Systematics of Cnemidophorus gularis. I. Reallocation of Populations Currently Allocated to Cnemidophorus gularis and Cnemidophorus scalaris in Coahuila, México

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Systematics of *Cnemidophorus gularis*. I. Reallocation of Populations Currently Allocated to *Cnemidophorus gularis* and *Cnemidophorus scalaris* in Coahuila, México

J. MARTIN WALKER

***Cnemidophorus scalaris* is currently defined as a biparental species with a range which includes most of the Mexican Plateau and a part of the Big Bend area of southern Texas. *C. gularis* replaces *C. scalaris* in México east of the Mexican Plateau and in parts of Oklahoma, Texas and southeastern New Mexico. In Coahuila, México, *C. gularis* is distributed westward from the vicinity of Monclova to the vicinity of Sacramento near the eastern edge of the intermontane Cuatro Ciénegas Basin. Specimens from an area 3.2 km NNE to 11.7 km W Sacramento are intermediate in color and pattern, size and scutellation between *C. gularis* and the Cuatro Ciénegas Basin endemic *C. scalaris pallidus* indicating extensive gene exchange between the two. To reflect this relationship, the appropriate nomenclatural combinations are *C. gularis gularis* and *C. gularis pallidus*. These subspecies are highly distinctive in color and pattern and maximum body size, but are similar in qualitative and quantitative features of scutellation. Specimens collected in Coahuila along Mexican Highway 30 from 8.8 to 20.0 km SW Cuatro Ciénegas de Carranza to 33.6 km NW San Pedro de las Colonias, and specimens collected along Highway 54 from the vicinity of Castaños to Cuesta la Muralla represent an unrecognized subspecies of *C. gularis*. Southern Coahuila, from the vicinity of Saltillo westward along Highway 40 to the vicinity of Zapata and Viesca, and adjacent parts of Zacatecas and Nuevo León are inhabited by a distinctive color and pattern variant which previous workers have allocated to *C. scalaris semifasciatus*. Evidence presented in this report indicates that the nomenclatural combination *C. gularis semifasciatus* reflects the true systematic relationships of the subspecies.**

THE *sexlineatus* species group in the genus *Cnemidophorus* contains a number of "species" which present some of the most unyielding systematic problems in North American herpetology. *C. gularis* Baird and Girard, *C. scalaris* Cope, *C. mexicanus* Peters and *C. alpinus* Maslin and Walker constitute an especially troublesome complex within the *sexlineatus* species group which is herein referred to as the *C. gularis* complex. These essentially allopatric species are morphologically similar biparental forms with a maximum body size of approximately 107 mm, 4-4 supraocular scales, enlarged and plate-like postantebrachial scales, abruptly enlarged mesoptychial scales, poorly developed circumorbital scale series, similar patterns of variation in numbers of granules around midbody (65–108), similar patterns of variation in numbers of femoral pores (26–45), and dorsal color patterns of stripes and/or bars and spots. The vast combined range of the complex includes a large area in the southwestern United States mostly east of New Mexico, the Mexican Plateau and peripheral areas and much of eastern México south through Veracruz and Oaxaca. In a preliminary study of *C. gularis* and *C. scalaris* (=*C. septemvittatus*) Duellman and Zweifel (1962) were unable to determine if the two are specifically distinct or if all forms of *C. scalaris* are properly allocated in the absence of specimens from critical zones of sympatry and intergradation. The problem is further complicated by the uncertain distributive and systematic relationships of *C. alpinus* of eastern Puebla and *C. mexicanus* of north-central Oaxaca.

Through the field efforts of numerous contemporary herpetologists it is now possible to clarify the relationship of *C. gularis* to certain populations allocated to *C. scalaris*. In 1963, a field party from the University of Texas acquired an extensive series of *Cnemidophorus* from a number of states in México. Samples from localities between Monclova and Cuatro Ciénegas de Carranza, Coahuila, revealed that *C. gularis* occurs farther west than had been

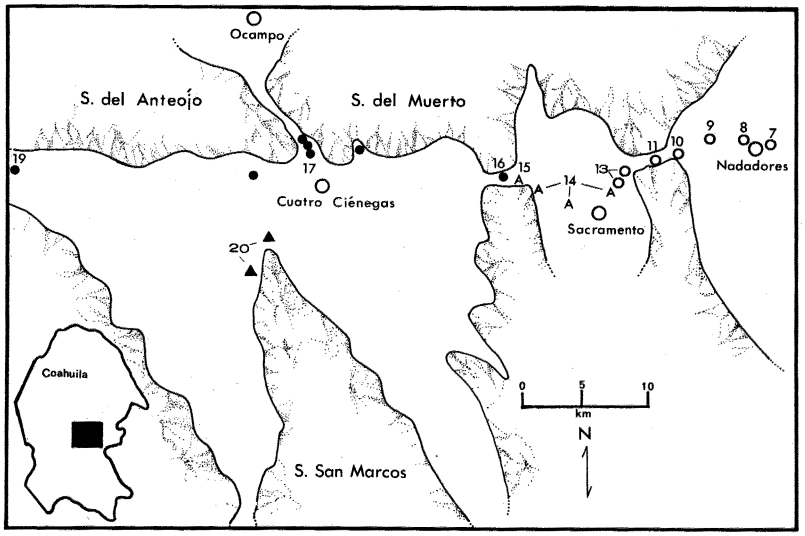

Fig. 1. Distribution of *Cnemidophorus gularis gularis* (open circles), *C. gularis gularis* × *pallidus* (A), *C. gularis pallidus* (closed circles) and *C. gularis* subsp. (undescribed) (closed triangles) in and near the Cuatro Ciénegas Basin (see Table 1 for locality data).

reported and, more importantly, samples from west of Sacramento, Coahuila, provided evidence that *C. gularis* and the Cuatro Ciénegas Basin endemic *C. scalaris pallidus* Duellman and Zweifel are subspecifically rather than specifically related. The geographic relationship of *C. gularis* to *pallidus* was further elucidated by collection of the latter at the western edge of the zone of intergradation by C. J. McCoy, Jr. in 1966. I also conducted field work between Monclova and Cuatro Ciénegas de Carranza in 1966 (Fig. 1). In addition, specimens from localities south of Monclova and Cuatro Ciénegas de Carranza provide a basis for reevaluation of the status of *C. scalaris semifasciatus* Cope, a form which occurs in southern Coahuila and adjacent parts of Nuevo León and Zacatecas.

The purpose of this paper is to present analyses of the first known areas of contact between *C. gularis* and populations now allocated to *C. scalaris* and to resolve the resulting nomenclatural problems. Included are analyses of variation within populations of *C. gularis* in Coahuila and redescriptions of *pallidus* and *semifasciatus* as subspecies of *C. gularis*.

Materials and Methods

The specimens used in this study are deposited in the following collections: American Museum of Natural History (AMNH), Arizona State University (ASU), Carnegie Museum (CM), Texas Natural History Collection (TNHC), University of Colorado Museum (UCM), University of Illinois Museum of Natural History (UIMNH), University of Kansas Museum of Natural History (KU), University of Michigan Museum of Zoology (UMMZ) and Tulane University (TU).

Seven characters of scutellation and two characters of color and pattern were quantitatively analyzed in 32 geographic samples and pooled samples of four subspecies (Table 1). Sample means, standard errors, standard deviations and tests for statistical significance, employing Duncan's Multiple Range Test for significance at the 0.05 level, were processed by IBM computer. Dorsal and ventral features of color and pattern were qualitatively analyzed (Tables 2–3). All specimens were measured to the nearest mm in snout vent length (SVL, Table 4).

Granules around midbody (GAB).—The count begins on one side adjacent to the ventral scales midway between axilla and groin and extends over the dorsum to a similar position on the opposite side but excludes the ventral scales.

Granules from occiput to rump (OR).—The count begins posterior to the enlarged occipital scales

TABLE 1. DATA [$\bar{x}$ ± S.E., RANGE, NUMBER (N)] FOR NINE CHARACTERS IN 32 GEOGRAPHIC AND 5 POOLED SAMPLES OF SUBSPECIES AND INTERGRADES OF *Cnemidophorus gularis*. Abbreviations are cited in the text.

Number and sample	GAB	OR	FP	SDL	COS	LSG	MS	PV	PV/GAB
Cnemidophorus gularis gularis									
1 Vic. Nava and San Juan de Sabinas (KU 39927–39935)	85.6 ± 1.1 81–90 N = 8	216.5 ± 4.4 190–232 N = 8	32.5 ± 0.7 30–35 N = 9	29.1 ± 0.6 27–32 N = 8	12.2 ± 0.9 10–16 N = 8	15.2 ± 1.5 7–20 N = 9	14.0 ± 0.6 12–18 N = 9	13.7 ± 0.8 10–17 N = 9	15.9 ± 0.9 12.3–19.5 N = 8
2 24 km NNW Múzquiz (TNHC 30603–30613)	85.0 ± 1.4 75–90 N = 11	211.9 ± 2.8 204–232 N = 11	33.8 ± 0.7 31–40 N = 10	30.2 ± 0.6 27–32 N = 9	11.9 ± 0.6 9–15 N = 10	15.0 ± 1.6 10–29 N = 11	14.5 ± 0.4 13–17 N = 10	12.5 ± 0.3 10–14 N = 11	14.6 ± 0.3 12.9–16.2 N = 11
3 Vic. Las Margaritas (KU 38345–38349, 38351–38358)	87.1 ± 1.9 76–94 N = 9	213.0 ± 4.2 206–233 N = 6	33.1 ± 1.0 29–38 N = 9	31.3 ± 0.5 29–33 N = 9	11.2 ± 0.7 8–14 N = 8	13.2 ± 1.3 8–19 N = 9	14.2 ± 0.5 13–17 N = 8	14.3 ± 0.5 13–17 N = 6	16.1 ± 0.8 13.9–18.8 N = 6
4 20.9 km N Hermanas (TNHC 30645–30654)	88.4 ± 1.9 81–97 N = 10	216.8 ± 2.8 200–226 N = 10	34.5 ± 0.6 31–38 N = 10	28.9 ± 0.2 28–30 N = 10	15.0 ± 1.5 8–22 N = 10	15.4 ± 1.5 9–23 N = 10	15.2 ± 0.4 13–17 N = 10	15.0 ± 0.8 10–18 N = 10	16.7 ± 0.8 11.6–19.7 N = 10
5 1.6–9.7 km NNE Monclova (TNHC 30667–30672, 30675–30678)	84.0 ± 1.3 76–90 N = 10	208.8 ± 2.6 192–221 N = 9	33.8 ± 0.8 30–39 N = 10	30.8 ± 0.7 27–34 N = 9	10.4 ± 1.1 7–13 N = 10	15.5 ± 1.3 10–23 N = 10	14.6 ± 0.4 13–17 N = 10	12.5 ± 0.9 9–16 N = 6	14.8 ± 1.0 11.8–19.0 N = 7
6 1.6 km SW San Buenaventura (TNHC 30291–30295)	80.4 ± 2.2 76–85 N = 5	199.4 ± 2.8 187–208 N = 5	34.0 ± 0.9 31–38 N = 5	30.6 ± 0.8 29–34 N = 5	11.6 ± 1.0 8–15 N = 5	17.0 ± 1.5 11–27 N = 5	14.6 ± 0.5 13–17 N = 5	11.4 ± 0.7 9–15 N = 5	14.1 ± 1.2 10.8–17.6 N = 5
7 1.6 km E Nadadores (TNHC 30696–30703)	84.0 ± 1.7 76–89 N = 7	211.0 ± 3.0 202–221 N = 6	34.2 ± 0.9 30–38 N = 8	31.6 ± 0.8 28–33 N = 6	10.8 ± 1.1 7–16 N = 8	12.8 ± 0.8 10–16 N = 8	15.1 ± 0.5 13–17 N = 8	14.5 ± 0.6 11–16 N = 7	17.4 ± 1.1 13.1–21.0 N = 6
8 1.6 km W Nadadores (TNHC 30704–30707, 30710–30713)	84.5 ± 2.2 76–93 N = 8	197.2 ± 5.8 174–216 N = 6	34.5 ± 1.3 30–40 N = 8	31.2 ± 0.7 28–34 N = 8	11.8 ± 0.8 9–15 N = 6	16.0 ± 1.2 11–22 N = 8	13.7 ± 0.5 12–16 N = 8	13.8 ± 0.6 12–16 N = 8	16.2 ± 0.6 13.7–18.7 N = 8
9 5.4 km W Nadadores (UCM 37759–37761)	86.6 76–99 N = 3	196.0 183–218 N = 3	35.0 33–37 N = 3	30.3 27–34 N = 3	15.6 14–18 N = 3	14.0 11–16 N = 3	16.3 16–17 N = 3	14.0 12–16 N = 3	16.3 14.4–18.4 N = 3
10 9.6 km W Nadadores (TNHC 30714–30720)	88.4 ± 1.6 84–95 N = 7	217.8 ± 3.9 202–232 N = 7	37.7 ± 1.3 34–43 N = 7	31.5 ± 0.8 29–34 N = 7	14.1 ± 1.1 11–19 N = 7	18.7 ± 1.9 11–25 N = 7	15.4 ± 0.8 13–18 N = 7	14.3 ± 1.1 10–17 N = 6	16.1 ± 1.2 10.5–18.4 N = 6

TABLE 1. CONTINUED.

