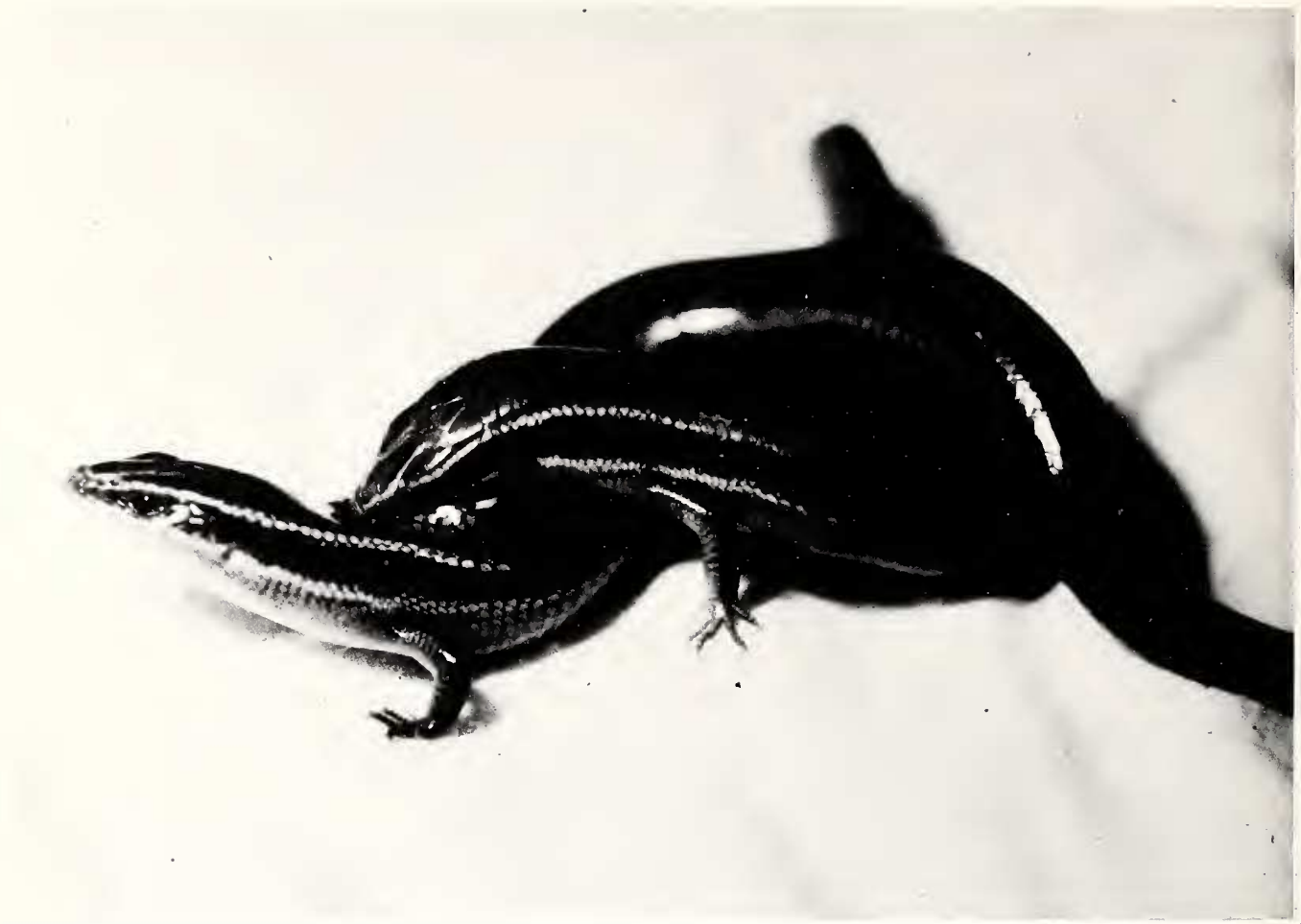

Figure 5. Male *brevilineatus* (TCWC 44173) and female *tetragrammus* (TCWC 44175) copulating under laboratory conditions. Both individuals are from 8 mi. N Uvalde, Uvalde Co., Texas; they were also observed copulating when captured. Photograph by Robert A. Thomas.

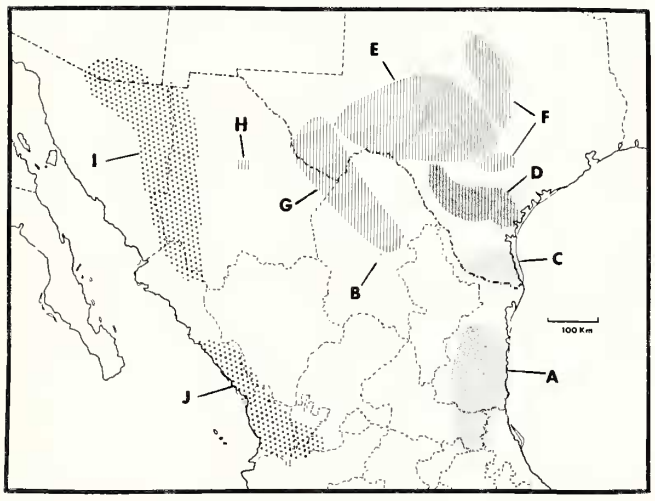

Figure 6. Geographic areas for combined samples indicated in Table 1. A, B, C: *Eumeces tetragrammus;* D: principal sympatric zone of *E. tetragrammus* and *E. brevilineatus* in southern Texas; E, F, G, H: *E. brevilineatus;* I, J: *E. callicephalus.*

and 0.08); postnasal scales present on at least one side of the head, 0.68 (0.03 and 0.09); enclosure of interparietal scale by parietals or azygous scales, 0.62 (0 and 0.03); primary temporal contacting parietal on at least one side of the head, 0.77 (0.17 and 0.25); and single (rather than double or triple) postlabials on at least one side, 0.97 (0.05 and 0.12). However, the frequencies of these characters vary geographically (Table 1, Fig. 6) and are discussed further below.

Most of the vividly patterned specimens of *callicephalus* vary from the basic *tetragrammus/brevilineatus* stripe pattern in having a persistent dark lateral stripe from neck to groin, faded dorsolateral and lateral light lines posterior to the shoulder, and a light median line on the anterior dorsum that bifurcates on the nuchal scales (Fig. 7). In some adults, particularly those from the southern part of the range, the color pattern is faded, with concomitant loss of the bifurcating Y-mark and median light line, and a general obscuring of the lateral stripe and other light lines. Such faded specimens seem to have been the basis for the original recognition of *humilis* Boulenger 1887, a name based on patternless individuals of *callicephalus* (Robinson, 1979).