Number and sample	GAB	OR	FP	SDL	COS	LSG	MS	PV	PV/GAB
11 12.8 km W Nadadores (KU 53744–53748)	80.0 ± 2.2 75–88 N = 5	197.7 ± 3.1 189–202 N = 4	35.4 ± 1.2 31–37 N = 5	30.3 ± 1.2 28–32 N = 3	10.8 ± 1.0 9–14 N = 5	15.4 ± 1.4 11–20 N = 5	14.4 ± 0.9 13–18 N = 5	13.6 ± 0.7 12–16 N = 5	16.9 ± 0.5 15.0–18.1 N = 5
12 22.4–28.8 km N, 22.4–25.6 km E Ocampo (KU 38290–38294)	81.0 77–85 N = 6	199.5 192–206 N = 4	32.6 29–36 N = 6	30.5 28–31 N = 6	10.7 9–15 N = 4	13.0 9–20 N = 5	14.0 12–15 N = 4	13.5 10–17 N = 6	16.7 11.7–22.0 N = 6
13 Vic. Agua del Carmen-El Cariño (CM 43147–43159, 43161–43162)	83.8 ± 1.0 78–91 N = 14	206.3 ± 2.1 194–223 N = 15	35.4 ± 0.5 32–39 N = 15	30.6 ± 0.5 27–33 N = 13	12.6 ± 0.6 9–18 N = 14	16.5 ± 1.5 11–29 N = 12	14.2 ± 0.4 12–16 N = 14	12.5 ± 0.6 9–17 N = 15	14.9 ± 0.7 10.7–19.1 N = 14
Cnemidophorus gularis gularis × *pallidus*									
14 3.2 km NNE, 8 km NNW Sacramento (TNHC 30722–30724, 30729–30733, 30735–30746)	81.7 ± 0.7 76–87 N = 20	196.4 ± 2.6 177–220 N = 20	34.3 ± 0.5 30–38 N = 20	30.5 ± 0.3 29–33 N = 19	12.5 ± 0.5 10–18 N = 19	16.6 ± 1.2 9–34 N = 20	14.1 ± 0.4 11–17 N = 19	14.7 ± 0.8 10–20 N = 17	17.8 ± 0.9 11.6–24.0 N = 17
15 11.7 km W Sacramento (UCM 37762–37789, CM 43169)	82.2 ± 0.8 74–93 N = 29	193.7 ± 1.8 172–214 N = 29	35.4 ± 0.4 30–39 N = 29	31.0 ± 0.3 28–34 N = 25	11.1 ± 0.4 8–15 N = 29	16.6 ± 0.9 11–28 N = 29	14.3 ± 0.3 11–18 N = 29	14.1 ± 0.4 11–18 N = 26	17.2 ± 0.4 13.6–21.6 N = 25
Cnemidophorus gularis pallidus									
16 21.7 km E Cuatro Ciénegas (CM 43293–43296)	80.7 ± 1.1 78–83 N = 4	183.0 ± 5.5 167–190 N = 4	37.0 ± 0.7 35–38 N = 4	31.5 ± 0.9 30–34 N = 4	16.0 ± 0.9 14–18 N = 4	19.0 ± 3.0 12–26 N = 4	14.2 ± 0.3 14–15 N = 4	13.5 ± 0.5 13–14 N = 2	16.7 ± 0.1 16.6–16.8 N = 2
17 4.8–8.0 km N Cuatro Ciénegas (CM 43283–85, 43286–92, 43297–43309, 43311–18, KU 80305, UCM 37790–93, 24929–41, 26690–96, TNHC 30756–57)	82.9 ± 0.7 71–91 N = 55	189.0 ± 1.3 169–207 N = 51	37.6 ± 0.3 31–43 N = 53	31.8 ± 0.2 29–37 N = 50	10.7 ± 0.4 6–17 N = 50	16.9 ± 0.5 9–30 N = 54	14.2 ± 0.2 10–18 N = 49	14.1 ± 0.3 11–18 N = 23	17.3 ± 0.3 14.6–20.8 N = 23
18 8 km SE Ocampo (KU 38296)	83 N = 1	192 N = 1	33 N = 1	33 N = 1	16 N = 1	13 N = 1	13 N = 1	— —	— —

TABLE 1. CONTINUED.

Number and sample	GAB	OR	FP	SDL	COS	LSG	MS	PV	PV/GAB
19 46.4 km W Cuatro Ciénegas (UIMNH 56989–56990)	79.5 78–81 N = 2	185.0 181–195 N = 2	34.0 32–36 N = 2	31.5 31–32 N = 2	10.0 7–13 N = 2	20.5 17–24 N = 2	13.0 13 N = 2	— — —	— — —
C. gularis subsp.									
20 8.8–20 km SW Cuatro Ciénegas (ASU 5470, 5495; UMMZ 125851; CM 48282, 48364, 51150, 51157, 51165, 51168, 51174, 51178–51181)	85.2 ± 1.4 75–98 N = 14	189.5 ± 3.6 168–213 N = 14	37.1 ± 0.7 33–43 N = 14	32.1 ± 0.4 30–35 N = 13	11.8 ± 0.8 8–18 N = 14	18.0 ± 0.9 13–24 N = 14	13.5 ± 0.8 8–19 N = 14	13.5 ± 0.8 8–19 N = 14	9.6 ± 1.5 5.0–22.8 N = 14
21 31–51 km S Castaños (TNHC 30261–30265)	85.6 ± 3.2 74–91 N = 5	195.4 ± 7.3 169–210 N = 5	37.2 ± 2.4 32–43 N = 5	30.5 ± 0.5 30–32 N = 5	10.0 ± 0.9 8–13 N = 5	19.0 ± 2.5 12–26 N = 5	17.0 ± 1.0 16–18 N = 5	11.0 ± 1.3 6–14 N = 5	12.8 ± 1.5 7.2–15.5 N = 5
22 Cuesta La Muralla (CM 43274–43278, 43280)	91.3 ± 1.8 84–97 N = 6	198.1 ± 3.8 191–214 N = 6	36.6 ± 1.5 31–39 N = 5	32.1 ± 0.7 30–34 N = 6	15.0 ± 1.8 12–21 N = 6	19.1 ± 3.0 12–31 N = 6	14.6 ± 0.6 13–16 N = 5	13.3 ± 1.3 9–18 N = 6	14.6 ± 1.6 10.0–21.4 N = 6
C. gularis pallidus × *C. gularis* subsp.									
23 16 km S Cuatro Ciénegas (KU 47091–47097)	87.0 ± 1.8 79–95 N = 7	203.2 ± 1.8 187–216 N = 5	37.1 ± 1.2 34–43 N = 7	32.3 ± 0.7 31–35 N = 6	12.5 ± 1.1 10–18 N = 7	14.1 ± 1.3 10–21 N = 7	14.4 ± 0.5 13–16 N = 7	10.7 ± 0.6 9–14 N = 7	12.3 ± 0.8 10.1–16.4 N = 7
C. gularis semifasciatus									
24 12.1–28.1 km N Saltillo (UCM 37731–37749)	95.4 ± 1.3 83–104 N = 19	216.8 ± 3.1 189–239 N = 18	39.4 ± 0.7 34–45 N = 19	33.4 ± 0.6 29–36 N = 18	12.1 ± 0.7 8–18 N = 17	19.1 ± 1.2 12–29 N = 17	15.3 ± 0.5 12–20 N = 19	17.0 14–20 N = 2	17.9 16.2–19.6 N = 2
25 24–34.7 km W Saltillo (AMNH 67361–67362, 77248; KU 29352–29355)	90.5 81–108 N = 6	219.3 215–224 N = 3	38.1 33–45 N = 6	32.3 31–34 N = 3	16.0 15–17 N = 2	24.5 22–27 N = 2	15.0 14–16 N = 3	21.5 17–26 N = 2	21.5 19.1–24.0 N = 2
26 Vic. General Cepeda (AMNH 77223; KU 37574–37591)	89.3 ± 1.7 76–104 N = 19	— — —	36.8 ± 0.7 30–42 N = 19	— — —	— — —	— — —	— — —	— — —	— — —

TABLE 1. CONTINUED.

Number and sample	GAB	OR	FP	SDL	COS	LSG	MS	PV	PV/GAB
27 Vic. Parras de la Fuente	89.3 ± 1.3	—	37.3 ± 0.7	—	—	—	—	—	—
(AMNH 77286–77287;	82–97	—	32–42	—	—	—	—	—	—
KU 39460–39471)	N = 14	—	N = 14	—	—	—	—	—	—
28 3.2 km W Arteaga	86.8 ± 3.1	208.0 ± 4.8	36.8 ± 1.2	32.2 ± 0.7	9.3 ± 1.0	16.0 ± 2.1	14.1 ± 0.9	12.1 ± 1.4	13.9 ± 1.3
(AMNH 77225–77231;	70–101	184–228	31–40	29–35	8–14	12–28	12–18	5–16	6.3–16.6
TNHC 30149–30150)	N = 9	N = 8	N = 8	N = 9	N = 6	N = 7	N = 7	N = 7	N = 7
29 1.6 km S Agua Neuva	82.6 ± 2.2	200.0 ± 4.0	35.7 ± 0.6	31.8 ± 0.6	12.1 ± 0.5	15.8 ± 1.6	15.6 ± 0.8	12.0	14.7
(TNHC 30130–30137)	76–92	185–216	34–39	29–33	11–14	11–22	14–18	9–15	10.7–18.7
	N = 6	N = 7	N = 7	N = 6	N = 6	N = 6	N = 6	N = 2	N = 2
30 17.6 km N Zapata	90.0	190.5	35.0	33.0	12.0	20.5	16.5	—	—
(UIMNH 44654–44655)	87–93	173–208	33–37	32–34	10–14	15–26	14–19	—	—
	N = 2	N = 2	N = 2	N = 2	N = 2	N = 2	N = 2	—	—
31 1.3 km E Casa Blanca,	91.8 ± 3.1	205.6 ± 5.5	38.4 ± 1.1	33.0 ± 0.8	12.5 ± 1.6	17.2 ± 0.8	15.0 ± 0.4	15.3	17.2
Nuevo León	82–101	196–226	36–42	32–36	10–17	15–20	14–16	13–17	15.8–19.1
(UCM 37726–37730)	N = 5	N = 5	N = 5	N = 5	N = 4	N = 5	N = 5	N = 3	N = 3
32 17.6 km NE Concepción	90.3 ± 2.2	205.8 ± 6.0	39.0 ± 1.1	34.0 ± 0.6	15.5 ± 0.9	18.5 ± 2.9	15.6 ± 0.7	12.6	13.4
del Oro, Zacatecas	84–101	180–229	34–44	31–36	12–21	10–32	13–18	10–18	10.7–17.8
(TNHC 30202–30208)	N = 8	N = 8	N = 8	N = 8	N = 8	N = 8	N = 8	N = 3	N = 3
Pooled Samples									
C. gularis gularis	85.3 ± 0.5	209.9 ± 1.3	34.5 ± 0.3	30.5 ± 0.2	12.4 ± 0.3	15.2 ± 0.5	14.6 ± 0.2	13.6 ± 0.2	15.8 ± 0.3
	75–99	174–233	29–43	27–34	7–22	7–29	12–18	9–18	10.5–22.0
	N = 103	N = 94	N = 105	N = 96	N = 98	N = 102	N = 101	N = 97	N = 95
C. gularis gularis × *pallidus*	81.9 ± 0.6	194.8 ± 1.5	34.9 ± 0.3	30.8 ± 0.2	11.7 ± 0.3	16.6 ± 0.7	14.1 ± 0.2	14.3 ± 0.4	17.4 ± 0.4
	74–93	172–220	30–39	28–34	8–18	9–34	11–18	10–20	11.6–24.0
	N = 49	N = 49	N = 49	N = 44	N = 48	N = 49	N = 48	N = 43	N = 42
C. gularis pallidus	82.6 ± 0.7	188.7 ± 1.3	37.5 ± 0.3	31.9 ± 0.2	11.1 ± 0.4	17.1 ± 0.5	14.3 ± 0.2	14.1 ± 0.3	17.4 ± 0.3
	71–91	167–207	31–43	29–37	6–18	9–30	10–18	11–18	14.6–20.8
	N = 62	N = 58	N = 60	N = 57	N = 57	N = 61	N = 56	N = 25	N = 25
C. gularis semifasciatus	90.2 ± 0.8	209.4 ± 2.0	37.7 ± 0.3	33.0 ± 0.3	12.6 ± 0.5	18.2 ± 0.8	15.2 ± 0.3	13.8 ± 0.5	15.6 ± 0.9
	70–108	173–239	30–45	24–36	8–21	10–32	12–20	5–18	6.3–24.0
	N = 88	N = 51	N = 88	N = 51	N = 45	N = 47	N = 50	N = 19	N = 19
C. gularis septemvittatus	84.0 ± 0.6	194.7 ± 1.4	38.0 ± 0.5	29.8 ± 0.3	10.7 ± 0.3	17.1 ± 0.7	14.1 ± 0.2	6.9 ± 0.3	8.3 ± 0.4
	78–95	178–210	34–43	26–32	6–14	11–31	12–17	4–11	5.0–12.6
	N = 34	N = 33	N = 32	N = 29	N = 32	N = 33	N = 32	N = 34	N = 33

and terminates at the first caudal scales on the rump.