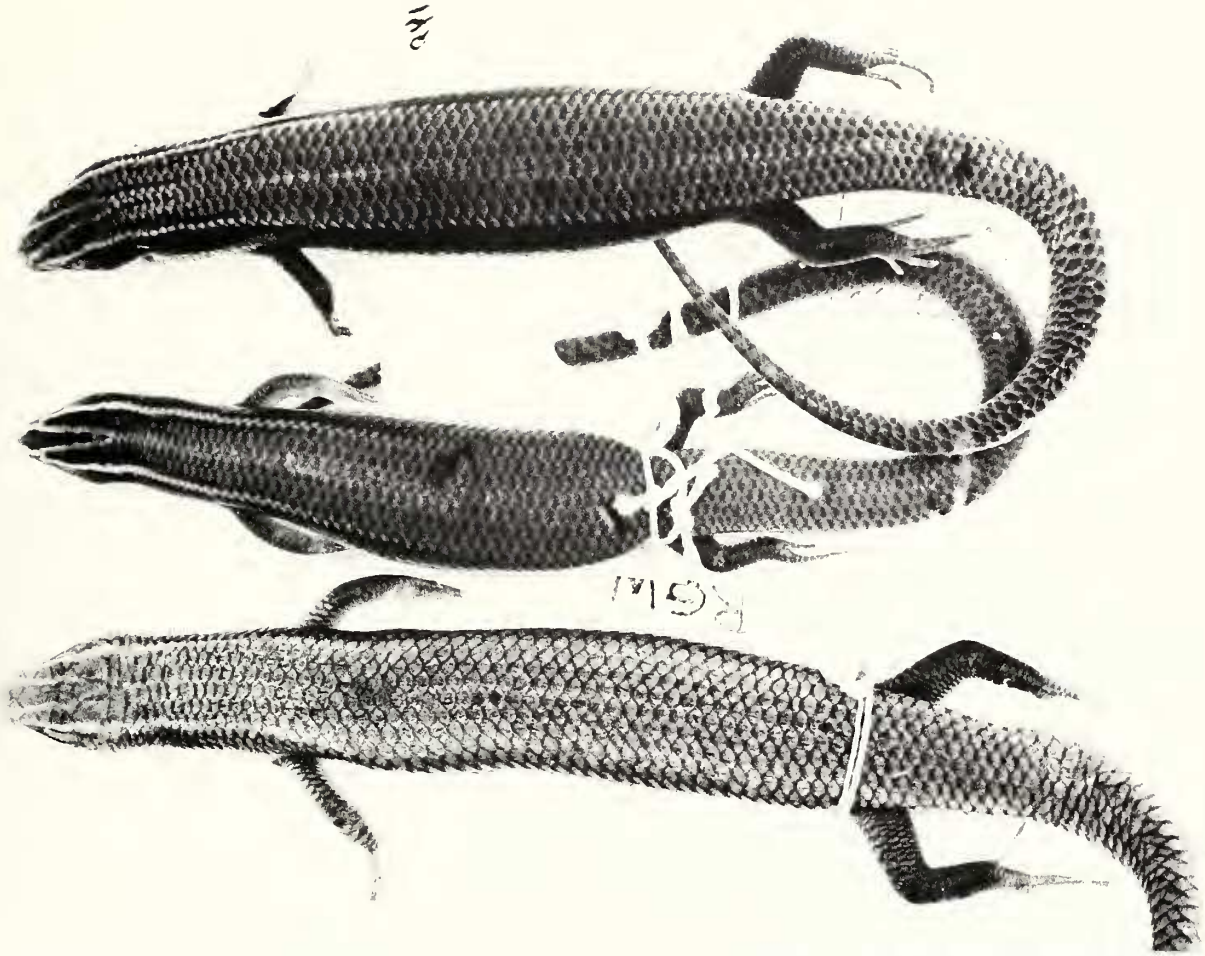

Figure 7. Pattern of *Eumeces callicephalus* and western *E. brevilineatus*. Top: *E. callicephalus* with typical pattern, including nuchal Y-mark (BYU 14260; Chihuahua: Cuiteco); Middle: *E. brevilineatus* from western part of range, with faint nuchal Y-mark present (UAZ 16816; Coahuila: vic. Piedra Blanca); Bottom: *E. callicephalus* with faded dorsal pattern (UTEP 4865; Sinaloa: vic. Mazatlan).

The geographic range of *callicephalus* in Mexico has been somewhat overestimated. Bocourt (1879) described the species from a specimen (MNHP 1643, not examined) sent to him in the mid-1800's by Alfrédo Dugés of Guanajuato, Mexico. Later authors, particularly Cope (1887) and H.M. Smith and Taylor (1945), assumed the city of residence of the collector to be the type locality of the species. There are also two specimens of *callicephalus* studied by Cope (ANSP 13604–05) that bear tags reading only "Guanajuato, Mexico . . . Dugés." The original type description, however, does not clearly give the collection locality as the city or state of Guanajuato, but only associates the specimen with the collector who resided there. Additional information is contained in a paper by Dugés (1889) on a comparison of the herpetofauna of the Guanajuato region with that of the Guadalajara (Jalisco) area. Here, he specifically associates *callicephalus* with the Jalisco capital, citing *lynxe* as characteristic of his own locale. This condition still pertains, and it is likely that the type specimen of *callicephalus* (as well as the ANSP material) originated from near Guadalajara or from some other locality farther to the west. Taylor (1935b) indicated that the remaining material in the Alfrédo Dugés Museum in Guanajuato bears the label "San Blas," presumably referring to the coastal town in Nayarit. Specimens of *callicephalus* are known from within 50 km of Guadalajara.

E. callicephalus has also been reported from Querétaro, Mexico (Smith and Taylor, 1945). H.M. Smith (Univ. Colorado, pers. comm.) has advised me that this is another of Dugés's specimens, but I have been unable to locate either the original citation or the specimen. The locality is "Huaxteca Potosina," which is more applicable to a general region in the northeastern part of the state than to any specific locality. *E. tetragrammus* occurs in the Huaxteca area, and the report could be based upon a specimen of this species.

Two additional localities, records of Taylor (1935b), have already been questioned and corrected: Tombstone, Arizona (see Zweifel, 1962) and "Ciudad" (=La Ciudad de Rocas) in Durango. The latter record, based upon a specimen (British Mus. Nat. Hist. 83.413, not examined) collected by Forrer in the early 1800's, is a *callicephalus* (in litt., R.G. Webb,

UTEP). However, La Ciudad is higher in elevation (more than 2400 m) than other records for the species in western Mexico, and only *brevirostris* occur there. Conant (1969:86) has discussed problems involving confused localities for other specimens credited to Forrer, and it seems likely that this specimen actually came from a much lower elevation somewhere along the trail between Ventanas and La Ciudad. Thus, the geographic range of *callicephalus* is confined to low and moderate elevations west of the Continental Divide, extending from the general area west of Guadalajara north to southern Arizona and adjacent New Mexico.

The geographic range of *callicephalus* is allopatric to those of the other *Eumeces brevilineatus* Group members. *E. brevilineatus* occur in the Sierra del Nido of Chihuahua, approximately 140 km east of the nearest loeality for *callicephalus* (Chihuahua: 8 mi. W Matachic, AMNH 68295). This Chihuahua *brevilineatus* population is known from four specimens (MVZ 70702–03, LACM 116401, UTEP 62), all of which were collected in Cañon de Santa Clara on the eastern slope of the range. The LACM and MVZ specimens have the typical color pattern of *brevilineatus,* whereas the UTEP specimen has traces of the *callicephalus*-like bifurcating head lines on an otherwise typical *brevilineatus* pattern. Sueh traces also occur in some individuals of *brevilineatus* from the western part of the range, but do not occur in eastern populations nor in *tetragrammus.* One specimen (MVZ 70702) is badly damaged, and most scalation features could not be determined (postmental entire, postnasals absent). In MVZ 70703, the postmental is entire, the postnasals absent, the interparietal not enclosed, the primary temporal contacts the parietal on the right side, and the postlabials are double. The LACM specimen is similar, except that neither primary temporal contacts a parietal. UTEP 62 has an entire postmental, no postnasals, an enclosed interparietal, contact of the primary temporal with the parietal on the left side, and a single postlabial on the right side.