Femoral pores (FP).—The sum of the left and right femoral pores.

Subdigital lamellae (SDL).—The number of subdigital lamellae on the fourth toe of the left pes.

Circumorbital scales (COS).—The sum of the circumorbital scales on each side counting in single rows from the enlarged temporals dorsally and anteriorly against the enlarged medial scales (Maslin and Walker, 1973).

Lateral supraocular granules (LSG).—The number of lateral supraocular granules lying between the superciliaries and the supraoculars on the right side which occur anterior to the suture between the third and fourth supraoculars (Maslin and Walker, 1973).

Mesoptychial scales (MS).—The number of conspicuously enlarged mesoptychial scales bordering the gular fold.

Paravertebral granules (PV).—The number of rows of paravertebral granules lying between the paravertebral stripes at a point midway between the axilla and groin.

PV/GAB.—The ratio, ×100, between the number of paravertebral granules and the granules around midbody.

A less comprehensive version of this study (Walker, 1966) served as a doctoral dissertation under the direction of T. Paul Maslin, University of Colorado Museum. All aspects of the original study have been carefully reevaluated, many additional specimens examined, and the statistics corrected and updated.

Taxonomic Revision

Cnemidophorus gularis gularis Baird and Girard
Fig. 2

Cnemidophorus gularis Baird and Girard, 1852:128.

Type specimen.—No holotype designated. Lectotype, USNM 3022a, selected from 14 syntypes (USNM 3022 and 1989), by Smith and Taylor (1950). The type locality, "Indianola (Texas), and the valley of the Rio San Pedro a tributary of the Rio Grande del Norte" restricted to ". . . mouth of the Devil's River, Texas" by Smith and Taylor (1950).

Remarks.—The name *sericeus* Cope, 1892, is herewith removed from the synonymy of *C. g. gularis.* The holotype, USNM 15650 collected by William Taylor, was reported to have originated at San Diego, Duval County, Texas, by Cope (1892). This locality is within the range of *C. g. gularis,* however, USNM 15650 agrees in color pattern and scutellation with *C. "scalaris" semifasciatus* Cope (1892), type locality Agua Nueva, Coahuila (Burt, 1931). The locality data accompanying USNM 15650 are apparently in error.

Distribution.—*C. g. gularis,* as treated herein, is equivalent to the *C. gularis* of Duellman and Zweifel (1962), Stebbins (1966) and Conant (1975). In the United States the range of this subspecies includes Texas (except the extreme western part, panhandle and eastern forested region), parts of southern Oklahoma and extreme southeastern New Mexico. Both Stebbins (1966, map 115) and Conant (1975, map 86) presented good approximations of the range in the United States; however, there are no published maps which accurately portray the range of *C. g. gularis* in Coahuila or its geographic relationship to populations allocated to *C. scalaris* elsewhere in México. The new locality data indicate that the entire northeastern quadrant of the state is included. Most of adjacent Nuevo León is included by Stebbins (1966) and Conant (1975) when in reality *C. g. gularis* is replaced in the southern part of the state by a distinctive undescribed spotted form. This undescribed form has an extensive range in the southern part of the Mexican Plateau and is similar to the *C. scalaris* subspecies reported from the vicinity of Guadalajara, Jalisco, by Zweifel (1959, 1961) and Duellman and Zweifel (1962), from Aguascalientes by Anderson and Lidicker (1963), and from Zacatecas by Baker, Webb and Dalby (1967). More recently Dixon, Lieb and Ketchersid (1971) described a similar form from Querétaro as *C. gularis colossus.* New locality data also indicate that *C. g. gularis* is restricted to extreme eastern and southeastern San Luis Potosí, with the undescribed population occupying most other parts of the state. *C. g. gularis* ranges eastward through most of Tamaulipas and south to Veracruz and Hidalgo.

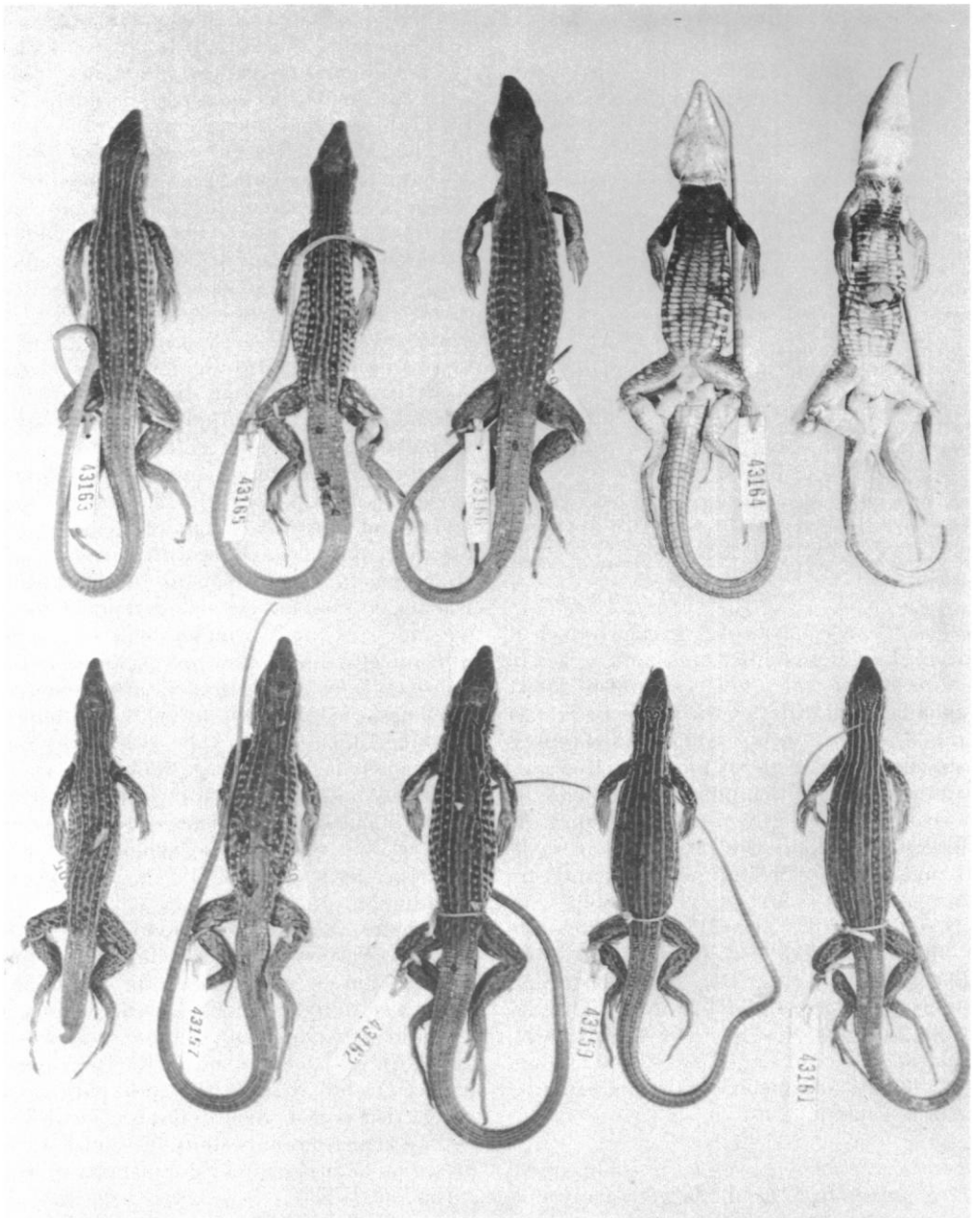

Fig. 2. Color pattern variation in *Cnemidophorus gularis gularis* from the eastern edge of a zone of intergradation. Upper (l. to r.), CM 43163, ♂—70 mm; CM 43165, ♂—68 mm; CM 43166, ♂—80 mm; CM 43164, ♂—76 mm; CM 43149, ♂—78 mm. Lower (l. to r.), CM 43158, ♂—65 mm; CM 43157, ♂—69 mm; CM 43162, ♂—70 mm; CM 43159, ♀—63 mm; CM 43161, ♀—71 mm. CM 43163–43166, 38.1 km W Monclova; CM 43149, 43157–43158, Agua del Carmen, 5.1 km E Sacramento; 43159, 43161–43162, E Cariño, 3.8 km E Sacramento.

Details of the distribution and variation in states other than Coahuila will be presented elsewhere along with an analysis of the relationship of *C. g. gularis* to other populations now allocated to *C. scalaris.*

Specimens examined.—Samples are presented on the basis of geographical relationships from north to south. México: Coahuila (N = 124): 9.7 km SSE Santo Domingo (TNHC 30628), 17.7 km SSE Santo Domingo (TNHC 30621), 3.2 km S, 4.8 km E San Juan de Sabinas (KU 30027–39928), 14.5 km S, 17.7 km E San Juan de Sabinas (KU 39935), 3.2 km S, 17.6 km E Nava (KU 39929–39934), 24.1 km NNW Múzquiz (TNHC 30603–30613), 4.8 km W Hda. San Miguel (KU 28144), Las Margaritas (KU 38344–38349, 38351–38358), 16.0 km NW Las Margaritas (KU 38350), 20.9 km N Hermanas (TNHC 30645–30651, 30653–30654), 25.7 km SSE Hermanas (TNHC 30652), 1.6 km NNE Monclova (TNHC 30675–30678), 3.2 km NNE Monclova (TNHC 30296–30297), 9.7 km NNE Monclova (TNHC 30667–30672), 12.8 km NNE Monclova (TNHC 30303–30304), 8.2 km W Monclova (UCM 37757), 38.1 km W Monclova (CM 43163–43166), 1.6 km SE San Buenaventura (TNHC 30291–30295), 1.6 km E Nadadores (TNHC 30696–30703), 1.6 km W Nadadores (TNHC 30704–30707, 30710–30713), 5.4 km W Nadadores (UCM 37759–37761), 9.6 km W Nadadores (TNHC 30714–30720), 12.8 km W Nadadores (KU 53744–53748), El Cariño, 3.8 km E Sacramento (CM 43147, 43159, 43161–43162), Agua del Carmen, 5.1 km E Sacramento (CM 43148–43158), 22.5 km E, 25.7 km N Ocampo (KU 38290–38294), 25.7 km E, 28.9 km N Ocampo (KU 38297).

Scutellation.—Specimens of *C. g. gularis* from all Coahuila localities sampled are characterized by 4-4 supraocular scales, enlarged and plate-like postantebrachial scales on the posterior surface of the forearms, abruptly enlarged mesoptychial scales at the edge of the gular fold, and circumorbital series that only rarely extend anteriorly beyond the level of the third supraocular scales. Variation in means, ranges of variation, and numbers of specimens examined for each quantitative character are: 80.0–88.4 (75–99, N = 103) GAB, 196.0–217.8 (174–233, N = 94) OR, 32.5–37.7 (29–43, N = 105) FP, 28.9–31.6 (27–34, N = 96) SDL, 10.4–15.6 (7–22, N = 98) COS, 12.8–18.7 (7–29, N = 102) LSG, 13.7–16.3 (12–18, N = 101) MS, 11.4–15.0 (9–18, N = 97) PV, and 14.1–17.4 (10.5–22.0, N = 95) PV/GAB. Sample comparisons are presented in Table 1.

Geographic variation in scutellation.—Specimens of *C. g. gularis* from Coahuila were arrayed in 13 geographic samples for the analysis of variation. Samples are grouped in Table 1 on the basis of geographic relationships.

Samples 1–5 were collected between Nava and Monclova, Coahuila, an area apparently well removed from the immediate genetic influence of other subspecies in the complex. Samples from this area exhibit no significant mean differences in GAB (mean range 84.0–88.4), OR (208.8–216.8), FP (32.5–34.5), and LSG (13.2–15.5), and only minor statistically significant differences in SDL (28.9–31.3), COS (10.4–15.0) and PV (12.5–15.0) means.

In the analysis of data for specimens from the vicinity of San Buenaventura to the vicinity of Nadadores, it became obvious that pooling all specimens from the area would obscure differences between samples from certain closely approximated localities. For example, the extremes in GAB means are set by small samples from 12.8 km W Nadadores (80.0, N = 5) and 9.6 km W Nadadores (88.4, N = 7). The OR means (197.7 and 217.8 respectively) for the two samples are also significantly different. Aside from the apparent differences in scutellation, specimens from the two localities are essentially similar in color and pattern. It is also of interest that eight specimens from 1.6 km E of Nadadores do not differ from seven specimens from 1.6 km W Nadadores in scutellation; however, they do exhibit differences in color and pattern. The specimens from 1.6 km E Nadadores closely resemble certain of the intergrade specimens from localities west of Sacramento, Coahuila. It seems plausible that *C. gularis pallidus* is distributed in arroyos and small canyons along the foothills of the Sierra del Muerto, eastward to the vicinity of Nadadores where it contacts *C. g. gularis* (Fig. 1). The variability in color and pattern and scutellation in specimens from the vicinity of Nadadores is unusual, but there is no evidence that more than one species is involved.

Although evidence of marginally significant geographic variation was found in all quantitative characters analyzed, only the samples from 1.6 km SE San Buenaventura, 12.8 km W Nadadores and the vicinity of Ocampo deviated from the expected. Each of these samples have low GAB (80.0–81.0) and OR (197.7–199.5) means which may be attributed in part to sampling error as each involves few specimens (N = 5–6). There is no indication of a clinal pattern of variation in Coahuila populations of *C. g. gularis.*

Color pattern.—Specimens of *C. g. gularis* have a variable pattern of seven or eight light stripes (never six in available material) and a dark ground color throughout ontogeny (Fig. 2). A pair of cream to pale yellow lateral stripes extends from the suborbital region to the anterior surface of the thighs, a pair of pale yellow to yellowish-orange dorsolateral stripes extends from the superciliary scales to the proximal half

of the tail, a pair of pale yellow to yellowish-tan paravertebral stripes extends from the parietal scales to the proximal half of the tail, and one or two dull yellowish-tan middorsal stripes extend from the interparietal scale to the base of the tail. A pair of cream to pale yellow ventrolateral stripes which extends from the lower edges of the ears to the preaxillae is present in all but the largest adults. In juveniles and small adults the ventrolateral stripes may occasionally be continuous posteriorly near the junction of the ventral and dorsal scales. The primary lateral, dorsolateral, and paravertebral stripes are normally straight-margined on the anterior part of the body and only occasional specimens have wavy stripes anteriorly. About 56% of the Coahuila specimens had a single wavy or straight middorsal stripe. Also occuring at varying frequencies in all populations are specimens with two middorsal stripes which may be distinctly divided, thinly divided, divided anteriorly, or divided at intervals along their length. Juveniles are black or blackish-brown with distinct spots. Large males display considerably less contrast between the fields and stripes as a result of color changes in both of these pattern components. Adults of both sexes have spotted forelimbs, boldly to faintly mottled hindlimbs, faint stripes on the proximal part of the tail and a pinkish-tan coloration on the distal part of the tail (Fig. 2).

The "typical" adult male of *C. g. gularis* has a salmon-red suffusion on the throat and gular fold, bluish-black chest and a checkerboard pattern of bluish-black on the abdomen. The femoral and subcaudal areas are reddish to pinkish-tan (Fig. 2). Females develop a similar but less intense throat and gular coloration, and usually have cream-white to grayish-white postcephalic ventral surfaces. Only two adult females with bluish-black on the chest were observed. Males of *C. g. pallidus* never develop the salmon-red throat coloration and bluish-black chest coloration typically seen in males of the nominal subspecies.

Geographic variation in color pattern.—Specimens from the vicinity of Nava, Margaritas, Múzquiz, and Hermanas in northeastern Coahuila have somewhat darker fields and more distinct stripes and spots than specimens from more southerly localities in the state. Males from these areas also develop the bluish-black chest coloration at a smaller body size than in other areas from which samples are available. Specimens from immediately NNE Monclova and 1.6 km E Nadadores exhibit the lightest colored fields and least amount of contrast between the stripes and fields of any examined. Specimens from between Nadadores and El Cariño exhibit a greater tendency toward fading of the stripes than specimens from farther north, however, no wholly spotted specimens were observed. Males from the area between Nadadores and El Cariño are also somewhat erratic in the development of the dark chest coloration, apparently a result of the genetic influence of *C. g. pallidus.*

Size.—Reproductive maturity in males was determined by studies of histological preparations of testes; maturity in females was determined by studies of ovaries and oviducts. Males and females from Coahuila are reproductively mature at 55–60 mm in SVL. The mean SVL of 54 adult males was 73.3 mm; the mean SVL of 30 adult females was 70.3 mm. Sexual dimorphism in body size seems indicated. SVL frequencies for adults are presented in Table 4. These data indicate that *C. g. pallidus* has the potential for significantly larger average body size than geographically adjacent populations of *C. g. gularis.*

Cnemidophorus gularis pallidus Duellman and Zweifel
Fig. 3

Cnemidophorus septemvittatus pallidus Duellman and Zweifel, 1962.

Type specimen.—The original citation concerning the holotype, "A. M. N. H. No. 77310, collected 3 miles east of Cuatro Ciénegas, Coahuila, by R. G. Zweifel on June 29, 1957" is in error. The holotype was collected 4.8 km NNW of the village of Cuatro Ciénegas de Carranza in Cañon de la Agua (Fig. 1).

Distribution.—Duellman and Zweifel (1962) briefly described *C. g. pallidus* from the holotype and seven topoparatypes. Subsequently, several large samples were collected in the vicinity of the type locality by C. J. McCoy, Jr. permitting a more thorough analysis of variation. The easternmost record of *C. g. pallidus* places it at the edge of the zone of intergradation with *C. g. gularis* at 21.7 km E Cuatro Ciénegas de Carranza (Fig. 1). A single specimen from 8 km SE Ocampo, 35.2 km NNW

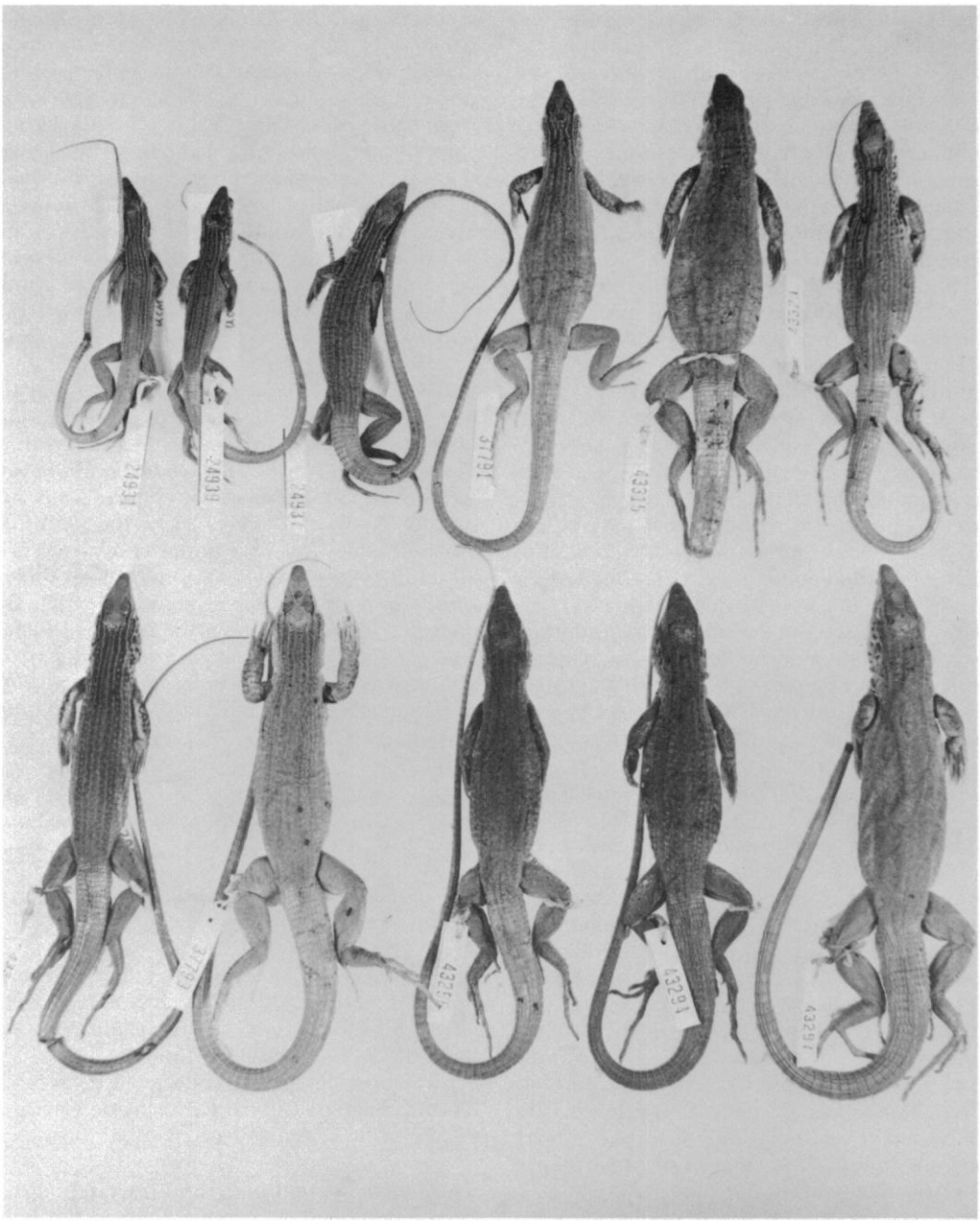

Fig. 3. Color pattern variation in *Cnemidophorus gularis pallidus* from the western edge of a zone of intergradation. Upper (l. to r.), UCM 24931, ♀—50 mm; UCM 24939, ♀—52 mm; UCM 24937, ♂—67 mm; UCM 37791, ♀—76 mm; CM 43315, ♀—86 mm; CM 43320, ♂—74 mm. Lower (l. to r.), CM 43301, ♂—77 mm; UCM 37793, ♂—86 mm; CM 43296, ♂—84 mm; CM 43294, ♂—82 mm; CM 43297, ♂—94 mm. UCM 24931, 24937, 24939, 37791, 37793, CM 43297–43298, 43301, 43315, 43320, 4.8–8 km N Cuatro Ciénegas; 43294, 21.7 km E Cuatro Ciénegas.

Cuatro Ciénegas de Carranza (KU 38296) extends the known range approximately 30.4 km northward. *C. g. gularis* has been collected 22.5 km E, 25.7 km N Ocampo (KU 38290–38294) and probably contacts *C. g. pallidus* near Ocampo. Two specimens from 46.4 km W Cuatro Ciénegas de Carranza (UIMNH 56989–56990) are tentatively referred to *C. g. pallidus* and mark the westernmost known locality for the subspecies.

Specimens examined.—Samples are presented on the basis of geographical relationships. Mexico: Coahuila (N = 69): 4.8 km NNW Cuatro Ciénegas de Carranza, Cañon de la Agua (CM 43283–43284, 43304–43308, TNHC 30756–30757, UCM 24929–24941, 26690–26696, 37790–37793), 5.3 km NNW Cuatro Ciénegas, Cañon de la Agua (CM 43286–43292, 43297–43303, 43309, 43311–43318), 8 km N Cuatro Ciénegas de Carranza, west slope Sierra del Muerto (CM 43285, 43319–43322), 8 km SE Ocampo (or 35.2 km NNW Cuatro Ciénegas de Carranza, KU 38296), 21.7 km E Cuatro Ciénegas de Carranza (CM 43293–43296), 9.1 km W Cuatro Ciénegas de Carranza (UIMNH 56988), 46.4 km W Cuatro Ciénegas de Carranza (UIMNH 56989–56990).

Scutellation.—Specimens of *C. g. pallidus* from 4.8–8 km NNW Cuatro Ciénegas de Carranza (vicinity of the type locality) are characterized by 4-4 supraocular scales, enlarged and platelike postantebrachial scales, abruptly enlarged mesoptychial scales, circumorbital series that extend anteriorly to the midpoints of the third supraocular scales, 82.9 (71–91, N = 55) GAB, 189.0 (169–207, N = 51) OR, 37.6 (31–43, N = 53) FP, 31.8 (29–37, N = 50) SDL, 10.7 (6–17, N = 50) COS, 17 (9–30, N = 54) LSG, 14.2 (10–18, N = 49) MS, 14.1 (11–18, N = 23) PV and 17.3 (14.6–20.8, N = 23) PV/GAB. Four specimens from 21.7 km E Cuatro Ciénegas de Carranza differ from all others in having circumorbital series that extend extend anteriorly to the second supraocular sutures. This difference is also reflected in the COS counts (Table 1, sample 16).

Color pattern.—Specimens of *C. g. pallidus* have a variable pattern of seven or eight pale stripes and a pale grayish ground color. The stripes are positioned much as in *C. g. gularis.* The lateral stripes are cream-white to cream with a faint yellowish cast, the dorsolateral stripes are cream-white to grayish-white, the paravertebral stripes are cream-white and the middorsal stripes are grayish-white (Fig. 3). In most specimens (82%) the dorsolateral stripes and paravertebral stripes are wavy on the anterior part of the body, as compared to straight in most *C. g. gularis.* In seven-striped specimens (23%) the middorsal stripe may be wavy or straight. In eight-striped specimens (77%) the two middorsal stripes may be distinctly separated, thinly divided or appear to be divided at intervals along their length. Two specimens were noted as having three middorsal stripes for a total of nine. The three available juveniles (32–56 mm) have medium gray to charcoal gray lower and upper lateral fields and charcoal gray dorsolateral fields, minute spots in all fields except the middorsal, grayish limbs with faint mottling, and a grayish-blue to bluish tail (Fig. 3). These three juveniles have weakly contrasting fields and stripes and differ strikingly from juveniles of *C. g. gularis.* Some topotypic adults have remnants of dark fields on the neck, perhaps indicating that some juveniles have darker fields than those available.