The small series from the Sierra del Nido thus contains two individuals (MVZ 70702, LACM) that are typical of eastern *brevilineatus* populations in color pattern and scalation, one (UTEP) that contains a mixture of *brevilineatus* and *callicephalus* color pattern and scalation similarly contained in western *brevilineatus,* and one (MVZ 70703) that has the typical *brevilineatus* color pattern and approaches the *callicephalus* scalation condition only in the contact of a primary temporal and a parietal (occurs at an overall frequency of 0.77 in *callicephalus* and 0.25 in more easterly *brevilineatus*). A similar trend is seen in other western *brevilineatus* populations (ca. 250–450 km to the east) for which larger series are available. Overall in the samples from Trans-Pecos Texas and Coahuila (Fig. 6; Table 1), the Y-shaped bifurcating head lines occur in 60 percent (N = 47) of the individuals, and the frequencies of two of the five scale characters typical of *callicephalus* are higher than those in the central Texas *brevilineatus* populations. Slightly higher frequencies of *callicephalus*-like scale features also occur in *brevilineatus* populations in the northeastern Edwards Plateau and along its southeastern periphery (Fig. 6, Table 1). The bifurcating head lines observed in many western *brevilineatus,* however, do not occur in the more easterly populations, nor in *tetragrammus.*

These data indicate a pronounced tendency for the westernmost populations of *brevilineatus* to express a color pattern feature otherwise more characteristic of *callicephalus,* and suggest similarities in some scalation features as well. The Trans-Pecos and Coahuila populations of *brevilineatus,* however, are separated from the range of *callicephalus* by 400 km of unsuitable Chihuahuan Desert habitats. There are no authenticated distributional data for *callicephalus* east of the Continental Divide, so it is unlikely that the observed trends in western *brevilineatus* populations could be due to hybridization with the other form. These patterns do suggest, however, that intermediate populations between *brevilineatus* and *callicephalus* probably extended across much of the now intervening desert during the pluvial past. The estimated extent of pinyon-juniper woodlands during the Wisconsin glacial maximum (ca. 20,000 years B.P.) is to elevations as low as 300–600 m at the 25th parallel, and 600–900 m at the 30th parallel (see Morafka, 1977, for review). Such displacements would have provided suitable corridors for these skinks across much of Chihuahua and Coahuila north of the Arteaga and Parras anticlines. Thus the differentiation of *callicephalus* and *brevilineatus* may be the result of interruption of a continuous gene pool by climate and vegetation changes of the last 10,000 years. Further studies on the variation and distribution of both *brevilineatus* and *callicephalus* in Chihuahua are needed, particularly in regard to the discontinuous areas of pinyon-juniper and oak habitats from which neither form is known. The degree of similarity of western Texas and Coahuila populations of *brevilineatus* to *callicephalus,* however, suggests that the two forms should be considered allopatric members of a single species, and that *callicephalus* be retained as a distinct subspecies.

TAXONOMIC AND DISTRIBUTIONAL SUMMARY

The three forms recognized as distinct species of the *Eumeces brevilineatus* Group of Taylor (1935b) are herein considered subspecies that are distributed in a discontinuous arc from western Mexico north to the southwestern United States and south again into eastern Mexico. The oldest available name for the three taxa is *Eumeces tetragrammus* (Baird). The following accounts summarize information on variation and distribution for the species and its three subspecies.

Eumeces tetragrammus (Baird)

Plestiodon tetragrammus Baird, 1858:256.
Eumeces callicephalus Bocourt, 1879:431–433.
Eumeces brevilineatus Cope, 1880:18–19, 44, 46.
Eumeces humilis Boulenger, 1887:377.
[*Eumeces tetragrammus*] var. *funebrosus* Cope, 1900:630, 661.

Type specimens. The type series originally consisted of 12 or more specimens from Matamoros, Tamaulipas (USNM 3124; Taylor, 1935b). Taylor designated 3124A as the lec-

totype (now USNM 165662, examined; the remaining specimens in the original type series were not seen).

Diagnosis. Maximum snout-vent length 74 mm, dorsal scales around body subequal, in 26 or 28 parallel rows at midbody; scale lying medial to postgenial scale longer than wide (see Robinson, 1979); supraoculars four; body striping present in all but old adults, striping terminates anterior to the midbody region or on tail within three to five scales posterior to vent; single dark lateral stripe at least two scale rows wide present on each side, bordered above and below by light lines; dorsolateral light lines occupy third and fourth, or fourth only, lateral scale rows of neck; lateral light line passes through auricular opening; median light line, if present, bifurcates on the nuchal scales and extends posteriorly no more than a third of the body length; distal portions of tails in hatchlings and juveniles bright blue.

Variation. Supranasal scales usually in contact; prefrontals in contact or not; parietals may or may not enclose interparietal; postnasals present or absent; supraciliaries vary from six to nine, usually seven or eight; postsuboculars vary from two to four, usually three; postlabials single or double; postmental single, or divided by a transverse suture; dorsal scales from occiput to above vent 52–60; lamellae under fourth toe of hind limb 10–18; upper secondary dark lines (see Dixon, 1969) present or absent; complete pattern loss may occur in very large or old adults.

Most patterned individuals may be identified to subspecies as follows:

1a. Dark lateral stripe extends from axilla to groin 2
1b. Dark lateral stripe terminates anterior to midbody region ..... *E. t. brevilineatus*
2a. Postlabials single; median light line anteriorly bifurcating on nuchals to form a Y-shaped head marking .... *E. t. callicephalus*
2b. Postlabials double; median line absent, no bifurcating lines on nuchals ..... *E. t. tetragrammus*

Distribution. Southwestern United States, northeastern and western Mexieo (Fig. 4).

Eumeces tetragrammus tetragrammus (Baird)

Type specimens. See species account.

Diagnosis. Postlabial scales usually double; postnasals usually absent; interparietal usually not enclosed by parietals; dark lateral stripes, dorsolateral and lateral light lines present throughout body length in adults and juveniles; median light line absent.

Variation. Some hatchlings have poorly expressed or truncated light lines. With the exception of the population at Cuatro Cienegas, Coahuila, there is little geographic variation in color pattern. As noted earlier, adults from this area have a relatively pale dorsal color and slightly wider dorsolateral light lines on the neck (Fig. 1). These characteristics are not evident, however, in the two juveniles from the same area. Additional specimens are needed to evaluate the ontogeny of color pattern in this unique geographic variant.

Distribution. See Figure 4.

Habitat. This subspecies is most abundant in brushlands and grasslands with sandy substrata, but it also occurs in tropical deciduous forest, palm forest, subtropical brushlands with rocky substrates, and in mesic forests associated with riparian areas. The known elevational range is sea level to 1060 m.

Eumeces tetragrammus brevilineatus (Cope)

Type specimens. There are two syntypes from Helotes, Bexar Co., Texas (USNM 10159A and 10159B). Taylor (1935b) designated 10159B as the lectotype.

Diagnosis. Postlabials usually double; interparietal usually not enclosed by parietals; body striping terminates between shoulder and midbody.

Variation. Ground color in adults varies from dark gray to greenish-gray to brown, with or without dark edges on the dorsal scales. Specimens from far western populations often possess a light bifurcating mark on the nuchals (Fig. 7).

Distribution. See Figure 4.

Habitat. *Eumeces t. brevilineatus* is most abundant in xerophilous woodlands with rocky substrata. It also inhabits grasslands and brushlands with sandy substrata and riparian woodlands through xeric areas. Reported elevations range from about 150 m to 2300 m.

Eumeces tetragrammus callicephalus (Bocourt)

Type specimen. The holotype (MNHP 1643, not examined) was sent from Guanajuato to Paris by Alfrédo Dugés in 1868, but it was probably collected elsewhere.

Diagnosis. Postlabials usually double, postnasals usually present, dark lateral stripe usually present throughout body length, light bifurcating head lines and short median light line usually present.

Variation. Color of adults in preservative is gray or gray-green dorsally, with dark brown to red-brown lateral stripes. The median light line, and the dorsolateral and lateral light lines, may be faded or absent (Fig. 7).

Distribution. See Figure 4.

Habitat. This subspecies seems to be most abundant in wooded rocky canyons in the northern part of its range, usually within an elevational range of 900 to 1700 m. In southwestern Mexico, they occur in mesic foothill forests and tropical deciduous lowland habitats. In the southern part of the range it is replaced at higher elevations by *Eumeces brevirostris* and by *E. multilineatus* in the north. Habitats on the eastern slopes of the Sierra Madre Occidental in Durango and Zacatecas, as well as across the southern margin of the Mexican Plateau that would appear suitable for *E. t. callicephalus,* are inhabited by *E. lynxe.* Suitable habitats in western New Mexico and western Chihuahua are apparently unoccupied.

SPECIES GROUP STATUS

Taylor (1935b) defined 15 species groups of *Eumeces,* but did not fully indicate his criteria for recognizing all groups. Moreover, the relationships between the species groups were

largely unstated, and were essentially confined to a phylogenetic tree (p. 38) with little comment or explanation. It is clear from this tree, as well as from the key to the species and from the text, that Taylor's groups were based upon shared features of color pattern and/or scalation. How he arrived at many of his conclusions is not easily determined.

Taylor's phylogeny indicated that the *E. brevilineatus* Group (i.e., *Eumeces tetragrammus* as defined above) was closely related to the *E. fasciatus* Group, an assemblage of 12 nominal species widely distributed in eastern Asia and the southeastern United States. The unifying feature of the *E. fasciatus* Group is primarily the presence of five dorsal light lines on the body and tail in all juveniles and many adults. In *tetragrammus,* only parts of this *E. fasciatus*-type pattern are present: the median light line is absent (or present only anteriorly), and the paired light lines are absent on the distal tail and/or reduced on the body. *E. fasciatus* Group species also differ from *tetragrammus* in the following (characteristics of the latter in parentheses): larger body sizes attained, with snout-vent lengths in excess of 80 mm typical of most speeies (observed snout-vent maximum 76 mm); interspecific variation in scales around body ranging from 22 to 26 (26–28 intraspecifically); postnasals usually present in eight of the 12 species (usually present in one of three subspecies). However, in these features of color pattern, body size, and scalation, *tetragrammus* is much less similar to any *E. fasciatus* Group form than it is to members of the *E. multivirgatus* and *E. anthracinus* species groups.

The *E. multivirgatus* Group was defined by Taylor (1935b) as follows: *multivirgatus, gaigei, humilis, parviauriculatus,* and *parvulus.* Subsequent studies have considerably altered the original composition of the species group. *E. gaigei* is now a junior synonym of *multivirgatus,* and the *gaigei* specimens that Taylor utilized are now *E. m. epipleurotus* (Taylor, 1935a; Axtell, 1961; Mecham, 1980). *E. humilis* was based on patternless *multivirgatus* from the United States (H.M. Smith, 1942; Mecham, 1957), and on patternless *callicephalus* from Mexico (Robinson, 1979). Robinson (1979) also removed *parviauriculatus* and *parvulus* from the *E. multivirgatus* Group and allocated them to the *E. brevirostris* Group (sensu Dixon, 1969). One species, *multilineatus* (known only from a small area in the high elevations of the Sierra Madre of Chihuahua), was added to the *E. multivirgatus* Group at the time of its description (Tanner, 1957). It is similar to *multivirgatus,* and was independently described as *E. multivirgatus mexicanus* Anderson and Wilhoft, 1959 (see Legler and Webb, 1960). The present composition of the *E. multivirgatus* Group consists of only *multilineatus* and *multivirgatus.*

Individuals of *multilineatus* have the fully developed five-lined dorsal pattern characteristic of the *E. fasciatus* Group, as do juveniles of some populations of the polytypic species, *multivirgatus.* Most of the populations of the latter form, however, have modified five-lined patterns in adults. The predominate modifications are patternless (unicolor), four-lined, and five-lined patterns that lack the nuchal Y-mark, as well as the multiple-lined pattern, the source of the scientific and common names (Many-lined Skink). *E. tetragrammus* resembles the species of the *E. multivirgatus* Group in body size and scalation features, and the color pattern of *E. t. tetragrammus* and the four-lined *multivirgatus* are similar. However, the great variation in color pattern in the *E. multivirgatus* Group and the tendency for reduced number of scales around the body (24) are absent in *tetragrammus.*

Greater resemblance to *tetragrammus* is found with the *E. anthracinus* Group. As defined by Taylor, the *E. anthracinus* Group contained three species: *anthracinus, copei,* and *septentrionalis.* At present, however, only *septentrionalis* and *anthracinus* remain in this group; *copei* was removed by Dixon (1969) and placed in the *E. brevirostris* Group. *E. septentrionalis* is a grassland species that is locally abundant over much of central North America from Manitoba to coastal Texas; *anthracinus* is a relatively rare forest species distributed discontinuously in the eastern United States. The principal diagnostic characters for the two (P.W. Smith and H.M. Smith, 1952) are the placement of the light lateral line in the auricular region (through the ear opening in *anthracinus,* above it in *septentrionalis*) and the condition of the postmental scale (entire in *anthracinus,* divided in *septentrionalis*). *E. tetragrammus* resembles these species in their essentially four-lined color patterns, comparable body size and proportions, and similar scalation (including 26–28 scale rows around body). Moreover, the position of the body striping is identical in *anthracinus, septentrionalis,* and *tetragrammus,* except the striping extends well onto the tail instead of terminating at the shoulder (*E. t. brevilineatus*) or within two to five scales posterior to the vent (*E. t. tetragrammus, E. t. callicephalus*). Some individuals of both *E. anthracinus* Group species possess traees of middorsal light lines as well. When present, this line occurs as an indistinct postnuchal light stripe with or without a dark border; no trace of a bifurcating Y-mark is ever present.

The resemblance of *E. tetragrammus* to the *E. anthracinus* Group is so marked that continued placement of *tetragrammus* in a separate species group is unwarranted. The three species, *anthracinus, septentrionalis,* and *tetragrammus* represent a fairly homogenous group within the genus, particularly when compared with such diverse assemblages as the *E. fasciatus, E. multivirgatus,* and *E. brevirostris* groups.

In the nearly five decades since the appearance of Taylor's generic monograph, a substantial number of taxonomic changes have occurred in the species or species groups of *Eumeces.* Only one of the subsequently introduced species names (*multilineatus*) has persisted as part of the North American fauna. Most studies have resulted in the reallocation of various taxa to other species or species groups. In order to summarize the relationships of *tetragrammus,* I provide in Table 2 a revised group classification of the genus *Eumeces.* This classification and species group terminology is in large based upon the arrangement of Taylor (1935b:35–39), but it incorporates subsequent changes. Additionally, I have incorporated the following new changes: the use of subgeneric nomenclatural categories for species series and sections above the level of species groups; the *E. longirostris* Group and the *E. obsoletus* Group are combined into the same species series. Taylor placed the *E. longirostris* Group

Table 2. A classification of the genus *Eumeces* (modified from Taylor, 1935b). Pertinent literature is indicated by the citations in parentheses.

Genus *Eumeces*
- *Eumeces* Section
  - *E. schneiderii* Species Series
    - *E. schneiderii* Species Group (Eiselt, 1940; Mertens, 1946)*
      - *E. algeriensis*
      - *E. pavimentatus*
      - *E. princeps*
      - *E. schneiderii*
  - *E. taeniolatus* Species Series
    - *E. taeniolatus* Species Group
      - *E. poonaensis* (Sharma, 1970)
      - *E. taeniolatus*
    - *E. schwartzei* Species Group
      - *E. altamirani*
      - *E. managuae*
      - *E. schwartzei*
- *Pariocela* Section
  - *E. obsoletus* Species Series
    - *E. longirostris* Species Group
      - *E. longirostris*
    - *E. obsoletus* Species Group
      - *E. chinensis*
      - *E. coreensis* (Doi and Kamita, 1937; Smith et al., 1975)
      - *E. kishinouyei*
      - *E. obsoletus* (Hall, 1976)
  - *E. lynxe* Species Series
    - *E. lynxe* Species Group (Parker, 1960; Webb, 1968)
      - *E. lynxe*
    - *E. sumichrasti* Species Group (Smith and Etheridge, 1953)
      - *E. sumichrasti*
  - *E. fasciatus* Species Series
    - *E. anthracinus* Species Group
      - *E. anthracinus* (Smith and Smith, 1952)
      - *E. septentrionalis* (Smith and Slater, 1949)
      - *E. tetragrammus*
    - *E. fasciatus* Species Group (Davis, 1969; Hikada, 1978a; Murphy et al., 1983)
      - *E. barbouri*
      - *E. capito* (Smith et al., 1975)
      - *E. elegans*
      - *E. fasciatus*
      - *E. inexpectatus*
      - *E. laticeps*
      - *E. latiscutatus*
      - *E. marginatus*
      - *E. okadae* (Hikada, 1978b)
      - *E. oshimensis*
      - *E. stimsoni*
      - *E. tamdaoensis* (Bourret, 1937)
      - *E. tunganus*
    - *E. multivirgatus* Species Group (Tanner, 1957; Robinson, 1979)
      - *E. multilineatus* (Tanner, 1957; Legler and Webb, 1960)
      - *E. multivirgatus* (Lowe, 1955; Mecham, 1957, 1980)
    - *E. brevirostris* Species Series
      - *E. brevirostris* Species Group (Dixon, 1969; Robinson, 1979)
        - *E. colimensis*
        - *E. copei*
        - *E. brevirostris*
        - *E. dugesii*
        - *E. ochoteranae*
        - *E. parviauriculatus*
        - *E. parvulus*
      - *E. egregius* Species Group
        - *E. egregius* (Mount, 1965, 1968)
      - *E. skiltonianus* Species Group (Rodgers and Fitch, 1947)
        - *E. gilberti*
        - *E. lagunensis*
        - *E. quadrilineatus*
        - *E. skiltonianus*