Adults of *C. g. pallidus* have little contrast between the fields and stripes except occasionally on the neck (Fig. 3). Many adults appear essentially unicolored at first glance; however, faint stripes usually become visible when a specimen is held horizontal to the line of vision. Only the largest adults lack faint stripes on the posterior part of the body. The low contrast between stripes and fields renders it is impossible to make the PV count in most adults. There is no evidence of a significant difference in the spacing of the paravertebral stripes of *C. g. pallidus* and *C. g. gularis.* In life, adults have gray, greenish-gray or grayish-tan fields. The hindlimbs are uniformly gray. Juveniles and small adults have faint spots in the upper lateral and dorsolateral fields and faint bars extending from the lower lateral fields to the upper lateral fields. With age these markings become indistinct. Approximately 58% of the adults examined had no evidence of spots.

Adults of *C. g. pallidus,* unlike adults of *C. g. gularis,* are not sexually dichromatic in the ventral pattern. The ventral surfaces of both males and females vary from white to grayish-white and bluish-white. Approximately 20% of all adults possessed distinct black spots in the throat and gular regions. No specimens of *C. g. gularis* with throat spots were observed.

Local variation in color pattern.—Only scattered specimens are available from localities other than the vicinity of the type locality, however, some remarks concerning local variations are in order. It appears that the essentially unicolored dorsal pattern obtains only at the type locality. Four adults from 21.7 km E Cuatro Ciénegas de Carranza have slightly more contrast

TABLE 2. COMPARISONS OF COLOR PATTERN IN JUVENILES AND ADULTS OF THREE SUBSPECIES OF *Cnemidophorus gularis*.

Character	*gularis*	*pallidus*	*semifasciatus*
Juveniles			
Fields	Black to blackish-brown	Pale gray to charcoal gray	Black to blackish-brown
Stripes	7–8 vivid, straight cream-yellow to yellowish-tan	7–9 pale, wavy, white to cream-white	7–8 distinct, paravertebrals, wavy, stripes grayish
Spots	Low count, minute, indistinct	Low count to essentially lacking	Small and distinct
Tail	Striped proximally, pinkish-tan distally	Not distinctly striped proximally, bluish distally	Stiped proximally, brownish-red distally
Adults			
Stripes	7–8 distinct (usually)	Barely visible	Slightly visible anteriorly
Fields	Black to medium brown	Gray, greenish-gray to pale grayish-tan	Stripes and fields partially to completely obscured by brown or tan
Spots and bars	Lower lateral and upper lateral fields barred, upper lateral and dorsolateral fields spotted	Faint bars laterally or not, spots indistinct to lacking	Faint to distinct bars, minute light spots
Throat	Salmon-red, unspotted, paler in females	White to bluish-white, occasionally spotted	Usually with black spots and orange suffusion
Chest	Bluish-black in males, immaculate in females	White to bluish-white	Bluish-gray with orange suffusion

between stripes and fields than specimens of comparable size from the vicinity of the type locality (Fig. 3). The specimens from 8 km SE Ocampo and 46.4 km W Cuatro Ciénegas de Carranza have darker fields on the neck than the average topotypic adult.

Size.—The available size data indicate that *C. g. pallidus* has a larger average body size than *C. g. gularis* (Table 4). The mean SVL of 35 adult males was 80.8 mm, whereas the mean SVL of 21 females was 74.4 mm. Sexual dimorphism in body size is indicated.

COMPARISON OF THE SUBSPECIES

Comparisons of scutellation data for *C. g. gularis* and *C. g. pallidus* indicate that the two subspecies can not be distinguished on the basis of any character or combination of characters of scutellation (Table 1), a point which supports the contention that they are conspecific. The only significant difference between the geographically adjacent samples of the subspecies involve OR means (Table 1, samples 13 vs. 16–17); however, the character is not diagnostic since the overlap in ranges of variation involves approximately 30% of the *C. g. gularis* and 66% of the *C. g. pallidus*. As in most polytypic species of the genus *Cnemidophorus*, the consistent distinguishing characters of the two are distinctive features of color and pattern. The two subspecies can be identified with 100% accuracy on the basis of the characters given in Table 2.

Cnemidophorus gularis gularis × *pallidus*
Figs. 4–5

Distributional relationships.—The Cuatro Ciénegas Basin (26°59′ North, 102°04′ West) is geographically well insulated from adjacent areas by formidable mountain ranges (Fig. 1). Several valleys and low mountain passes are potential dispersal corridors into the Basin. The corridor of concern in this study is followed by the highway from Monclova to Cuatro Ciénegas de Carranza. Two mountain passes are involved. Puerto Sacramento is located approximately 8 km W of Sacramento. All samples from the area between Monclova and Cuatro Ciénegas de

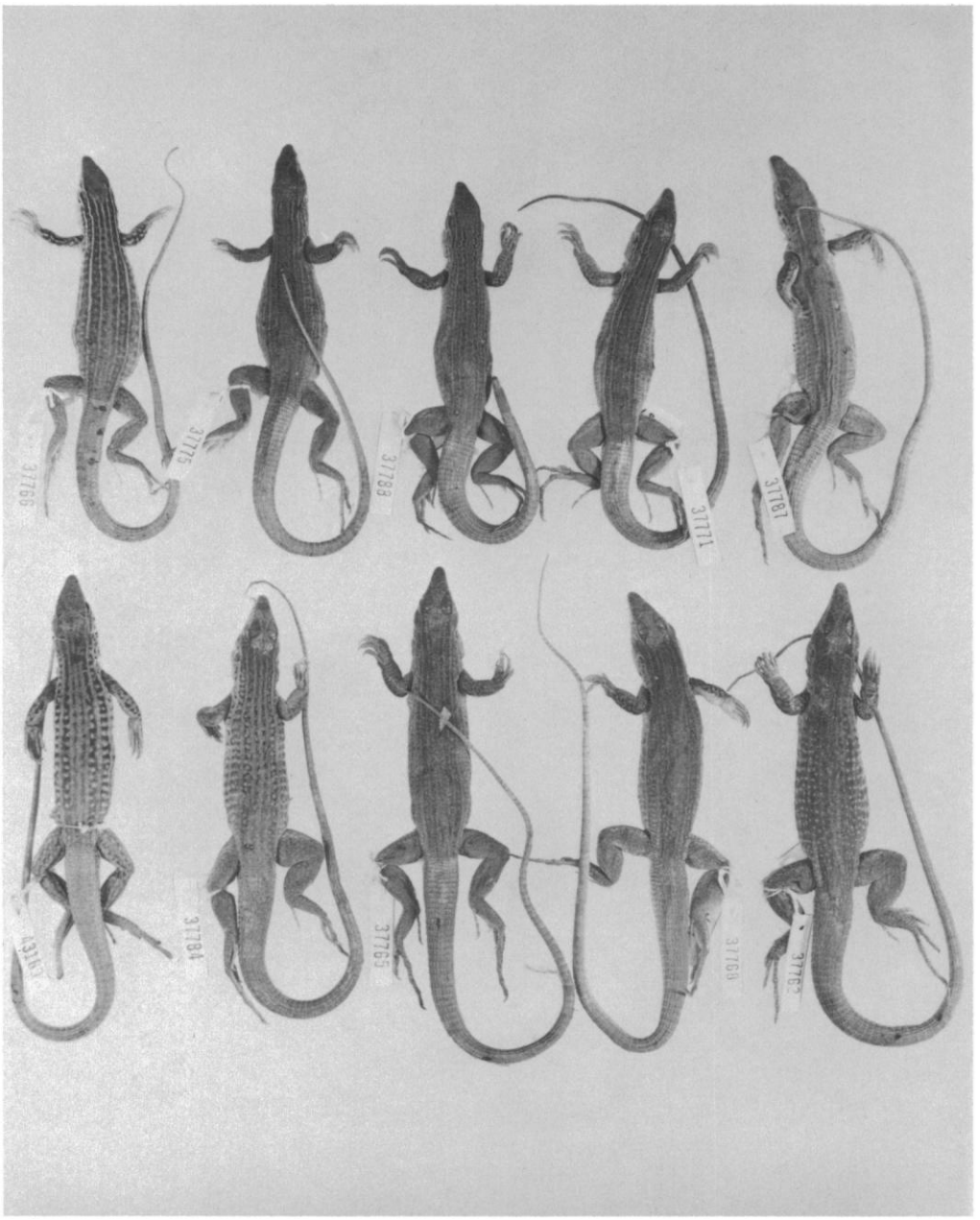

Fig. 4. Color pattern variation in *Cnemidophorus gularis gularis* × *pallidus*. Upper (l. to r.), UCM 37766, ♀—69 mm; UCM 37775, ♀—71 mm; UCM 37788, ♂—69 mm; UCM 37771, ♂—70 mm; UCM 37787, ♂—76 mm. Lower (l. to r.), CM 43169, ♂—74 mm; UCM 37784, ♂—73 mm; UCM 37765, ♂—79 mm; UCM 37768, ♂—76 mm; UCM 37762, ♂—85 mm. All specimens from 11.7 km W Sacramento.

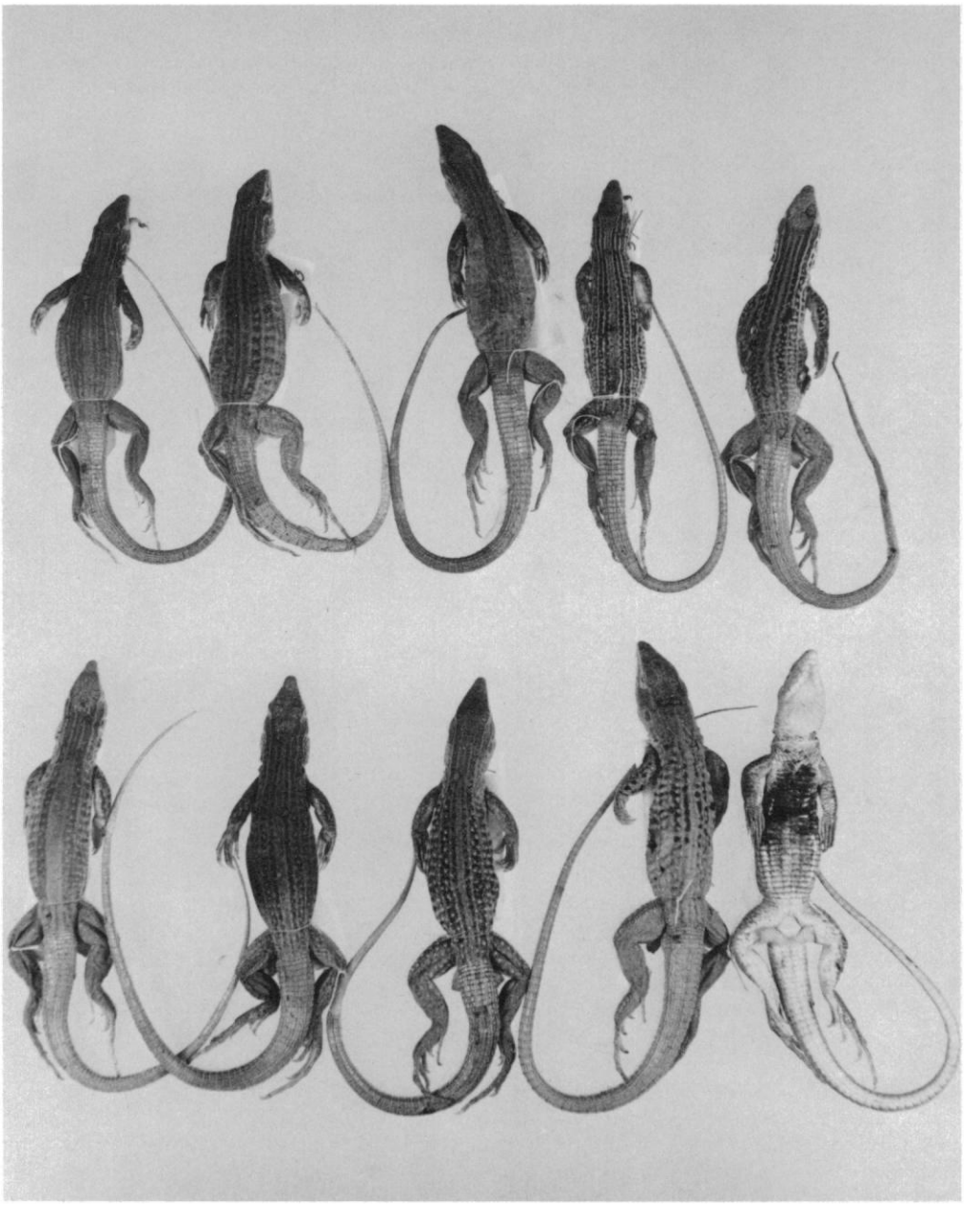

Fig. 5. Color pattern variation in *C. gularis gularis* × *pallidus*. Upper (l. to r.), TNHC 30742, ♀—66 mm; TNHC 30723, ♀—73 mm; TNHC 30371, ♂—80 mm; TNHC 30744, ♂—69 mm; TNHC 30736, ♂—74 mm. Lower (l. to r.), TNHC 30740, ♂—74 mm; TNHC 30738, ♂—76 mm; TNHC (?), ♂—78 mm; TNHC 30722, ♂—81 mm; TNHC 30722 (ventral). Specimens from 3.2 NNE to 11.0 km WNW Sacramento.

Carranza were collected during brief stops along the highway. The right-of-way along either side of the highway is heavily grazed by goats and cattle resulting in disturbed, sparsely vegetated habitat with patches of sandy substrate. The conspicuous vegetation in the area includes scattered mesquite trees, acacias, and various weeds. My experience in the area indicated that whiptails reach their greatest density in the disturbed areas adjacent to the highway.

C. g. gularis has a continuous distribution from Monclova to the vicinity of Sacramento. The westernmost localities for the subspecies in the principal study area are Agua del Carmen, 5.1 km E Sacramento (CM 43148–43158) and El Cariño, 3.8 km E Sacramento (CM 43147, 43159, 43161–43162). Three specimens from 3.2 km NNE Sacramento (TNHC 30722–30724), or 0.6 km W of the El Cariño locality have color pattern characteristics of both *C. g. gularis* and *C. g. pallidus,* presumably a result of secondary intergradation. The westernmost locality records for *C. g. gularis* place the subspecies slightly west of Puerto Sacramento (Fig. 1). All specimens from localities W of 3.2 km NNE Sacramento to 11.7 km W Sacramento are intermediate in color and pattern between *C. g. gularis* and *C. g. pallidus* (Figs. 4–5). At approximately 12.8 km W Sacramento, or 21.7 km E Cuatro Ciénegas de Carranza, the intergrade population is replaced by *C. g. pallidus.* The latter form is apparently distributed along the foothills, canyons, and arroyos of the Sierra del Muerto to the type locality in Cañon de la Agua, but is replaced in the southern part of the Basin by an unrecognized subspecies of *C. gularis* which enters the Basin along the basal slopes of the Sierra de San Marcos (Fig. 1).

The present patterns of distribution of *C. g. gularis,* the intergrades, and *C. g. pallidus* suggest that the latter subspecies differentiated in the isolation of the northern rim of the Cuatro Ciénegas Basin. Evidence that the Basin has been isolated can be seen in the highly endemic fish and invertebrate fauna and the presence of an isolated population of *C. inornatus* Baird. *C. g. gularis,* which is much more widely distributed and ecologically flexible, is apparently the invader, having established contact with the isolated *C. g. pallidus* through Puerto Sacramento. The data summarized in the following sections indicate that the two forms are not reproductively isolated. Both parental phenotypes have been essentially swamped in the area between 3.2 km NNE and 11.7 km W Sacramento. I regard the present situation as evidence of secondary contact and intergradation between subspecies rather than hybridization between species.

Scutellation.—The geographically closest samples of *C. g. gularis, C. g. pallidus,* and the samples of intergrades do not differ significantly in GAB, FP, SDL, COS, LSG, MS, PV or PV/GAB counts (Table 1). The samples of intergrades are intermediate in OR counts, the only significant difference in scutellation between the geographically closest samples of the two subspecies.

Color pattern.—Subspeciation in *C. g. gularis* and *C. g. pallidus* has primarily involved divergence in color and pattern. "Typical" specimens of the two subspecies have distinctly different color patterns from hatchling through adulthood. The bluish-black chest coloration in males of *C. g. gularis* is a particularly useful phenotypic marker in detecting the genetic influence of the subspecies. Thus, not surprisingly, the specimens from the zone of contact display all degrees of intermediacy between the *gularis*-type and *pallidus*-type color pattern (Figs. 4–5). Because of this unusual variation, the samples from the several closely spaced localities are treated separately.

Coahuila: 3.2 km NNE Sacramento (TNHC 30722–30724): Collected within 0.6 km of "typical" *C. g. gularis,* this sample includes one juvenile female (TNHC 30724, SVL 48 mm), one adult female (TNHC 30723, SVL 74 mm), and one adult male (TNHC 30722, SVL 81 mm). The juvenile has a faint gray suffusion in the centers of the black fields, seven distinct stripes, and faint spots. It differs from the average juvenile of *C. g. gularis* only in having slightly paler fields. The female has a somewhat faded dorsal pattern consisting of brown fields, faint stripes, and diffuse spots. Although this female has less contrast between the fields and stripes than the average female of *C. g. gularis,* it is closer to this form than to *C. g. pallidus.* The adult male has eight very faint stripes and remnants of a black ground color which is all but obscured by a grayish-tan coloration. The hindlimbs and tail are uniformly colored. The anterior part of the chest has a bold bluish-black

TABLE 3. COMPARISONS OF COLOR AND PATTERN IN SAMPLES 8–11 (N = 23) AND SAMPLE 13 (N = 15) OF *C. gularis gularis*, SAMPLE 14 (N = 17) AND SAMPLE 15 (N = 28) OF *C. gularis gularis* × *pallidus*, AND SAMPLE 17 (N = 57) OF *C. gularis pallidus*. Locality data for samples are the same as in Table 1.

Character	*gularis*	*gularis*	*gularis* × *pallidus*	*gularis* × *pallidus*	*pallidus*
Seven stripes	12 (52%)	12 (80%)	6 (35%)	11 (39%)	13 (23%)
Eight or more	11 (48%)	3 (20%)	11 (65%)	17 (61%)	43 (77%)
PV ($\bar{x}$)	13.9	12.5	14.7	14.1	14.1
PV/GAB ($\bar{x}$)	16.3	14.9	17.8	17.2	17.3
Stripes straight	20 (87%)	10 (67%)	9 (53%)	13 (46%)	10 (18%)
Stripes irregular anteriorly	3 (13%)	5 (33%)	8 (47%)	15 (54%)	47 (82%)
Stripes at base of tail	3 (13%)	1 (6%)	12 (71%)	15 (54%)	57 (100%)
Stripes on tail	20 (87%)	14 (94%)	5 (29%)	13 (46%)	— (0%)
Distinct spots	23 (100%)	15 (100%)	16 (94%)	21 (75%)	24 (42%)
No spots	— (0%)	— (0%)	1 (6%)	7 (25%)	34 (58%)
Mottled hindlimbs	23 (100%)	14 (94%)	9 (53%)	10 (36%)	— (0%)
Uniformly pigmented hindlimbs	— (0%)	1 (6%)	8 (47%)	18 (64%)	57 (100%)

suffusion. The dorsal pattern of the adult male closely resembles that of *C. g. pallidus*, whereas the ventral pattern is more like that of *C. g. gularis*. In total ensemble of color pattern characteristics the specimen is intermediate between the two subspecies.

Coahuila: 2.6 km NNW Sacramento (UCM 37758): The adult male (SVL 82 mm) from this locality has brown fields, seven sharply contrasting stripes, and distinct bars and spots. Although the dorsal pattern is similar to an average male *C. g. gularis*, the ventral pattern resembles that of *C. g. pallidus* in lacking a dark suffusion.

Coahuila: 3.2 km WNW Sacramento (TNHC 30729–30731): This sample includes one juvenile (TNHC 30729, SVL 50 mm), one adult female (TNHC 30731, SVL 81 mm), and one adult male (TNHC 30730, SVL 83 mm). The female has pale brownish-tan fields and eight very faint stripes, and is essentially intermediate between the two subspecies. The adult male, also intermediate in color pattern, has little contrast between the fields and stripes and only a faint suffusion of bluish on the chest.

Coahuila: 8.0 km WNW Sacramento (TNHC 30732–30733): This sample includes one adult female (TNHC 30733, SVL 72 mm) and one adult male (TNHC 30732, SVL 72 mm). The female is intermediate in color pattern between the two subspecies. The male has a faded dorsal pattern and only a faint bluish tinge on the chest.

Coahuila: 11.0 km WNW Sacramento (TNHC 30735–30746): This sample includes two juveniles (TNHC 30745–30746), four adult females (TNHC 30741–30744), and six adult males (TNHC 30735–30740). The juvenile male (SVL 46 mm) has blackish fields, eight distinct stripes, minute spots in the fields, broken stripes anteriorly, indistinct light areas in the fields and a faintly striped tail. The juvenile male resembles *C. g. gularis*, whereas the juvenile female is closer to *C. g. pallidus*. Among the females, TNHC 39744 (SVL 69 mm) has the typical *C. g. gularis* pattern, TNHC 39742 (SVL 66 mm) has a pattern much like that of *C. g. pallidus*, and TNHC 30741 and 30743 (SVLs 76 mm) are intermediate between the two. Three of the adult males (TNHC 30737, 30739–30740, SVLs 73–74 mm) have gray to grayish-tan fields, indistinct stripes and no trace of a dark ventral suffusion. TNHC 30737 has the typical *C. g. pallidus* color pattern, TNHC 30739–30740 have the appearance of very faded *C. g. gularis*. The three additional males in the sample (TNHC 30735–30736, 30738, SVLs 74–79 mm) have more contrast between the fields and stripes, however, only one specimen has the bluish-black chest suffusion of *C. g. gularis*.

Coahuila: 11.7 km W Sacramento (CM 43169, UCM 37762–37789): This sample includes 8 adult females and 21 adult males. All specimens were examined while alive or shortly after being killed. In life the lateral stripes were pale cream, the dorsolateral stripes were pale cream-yellow to tan with an orange cast, the paravertebral stripes were dull yellowish-tan

and the middorsal stripes were pale yellowish-tan. In life, the colors of the stripes were closer to those of *C. g. gularis*. The fields ranged from brown in a minority of specimens to grayish-tan in the majority (Fig. 4). Most specimens (75%) had white, pale yellow or pale tan spots in the fields. The forelimbs varied from blackish-brown to pale brown with grayish-tan spots. The hindlimbs varied from blackish-brown and brown with grayish-tan mottling to uniformly grayish-tan. The tail varied from grayish-brown to grayish-tan with an orange cast. Three males had faint suffusions of dark blue around the edges of the chest scales and one male had small black throat spots. All others were white, grayish-white or bluish-gray on the postcephalic ventral surfaces. Several of the largest males had faint traces of a salmon coloration on the throat.

The specimens from 11.7 km W Sacramento exhibit the full range of color pattern characteristics between *C. g. gularis* and *C. g. pallidus* (Fig. 4). In life, 11 of 21 males had brown fields anteriorly that contrasted sharply with the stripes. In several specimens of this group the fields changed to grayish-tan posteriorly and the stripes were indistinct. A second group of males (10 of 21) had pale grayish-tan fields from the occipital region to the base of the tail. In this group, the colors of the fields and stripes were so closely matched that the stripes were only faintly visible (Fig. 4). The division of the males into two groups is arbitrary since there are gradations between the two types. In general, however, the first group is closer to *C. g. gularis* in the dorsal pattern, but all lack a dark ventral suffusion. The second group closely resembles *C. g. pallidus* dorsally in having faded patterns; however, there is a consistent, if subtle, difference in the shading of the dorsal colors. Size data indicate that the faded pattern is partly related to size, or age. Specimens that retain a contrasting pattern average smaller (69.9, 67–79, N = 11) than specimens with faded patterns (75.4, 63–75, N = 10). However, ontogenetic variation only partly accounts for the difference between the two groups. A number of pairs of males of almost identical size have strikingly different color patterns, and probably had different juvenile patterns.

That the specimens possess characteristics of both adjacent subspecies can be demonstrated by employing the geographically closest samples of *C. g. gularis* and *C. g. pallidus*. Adult intergrades from this locality include 11 seven-striped specimens, 14 eight-striped specimens, 1 eight-plus-striped specimen, 1 ten-striped specimen and 1 eleven-striped specimen. These data indicate that the intergrades are more variable in stripe number than either subspecies (Table 3). A correlation exists between stripe number and PV separation. Seven-striped specimens have a mean PV separation of 13.6 (11–15, N = 16). Only 20% of the seven-striped specimens have a PV separation that exceeds 13, whereas only 13% of the specimens with eight or more stripes have PV separations that fall below 14. No such correlation exists between stripe number and GAB values (81.7 vs. 82.6). Finally, there is evidence of a correlation between stripe number and the character of the stripes. Seven-striped specimens tend to have straight-margined stripes more frequently (63%) than irregular stripes, whereas specimens with eight or more stripes have irregular stripes more frequently (65%) than straight-margined stripes.

Comparisons

Zweifel (1962) studied a zone of contact between *C. tigris gracilis* and *C. tigris marmoratus* in Hidalgo County, extreme southwestern New Mexico. In this region *C. t. gracilis* approaches the Peloncillo Mountains from the west and *C. t. marmoratus* approaches the mountains from the east. Zweifel mentioned several passes in which he found both subspecies and hybrids. Since the hybrids exhibited all gradations between the two subspecies, it was assumed that there had been no reduction of reproductive capabilities in the hybrids. The physiographic setting of Zweifel's study area in New Mexico is not unlike my study area in Coahuila. In both instances contact between subspecies has been established in disturbed habitats. There is also a difference in the situations. Zweifel (1962) found both subspecies as well as hybrids in his study area, and in one instance the zone of subspecies overlap involved no more than 1.5 km. All specimens in the zone of intergradation near Sacramento exhibited the genetic influence of both *C. g. gularis* and *C. g. pallidus*.