* Although Eiselt, and later Mertens, proposed a *schneideri* "Rassenkreis" to include the species listed here as subspecies of a single form (*Eumeces schneiderii*), it is now clear from karyological data (Kupriyanova, 1973; Talliuri, 1975; J.W. Wright, LACM, pers. comm.) that at least two different karyotypes are involved among these nominal taxa. The *E. schneiderii* Species Group is thus in need of taxonomic re-evaluation with respect to this new information.

into its own section (Section II) and allocated the *E. obsoletus* Group to Section III. In my classification, only two sections are recognized: the *Eumeces* Section (Taylor's Section I) and the *Pariocela* Section (Taylor's II and III). Taylor's placement of the *E. longirostris* Group into a separate section arose from his emphasis upon its unique arrangement of preanal scales. My combination of the *E. longirostris* Group with the *E. obsoletus* Group is based upon a shared arrangement of lateral scales that is otherwise unique in the genus. Thirdly, I retain separate the *E. lynxe* and *E. sumichrasti* groups, but unite them at the species series level. I concur with others (Smith and Etheridge, 1953; Parker, 1960) that the species involved are related, but perceive the differences between the two groups to be of a magnitude greater than that found within the species group levels in the rest of the genus.

The overall phenetic basis for the erection of the various categories above the species group level is indicated in the following key to those groups.

1a. Median row(s) of dorsal scales conspicuously wider than adjacent scale rows ..... *Eumeces* Section . . . 2

1b. Median row(s) of dorsal scales not noticeably wider than scales of adjacent rows ..... *Pariocela* Section . . . 4

2a. Most of the enlarged median dorsal scales in a single row at midbody ..... *E. taeniolatus* Series . . . 3

2b. Two rows of enlarged dorsal scales at midbody ..... *E. schneideri* Species Group and Series

3a. Two presuboculars posterior to second loreal ..... *E. taeniolatus* Species Group

3b. Three presuboculars posterior to second loreal ..... *E. schwartzei* Species Group

4a. Inferior lateral body scales in parallel rows 6

4b. Inferior lateral body scales in oblique rows ..... *E. obsoletus* Series ... 5

5a. Ground color of juveniles and subadults black, labials white-spotted; dorsal scales of adults yellow to greenish-gray with black scale margins; black scale margins occasionally expanded into dark body stripes ..... *E. obsoletus* Species Group

5b. Juveniles and subadults with distinct dark lateral stripes and dorsolateral light lines; dorsum of adults bronze or greenish with black suffusions on the anterior-medial portions of most dorsal scales ..... *E. longirostris* Species Group

6a. A middorsal light line present anteriorly or throughout body length in juveniles and patterned adults; line extending anteriorly on head terminating or bifurcating on the posterior part of the frontal scale ..... *E. lynxe* Series ... 7

6b. Middorsal light line absent in juveniles and patterned adults; or, if present, terminating or bifurcating on nuchal scales 8

7a. Middorsal light line extending posteriorly no more than a third of the body length ..... *E. lynxe* Species Group

7b. Middorsal light line extending posteriorly throughout body length to tail .... *E. sumichrasti* Species Group

8a. Scale lying medial to postgenial scale longer than wide, dorsal median light line present or absent 9

8b. Scale lying medial to postgenial scale wider than long, dorsal median light line invariably absent 10

9a. Dorsolateral light lines occupying second and third lateral scale rows on the neck just anterior to shoulder 10

9b. Dorsolateral light lines absent, or occupying third and fourth, or fourth only, lateral scale rows on the neck region just anterior to shoulder 12

10a. Postnasal scales absent 11

10b. Postnasal scales present ..... *E. skiltonianus* Species Group

11a. Supraocular scales four, or if less than four, postmental scale entire ..... *E. brevirostris* Species Group

11b. Supraoculars three, postmental divided by a transverse suture ..... *E. egregius* Species Group

12a. Scales around body in more than 24 rows 14

12b. Scales around body 24 or less 13

13a. Keeled lateral postanal scales present ..... *E. fasciatus* Species Group, in part

13b. Keeled lateral postanal scales absent ..... *E. multivirgatus* Species Group, in part

14a. Single dark lateral stripe present on each side of the body, terminating at the shoulder, at midbody, or on the tail within three to five scales posterior of vent ..... *E. anthracinus* Species Group, in part

14b. Single dark lateral stripe absent or extending throughout body length and onto tail for a distance considerably more than five scale-lengths posterior to vent 15

15a. Postnasal scales present 16

15b. Postnasal scales absent 17

16a. Scales around body 26 13

16b. Scales around body 28 or more ..... *E. fasciatus* Species Group, in part

17a. Middorsal light line present in patterned adults and juveniles, line bifurcating on the nuchals and extending throughout body length 13

17b. Middorsal light line absent, or, if partially expressed, does not form a bifurcating mark on the nuchals 18

18a. Postmental scale divided by a transverse suture *and* the light lateral line passes through the ear opening ..... *E. multivirgatus* Species Group, in part

18b. Postmental scale entire, or, if divided, the light lateral line above the ear opening ..... *E. anthracinus* Species Group, in part

SPECIMENS EXAMINED

Eumeces tetragrammus tetragrammus (Specimens examined, 162). MEXICO. COAHUILA: 3 mi. W Cuatro Cienegas (AMNH 77316); 3 mi. NW Cuatro Cienegas (TCWC 40750–51); 12.9 mi. E Cuatro Cienegas (TCWC 40752). NUEVO LEÓN: Arroyo de las Vacas, 2 km W Hwy 85 at Ranchitos (MVZ 185745). QUERÉTARO: 9.3 mi. E Jalpan, 3500 ft. (TCWC 29546); El Trapiche (TCWC 45494–97); 11 mi. N Jalpan, 2300 ft. (TCWC 32289–90). SAN LUIS POTOSÍ: 4 mi. (by rd to Oviedo) SSW Ajinche (LSUMZ 2374, 2376); 10 mi. S Antiguo Morelos (FMNH 105277); 1 mi. W Chantol (TCWC 59971); 3.5 mi. W Chantol, Rancho Pago Pago (TCWC 59969); Ebano (LSUMZ 343); 7 mi. W El Naranjo (BCB 61-878); 7 mi. N Valles, Los Sabinos (AMNH 66999); 8 mi. N Valles (UMMZ 118200); 5.4 mi. S, 1.1 mi. E Valles off Hwy 85 (TCWC 59904). TAMAULIPAS: 0.4 mi. SW Altamira (TNHM 28903–04); 0.3 mi. SW Rancho Carricitos, 1950 ft. (TCWC 49978); 1.3 mi. WSW Rancho Carricitos, 2500 ft. (TCWC 49779); 1 mi. E Chamal (UMMZ 101433); 6 mi. NW Chamal (BCB 68-49); 8 mi. NW Chamal (BCB nh8-908, -909); La Clementina (FMNH 105225); 3.5 mi. WSW Gavilan (TCWC 49780); Gomez Farias (UMMZ 110801); 24 mi. SW Jiminez (BCB 3238); Jaumave (UMMZ 95227); 3 mi. NW Limon (BCB 68-44); 19 mi. N Limon, 500 ft. (BCB 7323); 26 km N El Limon (UIMNH 22443); 12 mi. NW Llera (BCB 66-107); 22 mi. SE Manuel (BCB 6751); Matamoros (USNM 165662, lectotype); Padilla (TCWC 6937–38); San Jose (UMMZ 69252); Sierra San Carlos, 1.5 mi. NW Tinaja, 1800 ft. (TCWC 38666–67); Sierra de Tamaulipas, Hacienda Acuña (UMMZ 101431–32); 18 mi. N Ciudad Victoria (SM 6973); 19 mi. N Cd. Victoria,