Cnemidophorus gularis semifasciatus Cope
Fig. 6

Cnemidophorus gularis semifasciatus Cope 1892.

Type specimen.—According to Duellman and Zweifel (1962), "U.S.N.M. No. 9248 collected

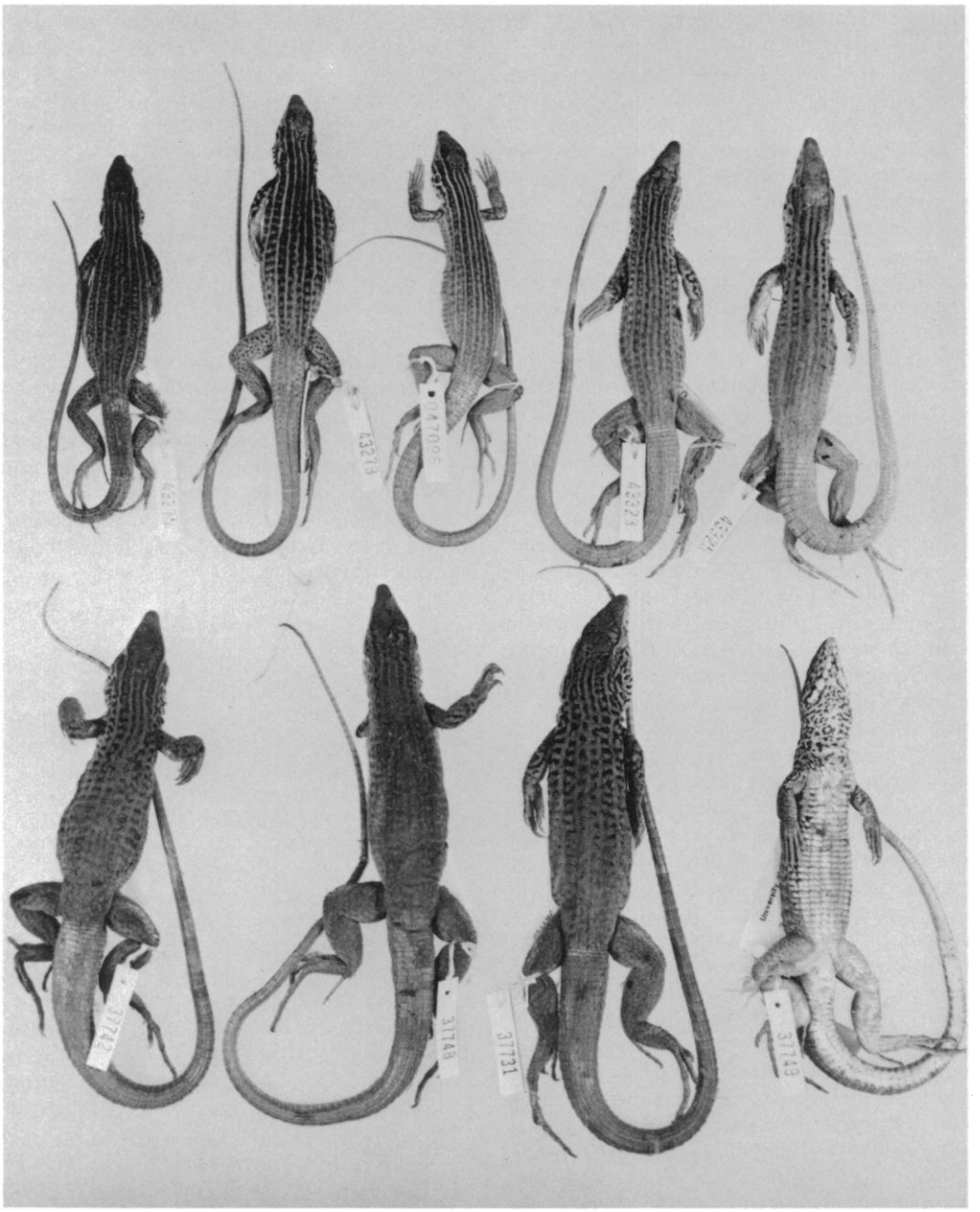

Fig. 6. Upper (l. to r.), *Cnemidophorus gularis* subsp. (Cuesta la Muralla, CM 43275, ♀—70 mm; CM 43278, ♂—74 mm) and *C. gularis pallidus* × *C. gularis* subsp. (16 km S Cuatro Ciénegas, KU 47097, ♂—76 mm; 40 km S Cuatro Ciénegas, CM 43323, ♂—83 mm; CM 43325, ♂—88 mm). Lower (l. to r.), *C. gularis semifasciatus*, UCM 37742, ♂—85 mm; UCM 37748, ♂—86 mm; UCM 37731, ♂—93 mm; UCM 37749, ♂—90 mm, all 12.1–25.6 km N Saltillo.

by Lieutenant Couch at Agua Nueva, Coahuila, México, is listed by Burt (1931a, p. 100) and Smith and Taylor (1950b, p. 184) as the type specimen, though Cope did not specify a type and also examined and referred to U. S. N. M. No. 3033 in the original description. The latter specimen was collected by Lieutenant Couch at Patos, Coahuila."

Distribution.—Southern Coahuila and adjacent parts of Nuevo León and Zacatecas.

Specimens examined.—Samples are presented on the basis of geographical relationships. Mexico: Coahuila (N = 92): 12.1 km N Saltillo (UCM 37731–37732), 20.3 km N Saltillo (UCM 37737–37742), 25.6 km N Saltillo (UCM 37743–37749), 28.1 km N Saltillo (UCM 37733–37736), 75.2 km N Saltillo (CM 43326–43327), 24 km W Saltillo (AMNH 72248), 32 km W Saltillo (AMNH 67361–67362), 34.7 km W Saltillo (KU 29352–29356), 12.8 km SW Saltillo (TNHC 30145), 6.4 km E Arteaga (TNHC 30149–30150), 3.2 km W Arteaga (AMNH 77225–77231), 1.6 km S Agua Nueva (TNHC 30130–30137), 12.8 km S Cañeros (TNHC 30140–30141), Coahuila, 38.4 km NE Concepción del Oro, Zacatecas (TNHC 30223–30226), 6.4 km NW General Cepeda (AMNH 77223), 16 km S, 8 km W General Cepeda (KU 37574–37591), Parras de la Fuente (KU 39460–39471, 44713), arroyo, 0.8 km S Parras de la Fuente (CM 59446–59448), 3.2 km W Parras de la Fuente (AMNH 77286–77287), 17.6 km N Zapata (UIMNH 44654–44655), 23 km SE Viesca, road to Ahuichila (CM 59472).

Nuevo León (N = 6): 1.3 km E Casa Blanca (UCM 37726–37730), 40 km S Santa Catarina (TU 16502).

Zacatecas (N = 8): 9.6 km NNE Concepción del Oro (TNHC 30218), 17.6 km NE Concepción del Oro (TNHC 30302–30308).

Scutellation.—*C. g. semifasciatus* has 4-4 supraocular scales, enlarged and plate-like postantebrachial scales, abruptly enlarged mesoptychial scales, and supraorbital scales that extend anteriorly to the midpoints of the third supraocular scales. Mean ranges, ranges of variation, and numbers of specimens examined for each quantitative character are: 82.6–95.4 (70–108, N = 86) GAB, 200.0–216.8 (173–239, N = 46) OR, 35.7–39.4 (30–45, N = 86) FP, 31.8–34.0 (29–36, N = 46) SDL, 9.3–15.5 (8–21, N = 41) COS, 15.8–19.1 (10–32, N = 43) LSG, 14.1–15.6 (12–20, N = 45) MS, 12.1–21.5 (5–26, N = 19) PV, 13.4–21.5 (6.3–24.0, N = 19) PV/GAB (OR, SDL, COS, LSG and MS data of sample 25, Table 1 excluded). In reference to this subspecies, Duellman and Zweifel (1962) remarked, "The small sample of *semifasciatus* has a surprisingly wide range in the number of granules around midbody: 74–100 in seven specimens from a single locality near Arteaga, and 74 to 110 for the whole sample of 14 specimens. The spacing of the paravertebral stripes also varies widely." The trends noted by the authors in the small samples available to them are verified by the data presented in this study. The data presented in Table 1 provide evidence that there is variation between localities in the subspecies (sample 30 scale data excluded).

Color pattern.—Most juveniles of this subspecies have a black to blackish-brown ground color except near the base of the tail where the color changes to light brown. There are six primary stripes and one or two less distinct middorsal stripes. The gray to greenish-gray lateral stripes originate under the orbits and terminate at the hindlimbs, the greenish-gray dorsolateral stripes originate on the superciliary scales and terminate on the base of the tail and the grayish paravertebral stripes originate on the parietal scales and terminate at the base of the tail. The paravertebral stripes are narrower and more undulant than the lower pairs of stripes. The middorsal stripes are quite undulant and often touch the paravertebral stripes and may blend with the light brown ground color on the rump. Even small specimens tend to develop the faded rump pattern characteristic of adults. The upper lateral and dorsolateral fields of all specimens are spotted anteriorly and may be barred posteriorly. The forelimbs are black with grayish-tan spots; the hindlimbs are black with an extensive mottling of tan. A faint suffusion of orange was noted on the throat of several freshly killed juveniles.

Adults are quite variable in appearance, however, certain features of color and pattern are common to all specimens (Fig. 6). The head is brownish-tan dorsally, and mottled with black laterally. Most specimens retain some indication of the stripes and blackish ground color anterior to the forelimbs. The dorsal pattern is usually abruptly differentiated at or slightly posterior to the forelimbs. Posterior to the forelimbs the dorsum changes to a faded brown coloration middorsally and a lighter grayish-brown laterally. Small grayish spots are present in the middorsal region and faint vertical barring appears along the sides. Isolated patches of the dark fields may persist posteriorly. Some specimens have a faded pattern over the entire dorsum and strongly resemble *C. g. pallidus*. The tail coloration in adults varies from brown to brownish-tan.

All males had an orange suffusion on the chin, throat, anterior part of the chest, preanal scales, and ventral surfaces of the hindlimbs. Females had the orange suffusion restricted to the chin and throat. About 50% of the adult males examined had scattered black spots on the throat, varying in size from a few black

TABLE 4. COMPARISON OF SNOUT-VENT LENGTH DATA FOR ADULT SPECIMENS OF THREE SUBSPECIES AND INTERGRADES OF *Cnemidophorus gularis*.

Taxon		mm 50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96–100	$\bar{x}$	N
C. gularis gularis	♀	1	–	–	–	–	2	2	–	–	6	6	5	3	3	2	–	–	–	–	–	–	–	–	–	70.3	30
	♂	–	1	–	1	–	–	1	4	4	5	4	9	9	5	4	5	1	–	–	–	–	1	–	–	73.3	54
C. gularis gularis × *pallidus*	♀	–	–	–	–	–	–	1	1	2	1	2	1	–	1	1	1	–	–	–	–	–	–	–	–	70.1	11
	♂	–	–	–	–	–	–	–	1	1	4	1	4	7	4	1	3	1	2	–	–	–	–	–	–	73.2	29
C. gularis pallidus	♀	–	–	–	–	1	–	–	1	1	3	–	6	–	1	–	2	3	2	1	–	–	–	–	–	74.4	21
	♂	–	–	–	–	–	–	–	1	1	1	2	1	1	3	3	3	3	8	2	3	2	–	1	–	80.8	35
C. gularis semifasciatus	♀	–	–	–	1	1	1	–	–	–	2	–	3	–	3	2	1	3	–	1	2	1	–	1	–	80.5	22
	♂	–	–	–	1	–	1	–	–	–	–	1	1	–	–	4	2	–	–	3	–	3	4	4	5	85.9	29

scales to several dozen black scales. This appears to be a polymorphic character and the absence of spots is usually correlated with a dorsal pattern in which the dark ground color is almost totally obscured by brown pigment. Sexual dimorphism in *C. g. semifasciatus* is subtle. Females retain slightly more evidence of the stripes and dark fields anteriorly and develop lateral bars and a wide middorsal band by expansion of the paravertebral and middorsal stripes more frequently than males. Females have the orange coloration limited to the chin and throat.

Size.—Data for 51 adults indicate that *C. g. semifasciatus* attains a body size in excess of 90 mm in SVL more frequently than *C. g. gularis* and *C. g. pallidus* (Table 4). The mean SVL of 29 adult males was 85.9 mm, whereas the mean SVL of 22 females was 80.5 mm.

Comparisons with other subspecies.—I concur with Duellman and Zweifel (1962) that *C. g. semifasciatus,* as known from the localities cited, is sufficiently differentiated from *C. g. pallidus* for subspecific recognition (Table 2). Although *C. g. semifasciatus* trends toward higher values for most characters of scutellation, the differences are statistical rather than diagnostic. In features of color and pattern, *C. g. semifasciatus* is more similar to *C. g. pallidus* than to *C. g. gularis,* however, all available specimens can be distinguished on the basis of the characters given in Table 2. Two specimens from 36.8 km S Viesca, road to Ahuichila (CM 59473–59474) are intermediate between *C. g. semifasciatus* and a new subspecies described in the following paper in this issue (Walker, 1981).