Rio Corona (BCB 11710); 21 mi. N Cd. Victoria, Rio Corona (BCB 11711); 22 mi. N Cd. Victoria, Rio Corona (BCB nhv67-470–nhv67-472); Zaragoza (BCB 68-45). USA. TEXAS: *Cameron Co.:* 2 mi. S Bluetown, 50 ft. (BCB 3447–51); 2 mi. W Bluetown, 40 ft. (BCB 4749–51); Brownsville (AMNH 102620; FMNH 5499; KU 69025; TAIC 2413 [2]; TCWC 8969–72); Brownsville, Fort Brown (AMNH 79091; USNM 52301); 6 mi. N Brownsville on Los Fresnos Rd (TNHM 13617–23); 5 mi. SE Brownsville (TAIC 2516); 9 mi. SE Brownsville (AMNH 79089–90; ANSU 6039); 10 mi. SE Brownsville, 25 ft. (BCB 3283–86); 17 mi. E Brownsville (BCB 25); 20 mi. N Brownsville (KU 7754–58); 1 mi. E Los Fresnos (TNHM 14998–99); 4 mi. W Los Fresnos (TNHM 11924–26); Harlingen (FMNH 94823–24); 1 mi. E Harlingen, 40 ft. (BCB 19); Padre Island (AMNH 8160); 3 mi. SE Santa Maria, near La Feria Pump Sta. (TNHM 13624); Southmost Palm Grove (TCWC 38759–60); *Duval Co.:* Freer (LSUS 3222); *Frio Co.:* 11 mi. W Dilley (CM 10558); *Hidalgo Co.:* 5 mi. S Alamo (LSUMZ 18214, 18266); 13 mi. N Edinburg, La Coma Ranch (TCWC 36524–31); 0.5 mi. N Hidalgo, FmRd 1962 (TCWC 18176–80); 1 mi. S Hidalgo, near Rio Grande River (TCWC 18181–82); *Kenedy Co.:* King Ranch, Norias Div., Rudolf Gate Area (TCWC 38855); *Live Oak Co.:* 8 mi. W Jct. FmRd 624 & US Hwy 281 (TAIC 117); *Starr Co.:* Arroyo Los Alamos, 3 mi. SE Rio Grande City (FMNH 105226); Arroyo El Salado (KU 7747); 6 mi. W El Sauz (BCB 68-841, 842); *Uvalde Co.:* 8 mi. N Uvalde (TCWC 44175, 77176–83); *Webb Co.:* 0–2 mi. W Bruni, along RR tracks (TCWC 39270–76, 41555–61; UTEP 8759); *Willacy Co.:* Raymondville (TCWC 35558); 3 mi. N Raymondville (MVZ 68402). Other significant localities represented by unexamined specimens include: TAMAULIPAS: 1 mi. NW La Pesca (Baker and Webb, 1967). VERACRUZ: Tampico (Taylor, 1935b); 39 mi. and 34 mi. S Tampico (Darling and Smith, 1954). Specimens examined for which the locality data are questionable include: MCZ 93177 (Matagalpa, Nicaragua [sic]); USNM 78581 (TEXAS: Rio Grande, Brule)—I have been unable to locate this placename within a modern county; WW unnumbered, four specimens (TEXAS: *San Patricio Co.:* Welder Wildlife Refuge, HQ area)—circumstances surrounding the capture of the specimens (E. Blackloek, pers. comm.) strongly suggests they were accidentally imported in ornamental vegetation from the lower Rio Grande Valley.

Eumeces tetragrammus brevilineatus (Specimens examined, 330). MEXICO. CHIHUAHUA: 5 mi. N Cerro La Campana (MVZ 70702–03); Santa Clara Canyon, 4.5 mi. (by rd) E MX Hwy 45 (LACM 116401); Sierra del Nido, 4.7 mi. (by rd) W Encinillas (UTEP 62). COAHUILA: 21 mi. NW Ciudad Melchor Muzquiz (EAL 3139); 16 mi. E, 18 mi. N Ocampo (KU 38073); 5 mi. W Piedra Blanca, 5000 ft. (MVZ 58338); 5.3 mi. E Piedra Blanca (UAZ 16815–17); 8 mi. SW Piedra Blanca, 7000 ft. (MVZ 58337); Sierra Madera Jardin (SRSU 864); 2 mi. S Villa Acuña (UIMNH 27136); NUEVO LEÓN: near Sabinas Hidalgo (UIMNH 22441). USA. TEXAS: *Atascosa Co.:* 4 mi. W Jordanton (USL 15433); near Lytle (KU 15564); *Bandera Co.:* 9 mi. S Medina (TCWC 15065); 7 mi. SW Medina on W Fork Medina River (TNHM 1410); 18 mi. NW Medina, Sutton's Ranch (TNHM 1898); 8.4 mi. N Vanderpool on Hwy 187 (LSUMZ 10359); 10.4 mi. W Vanderpool, Hwy 337 (USL 13133); 14.7 mi. W Jct. Hwy 462 on Hwy 470 (USL 13133, 13551, 15680); *Bell Co.:* 7.2 mi. NE Holland along Salado Creek (TCWC 23064); *Bexar Co.:* Helotes (KU 7744, 7764; USNM 10527 [2], 13628); Marnock's Ranch, near Helotes (KU 69018; USNM 10159-B, lectotype, and 10159-A, syntype); 1 mi. N Helotes (MVZ 68397); 7 mi. SE Lytle (CM 18406); 6 mi. NW Rio Medina (CM 58465); San Antonio (KU 8703, 8810–11, 15565); San Antonio, Brackenridge Park (CM 18392); 9 mi. S San Antonio (CM 8466); 8 km ENE Shavano Park, Voight Ranch (UTEP 8873); Somerset (KU 8703); 2.5 mi. N Somerset (BCB 2257); 6 mi. N Somerset, Medina River (CM 18425); 8 mi. SW Somerset (BCB 3351); Von Ormy (CM 18377); *Blanco Co.:* 4.5 mi. SE Johnson City (TCWC 8942); 6 mi. S and 3.4 mi. E Johnson City (UTEP 165); *Bosque Co.:* 2 mi. S Mosheim, Mid Fork Bosque River (TCWC 36932, 38740–43); 3 mi. N Osage (TCWC 14242); *Brewster Co.:* Alpine (SRSU 223, 343); 3 mi. SW Alpine (KU 7768–70); 20 mi. S Alpine (SRSU 453); Big Bend Natl. Park (BBNP), Boquillas Ranger Station (UNM 9974); BBNP, base of Burro Mesa (UNM 9972–73); BBNP, Casa Grande (TCWC 16052); BBNP, Government Springs (UNM 20843); BBNP, Government Wells (UNM 18239–40); BBNP, Grapevine Springs (TCWC 16045); BBNP, south of Moss Well, 5000 ft. (UNM 5900); BBNP, Oak Canyon, 4000 ft. (UNM 20846); BBNP, Panther Jct. (UNM 6555); Chisos Mts., E slope (KU 13200); Chisos Mts., Basin, 6000 ft. (TCWC 1113); Chisos Mts., Green Gulch (TCWC 16050); Chisos Mts., Mt. Emory, 8000 ft. (KU 12748); Chisos Mts., Pine Canyon (TCWC 14269); 16.2 mi. NW La Linda, Coahuila (EAL 3238); 60 mi. S Marathon, Black Gap Wildlife Mgmt. Area (TCWC 20161; TNHM 12939, 12987); Glass Mts., 5 mi. N Marathon (KU 13199); Strumbere Ranch (SRSU 3605); *Brown Co.:* 4 mi. W Bangs, US Hwy 67 (TCWC 23446–48); 4 mi. W Brownwood (KU 11387); *Burnet Co.:* "Burnet County" [no further data] (USNM 5877); Burnet (CAS 7409); 8 mi. W Burnet (TCWC 4499–501); *Callahan Co.:* 19 mi. W Cross Plains (TNHM 9738); *Comal Co.:* New Braunfels, Water Rec. Dist. #2 (TCWC 15064); *Comanche Co.:* 5 mi. N DeLeon (TCWC 15266); *Crockett Co.:* 11 mi. E Ozona, US Hwy 290 (ANSU 148); *Dimmit Co.:* near Carrizo Springs, Nueces River (KU 8195–96); *Edwards Co.:* 24 mi. NE Rocksprings (TCWC 4502); *Gillespie Co.:* 15 mi. NE Fredricksburg (TCWC 5545–46); *Hays Co.:* Fern Bank Springs, Little Arkansas (TCWC 31486–87, 36534, 38744); 10 mi. S Oak Hill on Big Bear Creek (TNHM 21179); Pollard Wildlife Refuge (TCWC 38745–49); 4 mi. W San Marcos (TCWC 8941); 7 mi. W San Marcos (FSM 3579); 2 mi. E Wimberly on Cypress Creek (TNHM 8794); 4 mi. E Wimberly (TCWC 27320–24); *Irion Co.:* 11 mi. NW Mertzon (ANSU 2768–69, 2771, 2773, 2790); 12 mi. NW Mertzon (ANSU 4535); 13 mi. NW Mertzon (ANSU 629–30, 871–73); *Jeff Davis Co.:* Cherry Valley (MCZ 12822); 10.6 mi. N Fort Davis, Jones Ranch (TCWC 26108); Nations Canyon (SRSU 688); *Kendall Co.:* 0.5 mi. W Cen-

tury Caverns (TCWC 38739); 0.5–1.0 mi. S Camp Alzafar (TCWC 30172, 38737–38); *Kerr Co.:* 4 mi. NE Centerpoint (TCWC 181); Kerrville (USL 1716); 15 mi. SE Kerrville (LSU 13676); Kerr Wildlife Mgmt. Area (TCWC 13806); *Kimble Co.:* 2–4 mi. N Cleo (TCWC 38750–53); 2 mi. SW Junction on US Hwy 377 (UTEP 8583); 10 mi. W Junction (ANSU 7153); 15 mi. NW Junction (ANSU 8132); 2.3 mi. S Junction, Schriener Ranch (TNHM 7065); Telegraph, Point Creek and Schiener Ranches (TNHM 7003–05); *Kinney Co.:* Ft. Clark (USNM 25445); *Live Oak Co.:* 6 mi. E George West on Nueces River (TAIC 258.1–.2); 3 mi. W Three Rivers (TCWC 10535–36, 10538); 8 mi. W Jct. FmRd 624 & US Hwy 281 (TAIC 123.2–.3); *Mason Co.:* 20 mi. ESE Mason (TCWC 31047–50); 8 mi. S Mason (TCWC 3105); 10 mi. S Mason (TCWC 31052–53; *Maverick Co.:* Mangus Ranch, S of Eagle Pass (TAIC 2473, [2]); *McClennan Co.:* Bluff Creek, 0.5–2 mi. W Crawford (FMNH 46757–58, 46762); near Crawford (FMNH 46759); *McMullen Co.:* 5.6 mi. W Whitsett (TCWC 39267); 7.9 mi. W Whitsett (TCWC 39266); *Medina Co.:* "Medina County" [no further data] (USNM 42307); 5 mi. N Hondo (TCWC 14621); 3 km ENE Mico, 1200 ft. (UTEP 9481); *Nueces Co.:* 10 mi. W Corpus Christi (TCWC 18175); *Palo Pinto Co.:* BSA Camp Constantine (TCWC 25271); 10 mi. W Graford (ANSU 7154); 10 mi. S Mineral Wells (TCWC 406); 2.8 mi. N Palo Pinto (TNHM 13503); *Pecos Co.:* 11 mi. E Bakersfield (SRSU 771); Fort Stockton (SRSU 1412); near Iraan (TNHM 33380); 1.4 mi. W Sheffield on US Hwy 290 (UTEP 8584); *Presidio Co.:* Chinati Mts., Pinto Canyon (SRSU 524); 11 mi. W Valentine, CE Miller Ranch (TNHM 1124, 2876, 3257, 3298–99, 3395, 4256, 4283); *Regan Co.:* Best (ANSU 2745–47); 15 mi. W Big Lake (ANSU 528); 9 mi. W, 12 mi. S Big Lake, 2500 ft. (ANSU 7166–69, TCWC 31355–58); *Real Co.:* 14.4 mi. E Jct. US Hwy 83 on FmRd 337 (USL 16378); *San Saba Co.:* Gorman Falls Camp, 6 mi. SE Bend (ANSU 141, 144, 2799–800, 5525, 5629, 5264); San Saba (ANSU 2916, 4064–74); 1 mi. S San Saba (ANSU 2968); 12 mi. E San Saba (TNHM 28837); 20 mi. NNW San Saba (TNHM 9697); *Schleicher Co.:* "Schleicher County" [no further data] (ANSU 2729); 5 mi. S Christoval (ANSU 145); 12 mi. S Christoval (ANSU 146); *Shackleford Co.:* 20 mi. N Albany, Matthews Ranch (UNM 9049); *Sutton Co.:* 5 mi. S Sonora (TNHM 33381); 10 mi. S Sonora (MVZ 38199–200); 26 mi. SE Sonora (USNM 6529); *Terrell Co.:* 27 mi. ESE Dryden (USL 15432); 13 mi. S Sheffield (TNHM 7588, 7612, 7678, 7777); 15 mi. S Sheffield, Blackstone Ranch (TNHM 7105); 18 mi. S Sheffield (TNHM 8131–33); 21 mi. S Sheffield (TNHM 7920, 7948); 30 mi. S Sheffield, Chandler Ranch (SRSU 303, 316, 325, 338–40, 2201; TNHM 8314–18, 8054); *Tom Greene Co.:* Christoval (ANSU 1180, 2108–10, 5579); 3 mi. E Christoval, Toe Nail Trail (ANSU 140, 142); 4 mi. S Christoval, Concho River (ANSU 5561); 4.5 mi. S Christoval, Head of River Ranch (ANSU 147, 150); 5 mi. S Christoval (ANSU 149); N Concho Lake (ANSU 279, 3114–15, 3161); Fort Concho (USNM 12777); 4 mi. N Log Cabin Steakhouse Club (ANSU 5274); Nasworthy Lake (ANSU 3035–36); San Angelo (ANSU 3140, 8131); 4 mi. S San Angelo, near Nasworthy Dam (ANSU 143); *Travis Co.:* Austin, Texas Univ. Campus (TNHM 25727); 1 mi. NW Austin, Bull Creek Rd (TNHM 33375); 4 mi. SSW Austin (TNHM 9877); 5 mi. SW Austin, Barton Creek (TNHM 1693, 1936, 5870, 5942); 6 mi. SE Austin (TNHM 32195); 1.5 mi. SE Manchaca (TNHM 21683; Shoal Creek (TNHM 13074–75); 1 mi. upriver from Zilker Park (TNHM 13501); *Uvalde Co.:* near Concan, Bludworth Ranch (SM 5024); 3 mi. E Concan (BCB 7161); 3 mi. N Sabinal (TNHM 4873); 8 mi. N Uvalde (TCWC 44173–74); *Val Verde Co.:* 3 mi. W Comstock, along RR (ANSU 7161); 5.2 mi. N Comstock at Pecos River (ANSU 7156); 12 mi. N Comstock at Pecos River (ANSU 7157–60); 12 mi. S, 11 mi. E Comstock (ANSU 7165); 19.5 mi. SE Comstock (ANSU 7155); 20 mi. SE Comstock, under US Hwy 90 (ANSU 7162–64); near mouth of Devils River (KU 7748); Dolan Falls, Devils River (UNM 5973); Dolan Springs, Fawcett Ranch (UNM 5971–72); 12 mi. NW Del Rio (TNHM 32495); 50 mi. NW Del Rio (MVZ 68398); 60 mi. SW Ozona (ANSU 5448); *Webb Co.:* Laredo (UMMZ 114253); *Wilson Co.:* Cibolo River bottoms (SM 4353, 4355). Other significant localities represented by unexamined specimens include: MEXICO. COAHUILA: 33 mi. N, 8 mi. W San Geronimo (KU 33502); NUEVO LEÓN: 4 mi. W Sabinas Hidalgo (Taylor, 1935b); 31 mi. S Sabinas Hidalgo (Taylor, 1935b). TEXAS: *Coke Co.:* 2 mi. S Blackwell (Brown, 1950); *Coleman Co.:* 22 mi. S Valera, Day Ranch (TCWC 53456–61); *Kinney Co.:* 18.0 mi. N Bracketville (TCWC 46527); *Llano Co.:* 19 mi. SW Llano, FmRd 2323 (TCWC 58480–81); *McCulloch Co.:* 8 mi. N Brady (TCWC 18925); *Menard Co.:* 2.5 mi. E Ft. McKavett, 1800 ft. (TCWC 51196); *Throckmorton Co.:* 19 mi. NW Albany (KU 61796–97). Specimens examined for which the locality data are questionable include: FMNH 106623–26 ("large spring near Sabinas, Hidalgo")—the locality may refer to Sabinas Hidalgo in Nuevo León; TNHM 27810 (OKLAHOMA: 5 mi. SW Colbert); FMNH 27215–17 ("Probably Brownsville, Texas"); BCB nH69-1237, -2181 (TEXAS: *Henderson Co.:* 10 mi. S Athens); FMNH 46760–61 (TEXAS: *Limestone Co.:* between Oletha and Thronton).