Distributional relationships.—The area between the ranges of *C. g. gularis* and *C. g. pallidus* in central Coahuila and *C. g. semifasciatus* in southern Coahuila is poorly understood. All available specimens are from localities along Mexican Highway 57 from Monclova to Saltillo in southeastern Coahuila and from along Highway 30 from Cuatro Ciénegas de Carranza to San Pedro de las Colonias in southwestern Coahuila. Duellman and Zweifel (1962) tentatively allocated specimens from within this area, namely Las Delicias (AMNH 67392–67396 + 8 untagged), 57.6 km S Castaños (AMNH 77294–77300), 16 km S Cuatro Ciénegas de Carranza (KU 47091–47097), to *C. septemvittatus septemvittatus* Cope (type locality Marfa, Presidio Co., Texas). Studies of several of these specimens indicate that KU 47091–47097 are intergrades between *C. g. pallidus* and an unrecognized form of *C. gularis* which enters the southern part of the Cuatro Ciénegas Basin along the basal slopes of the Sierra de San Marcos (Fig. 1). *C. gularis* subsp. is not distinguishable from the *gularis-pallidus-semifasciatus* complex on the basis of scutellation, however, it is easily distinguished from each of these subspecies by features of color and pattern. The primary distinguishing characters of *C. gularis* subsp. in southcentral Coahuila are: no bluish-black ventral suffusion in either sex; retention of a dorsal pattern of distinct stripes, blackish fields, and distinct spots; and presence of black spots and/or dusky markings on the chin and throat (Fig. 6). Additional specimens which exhibit these characters are: 8.8–20 km SW Cuatro Ciénegas de Carranza (ASU 5070, 5495; UMMZ 125851; CM 48282, 48364, 51150, 51157, 51165, 51168, 51174, 51178–51181); 10 km S

Castaños (UCS 37756); 35–51 km S Castaños (TNHC 30261–30265); 68.3 km S Monclova, Cuesta la Muralla (CM 43274–43280); 43.2 km N San Pedro de las Colonias (CM 59439, 59440 (6), 59443 (7); 1.6 km W Las Delicias (CM 59444 (6).

It seems appropriate to restrict the name *septemvittatus* to populations in the Big Bend region of Texas and adjacent parts of Coahuila and Chihuahua. Although no contact zones are presently known for *septemvittatus* and other forms of *C. gularis,* there seems little doubt that the nomenclatural combination *C. gularis septemvittatus* reflects the true systematic relationships of the taxon. *C. g. septemvittatus* cannot be distinguished from the other subspecies of *C. gularis* on the basis of qualitative or quantitative characters of scutellation (Table 1), however, the subspecies is readily distinguished by features of color and pattern.

Coahuila: 16 km S Cuatro Ciénegas de Carranza (KU 47091–47097): This series, which was previously allocated to *C. s. septemvittatus* by Duellman and Zweifel (1962), includes three juveniles and four small adults. The juveniles differ from "typical" *C. g. pallidus* in having strongly contrasting patterns of light stripes and blackish fields, but are similar to *C. g. pallidus* in having spots and stripes of similar character. The four small adults retain greater contrast between the fields and stripes anteriorly than *C. g. pallidus*; however, the pattern on the posterior part of the dorsum in each specimen is very similar to that seen in *C. g. pallidus* (Fig. 6). The specimens in the KU series exhibit characteristics which might be expected in intergrades of *C. g. pallidus* and *C. gularis* subsp. of southcentral Coahuila. Scutellation data for the series are summarized in Table 1.

Coahuila: 40 km S Coahuila (CM 43323–43325): Included are two adult males of 83 mm (CM 43323) and 88 mm (CM 43325) and one adult female of 74 mm (CM 43324). The specimens have 75–84 GAB, 171–188 OR, 35–37 FP, 30–31 SDL, 9–11 COS, 16 LSG, 14–16 MS, 7–11 PV and 15.2–16.0 PV/GAB. Two specimens have seven straight-edged stripes; one specimen has eight stripes (split vertebral). From the neck patterns it is apparent that each specimen had a juvenile pattern of black fields and light stripes. Although the stripes are visible on the neck in each specimen, the stripes and fields are largely obscured posteriorly by grayish to brownish pigment. Were it not for the remnants of black fields anteriorly, the specimens might be allocated to *C. g. pallidus,* however, in total ensemble of characters they are intermediate between *C. g. pallidus* and *C. gularis* subsp. (Fig. 6).

Discussion

The name *C. g. gularis* is here applied to lizards in parts of Oklahoma, New Mexico and Texas, and parts of Coahuila, Nuevo León, San Luis Potosí, Tamaulipas, Veracruz, and Hidalgo in México. The nominal form occurs over an extensive latitudinal range which includes regions in southern temperate latitudes from southern Oklahoma in the United States southward to habitats with tropical characteristics in Tamaulipas and Veracruz; from the foothills of the Sierra Madre Oriental to the eastern Gulf Coast of México. Approximately 1,000 specimens from many localities in addition to those cited have been examined. Significant variation occurs between populations, perhaps reflecting different selective pressures in diverse habitats. Specimens from northern localities such as Denton, Texas, reach a significantly larger SVL and body volume than specimens from southern Texas and México. GAB means vary from the 70s to the 90s along with variation in other scutellation characters. There is also variation in color and pattern, however, this variation is within a pattern that has only rarely led to misidentifications in museum collections. The distribution of *C. g. gularis* involves zones of contact and gene exchange with populations previously allocated to *C. septemvittatus* by Duellman and Zweifel (1962) near Cuatro Ciénegas de Carranza, Coahuila, and in areas to the south which will be analyzed elsewhere. In each of the zones of contact there appears to be a complete lack of reproductive isolation, conclusively pointing to subspecific relationships and necessitating reallocation of populations of *scalaris*-like lizards to *C. gularis.*

In contrast to the nominal subspecies, *C. g. pallidus* is geographically restricted and highly localized in distribution. This subspecies is restricted to mesic canyons and arroyos along the northern rim of the Cuatro Ciénegas Basin. About half of the specimens employed in this study were collected in the immediate vicinity of the type locality 4.8–8 km N village of Cuatro Ciénegas de Carranza by C. J. McCoy, Jr., and A. V. Bianculli 7–30 June 1966. Even with intensive collecting only 38 specimens were captured. The subspecies is marginally sympatric

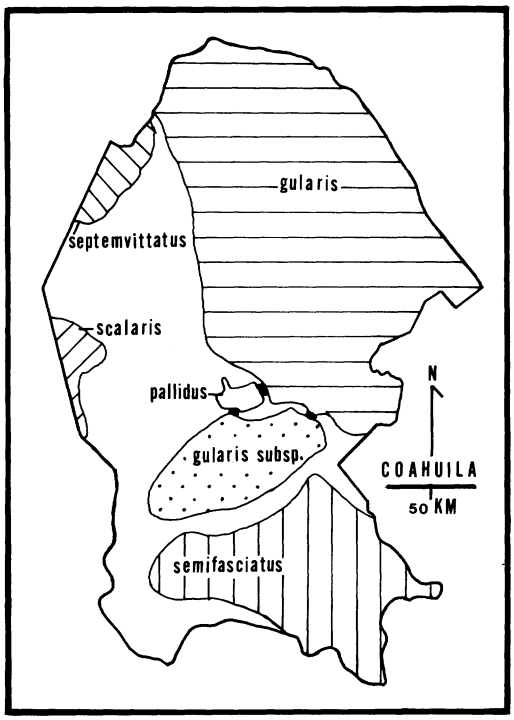

Fig. 7. Approximations of the distribution areas of five subspecies of *Cnemidophorus gularis* in Coahuila based upon available locality data. Solidly shaded areas are zones of intergradation between adjacent subspecies. Apparent disjunctions probably reflect areas inaccessible to conventional transportation.

with *C. tigris marmoratus* which is much more numerous and widely distributed in the Basin, with a total of 104 specimens collected 7–30 June 1966 by McCoy and Bianculli. Collecting data indicate that *C. g. pallidus* exists in numbers which would lead one to consider it rare. Based upon specimens from east, north, west and south of the type locality it is apparent that the geographic range of the subspecies is small. Gene exchange with *C. g. gularis* occurs 22.2 km E Cuatro Ciénegas de Carranza, whereas specimens from immediately south of the type locality exhibit characteristics one would expect in intergrades of *C. g. pallidus* × *C. gularis* subsp. A specimen from 35.2 km NNW Cuatro Ciénegas (KU 38296), in the same canyon system as the type locality, marks the northernmost locality for the subspecies. Two specimens from 46.4 km W Cuatro Ciénegas de Carranza (UIMNH 56989–56990) represent the westernmost locality for *C. g. pallidus*. Specimens from Sierra Mojada (KU 38299–38304) immediately west of the previous locality are a part of the *scalaris*-like whiptail complex of Chihuahua, Durango, and extreme western Coahuila.

C. g. semifasciatus occupies rugged arroyos, canyons, and desert scrub from south of Cuesta la Muralla to Saltillo, thence west to the vicinity of Zapata and Viesca and adjacent parts of Nuevo León and Zacatecas. Although *C. g. semifasciatus* occurs over a much larger geographic area than *C. g. pallidus* (Fig. 7), field data indicate that it occurs in low population densities in contrast to the more numerous sympatric *C. inornatus*. *C. g. semifasciatus* is subspecifically related to *scalaris*-like populations in eastern Durango. In most of Zacatecas *C. g. semifasciatus* is replaced by a distinctive form which is described concurrently (Walker, 1981). Fig. 7 depicts the known distribution areas of five subspecies of *C. gularis* in Coahuila.

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Literature Cited

Anderson, J. D., and W. Z. Lidicker. 1963. A contribution of our knowledge of the herpetofauna of

the Mexican state of Aguascalientes. Herpetologica 19:40–51.

BAIRD, S. F., AND C. GIRARD. 1852. Characteristics of some new reptiles in the museum of the Smithsonian Institution. Part 2. Proc. Acad. Nat. Sci. Philadelphia, pp. 125–128.

BAKER, R. H., R. G. WEBB AND P. DALBY. 1967. Notes on reptiles and mammals from southern Zacatecas. Amer. Midl. Nat. 77:223–226.

BURT, C. E. 1931. A study of the teiid lizards of the genus *Cnemidophorus* with special reference to their phylogenetic relationships. U.S. Natl. Mus. Bull. 154.

CONANT, R. 1975. A field guide to reptiles and amphibians of eastern and central North America. Houghton Mifflin Co., Boston, Mass.

COPE, E. D. 1892. A synopsis of the species of the teiid genus *Cnemidophorus*. Trans. Amer. Phil. Soc. 17:27–52.

DIXON, J. R., C. S. LIEB AND C. A. KETCHERSID. 1971. A new lizard of the genus *Cnemidophorus* from Queretaro, Mexico. Herpetologica 27:344–354.

DUELLMAN, W. E., AND R. G. ZWEIFEL. 1962. A synopsis of the lizards of the *sexlineatus* group (genus *Cnemidophorus*). Bull. Amer. Mus. Nat. Hist. 123:155–210.

MASLIN, T. P., AND J. M. WALKER. 1973. Variation, distribution and behavior of the lizard, *Cnemidophorus parvisocius* Zweifel (Lacertilia: Teiidae). Herpetologica 29:128–143.

SMITH, H. M., AND E. H. TAYLOR. 1950. An annotated checklist and key to the reptiles of Mexico exclusive of the snakes. U.S. Natl. Mus. Bull. 199.

STEBBINS, R. C. 1966. A field guide to western reptiles and amphibians. Houghton Mifflin Co., Boston, Mass.

WALKER, J. M. 1966. Morphological variation in the teiid lizard *Cnemidophorus gularis*. Unpubl. PhD Dissertation, University of Colorado, Boulder.

———. 1981. Systematics of *Cnemidophorus gularis*. II. Specific and subspecific identity of the Zacatecas Whiptail (*Cnemidophorus gularis semiannulatus*). Copeia 1981:850–868.

ZWEIFEL, R. G. 1959. Variation in and distribution of lizards of western Mexico related to *Cnemidophorus sacki*. Bull. Amer. Mus. Nat. Hist. 117:57–116.

———. 1961. Relationship of two whiptail lizards (genus *Cnemidophorus*) in western Mexico. Copeia 1961:98–103.

———. 1962. Analysis of hybridization between two subspecies of the desert whiptail lizard, *Cnemidophorus tigris*. Copeia 1962:749–766.

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Literature Cited

Notes on Reptiles and Mammals from Southern Zacatecas

Rollin H. Baker; Robert G. Webb; Peter Dalby

American Midland Naturalist, Vol. 77, No. 1. (Jan., 1967), pp. 223-226.

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E. D. Cope

Transactions of the American Philosophical Society, New Ser., Vol. 17, No. 1. (1892), pp. 27-52.

Stable URL:

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Copeia, Vol. 1981, No. 4. (Dec. 29, 1981), pp. 850-868.

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