Eumeces tetragrammus tetragrammus* × *brevilineatus (Specimens examined, 10). MEXICO. NUEVO LEÓN: Arroyo de las Vacas, 2 km W Hwy 85 at Ranchitos (MVZ 185746). USA. TEXAS: *Jim Wells Co.:* Casablanca, Nueces River (KU 8812); *La Salle Co.:* 2.8 mi W Jct. FmRd 624, FmRd 468, and FmRd 469 (TAIC 643); *Live Oak Co.:* 3 mi. W Three Rivers (TCWC 10537); 8 mi. W Jct. FmRd 624 and US Hwy 281 (TAIC 123.1); *McMullen Co.:* 17 mi. S Charlotte (TNHM 28836); 6.9 mi. S Tilden on State Hwy 16 (LACM 134855); 8 mi. W Whitsett (TCWC 39265); *Uvalde Co.:* 8 mi. N Uvalde (TCWC 44171–72).

Eumeces tetragrammus callicephalus (Specimens examined, 106). MEXICO. CHIHUAHUA: Bavispe River below Three Rivers, Sonora–Chihuahua line (BYU 13145–49, 14233); ca. 2 mi. E Cerocahui (BYU 14248–49); Cuiteco (BYU 14259–61, 14608–10); Guasaremos (MCZ 43389–90); Madera (MCZ 15928); Madronoi, W Rim, between Urique and Cerocahui (BYU 14338); 8 mi. W Matachic (AMNH 68295); Pacheco (MVZ 46672); 3 mi. NE Temoris (KU 51462). JALISCO: 38.2 mi. NW Guadalajara on MX Hwy 15 (FSM 12844–45); Hostotipaquillo (AMNH 17943); near

Magdalena (FMNH 106357–58); 3 mi. NE Magdalena (KU 38069). NAYARIT: 6 mi. SE Ahucatlan (UMMZ 118530); 7.1 mi. N Compostela, 3200 ft. (FSM 28999); Rosamorada (AMNH 15488); Mt. San Juan Tepec (FMNH 106359); Laguna Santa Maria del Oro, 2350 ft. (AMNH 96608); 19.6 mi. E Santa Cruz (CAS 95518); Santiago Ixcuintla (AMNH 19305–06); 12 mi. SW Santiago Ixcuintla (FSM 19305–06); 5 mi. NE Sentispac (AMNH 87673–77, 87974); 23.1 mi. E Tepic (MVZ 71259); 29 mi. SW Tepic at Crater Lake (BCB 64-1331). SINALOA: 16 km NNE Choix, 1700 ft. (KU 73745); vic. El Dorado (BCB 66-1381); La Cruz (LACM 6768); 1 mi. N Mazatlan (UTEP 4863–65); 2 mi. E Mazatlan (CAS 104975–77); 5 mi. N Mazatlan, along Sabalo Beach Rd (AMNH 87672); Sierra Surutato, 0.5 mi. (by rd) SE Los Hornos, ca. 1920 m (CAS 155910, 155913); Sierra Surutato, Canon de Tarahumare between La Joya and Baranca de las Tahonitas, ca. 1310 m (CAS 155911–12); Teacapan (LACM 6769–70); 24.8 mi. (by MX Hwy 40) E Jct. MX Hwy 15 (CAS 11483). SONORA: Alamos (AMNH 64219; UAZ 3468); 7 mi. SE Alamos, Arroyo Cuchujaqui (MVZ 72602); N Slope Alamos Mt., Las Higueras Creek (UAZ 3472); stream above Alamos on Sonora–Chihuahua border (MVZ 74186); Arispe, 840 m (UAZ 3471, 3473–74); Guirocoba, Cienigitas (MVZ 50735); 9 mi. NNE Imuris, 1000 m (KU 50633); 9.4 mi. by rd from Huertas (UAZ 11310–11); ca. 28 mi. E Nacozari, Presa de Rebeico (UAZ 11309); 36 mi. ENE Nuri, 3600 ft. (UAZ 3467); upper fork Nutria Creek (BYU 13140–41); 2 mi. E Santa Ana on rd to Yecora (UAZ 28193–94); above Santa Maria Mine (UMMZ 78124); 0.5–1.0 mi. SW Yecora (UAZ 16598); Rio Zatachi, 2930 ft. (UAZ 3475). USA. ARIZONA: *Cochise Co.:* Huachuca Mts. (CAS 48095–96, 80747); Huachuca Mts., Ash Canyon (KU 6473–76); Huachuca Mts., Copper Canyon (FMNH 46117); Huachuca Mts., Hunter Canyon, 5640 ft. (UAZ 16734); Huachuca Mts., Ramsay Canyon (UMMZ 71029); N Ridge Hunter Canyon, Short Springs (UAZ 16737); *Pima Co.:* Baboquivari Mts., Brown Canyon (AMNH 86573); Baboquivari Mts., Elkhorn Ranch, 3750 ft. (UAZ 7166); *Santa Cruz Co.:* Pajarito Mts., Peña Blanca Canyon (AMNH 15063); Pajarito Mts., Peña Blanca Springs (MVZ 49838, 53877; CAS 84125); Pajarito Mts., Walker Canyon, 1.5 mi. N Ruby Rd, Rockwell Camp, 3750 ft. (UAZ 19834, 30607–08); Santa Rita Mts., Madera Canyon (AMNH 64342; LACM 5929); Sycamore Canyon, 3800–3960 ft. (UAZ 3466, 3419; MVZ 50736). NEW MEXICO: *Hidalgo Co.:* Guadalupe Mts., Guadalupe Canyon, 4500 ft. (KU 74332–34). A significant locality represented by an unexamined specimen is: MEXICO. ZACATECAS: Mesquital del Oro (Taylor, 1935b). Specimens examined for which the locality data are questionable include: ANSP 13604–05 (MEXICO. GUANAJUATO: Guanajuato).

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