

A SYNOPSIS OF THE LIZARDS
OF THE *SEXLINEATUS* GROUP
(GENUS *CNEMIDOPHORUS*)

WILLIAM E. DUELLMAN
AND
RICHARD G. ZWEIFEL

BULLETIN
OF THE
AMERICAN MUSEUM OF NATURAL HISTORY
VOLUME 123 : ARTICLE 3 NEW YORK : 1962

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AMERICAN MUSEUM OF NATURAL HISTORY
VOLUME 123 : ARTICLE 3
NEW YORK : 1962

BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY

Volume 123, article 3, pages 155–210, text figures 1–10,
plates 24–31, tables 1–6

Issued February 26, 1962

Price: \$1.50 a copy

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INTRODUCTION

MEMBERS OF THE teiid genus *Cnemidophorus* are among the most abundant and conspicuous lizards throughout the southwestern United States, México, and parts of northern Central America. One species group, *lemniscatus*, occurs in South America and Central America, and four other groups are found in the United States, México, and northern Central America. Of these, the *hyperythrus* group is composed of one species represented by six subspecies inhabiting extreme southern California, the peninsula of Baja California, and adjacent islands (Smith and Taylor, 1950b, p. 186). The *tessellatus* group contains six species inhabiting the western United States from Idaho and Oregon southward through Baja California, including the adjacent islands, and western Texas to southern Coahuila, Chihuahua, Durango, and Sonora (Smith and Taylor, 1950b, p. 187); one species, *tigris*, as currently recognized, is comprised of 14 subspecies. The *deppei* group contains three species, composed of 10 subspecies, inhabiting the lowlands from northern Veracruz and Nayarit, México, southward to Costa Rica (Duellman and Wellman, 1960). The *sexlineatus* group is the most widespread and highly differentiated of the groups of *Cnemidophorus*. The combined ranges of the species comprising this group include the United States from Maryland and Florida westward to Wyoming and Arizona, and Baja California, and southward to Honduras and El Salvador.

The taxonomic history of the *sexlineatus* group is characterized by the shuffling of names and the lumping and splitting of populations on specific and subspecific levels. Burt (1931a) recognized two species, *labialis* and *sexlineatus*, the latter composed of three subspecies. Smith and Taylor (1950b) recognized six species, including 15 subspecies in México, while Burger (1950) recognized an additional species and subspecies in the United States. During the last decade a multitude of papers appeared in which our knowledge of the systematics and distribution of members of the *sexlineatus* group was expanded and clarified on one hand, and sometimes confused on the other. Different inter-

pretations presented by various workers have resulted in a chaotic nomenclature. Fifteen species and subspecies have been described, resurrected, or discussed in these papers, principally the works of Burger (1950), Davis and Smith (1952), Duellman (1955, 1960a, 1960b), Duellman and Lowe (1953), Grant and Smith (1960), Hoffman (1957a), Lowe (1955b, 1956), Lowe and Zweifel (1952), Maslin, Beidleman, and Lowe (1958), and Zweifel (1959, 1960, 1961). Our reexamination of specimens and reevaluation of data result in the recognition of 17 species and a total of 31 forms.

Zweifel studied the variation and distribution of *Cnemidophorus* "*sacki*" and related species in western México (see Zweifel, 1959) and made the first serious attempt to clarify the systematics of Mexican members of the *sexlineatus* group. His study included lizards allied to *Cnemidophorus sacki* from Sonora southward to Jalisco. Duellman, who studied the herpetofauna of Michoacán, tried to place specimens from that region in Zweifel's arrangement and tie in the western Mexican populations with "*sacki*" in the upper Balsas Basin. Through the courtesy of Dr. Heinz Wermuth of the Zoölogisches Museum, Berlin, he examined the type specimens of *Cnemidophorus sacki* Wiegmann and *Cnemidophorus mexicanus* Peters. The examination of the type specimen of *sacki* disclosed Smith's (1949) misapplication of the name *sacki*, for the type specimen actually is representative of the population currently identified as *Cnemidophorus sacki australis* Gadow. Zweifel examined the type and confirmed the identification. The allocation of the specific and subspecific names *sacki* to the lizards previously referred to *sacki australis* necessitates the resurrection of the next available name, *costatus* Cope (1877), for the lizards in the upper Balsas Basin that Smith (1949) called *C. sacki sacki*.

To one unfamiliar with *Cnemidophorus*, it might seem relatively simple to allocate the name *sacki* correctly and substitute *costatus* for *sacki* as currently used. Nothing could be more remote from the truth, for "*sacki*" in the inclusive sense used by Smith and Taylor

(1950b, pp. 180–184) comprises populations that represent 10 distinct species as we interpret the situation. Some of these species have been recognized as such in papers published subsequent to the Mexican checklist of Smith and Taylor, but others are still in synonymy.

A complete revision of the *sexlineatus* group is out of the question at the present time, for much field work remains to be done. What we present here is merely a preliminary synopsis that expresses our ideas regarding the names applicable to various populations. During the preparation of this synopsis, and even long before, much of the critical material passed through the hands of one or both of us. In most cases, the opportunity to examine these specimens has helped to clarify our knowledge and to solidify our interpretations. On the other hand, some specimens introduced confusion and raised problems that almost destroyed our faith in some biological principles. With the exception of two species, *Cnemidophorus labialis* and *C. parvisocius*, one or the other of us has examined living specimens of all species and subspecies of the *sexlineatus* group recognized herein and is acquainted with them in the field.

This synopsis results from the examination of several hundred specimens of the *sexlineatus* group. Through the information gathered from type specimens, studies of variation, the application of new methods of study, and our knowledge of the animals in the field, we believe that we have compiled a reasonable taxonomic arrangement of this group. This synopsis is not intended, however, to be the last word. Rather, it provides a basis for future systematic work. As our knowledge of certain taxa and various regions increases, changes in the arrangement given here undoubtedly will be necessary. We make no attempt to unravel the phylogenetic relationships of the species, for our imperfect knowledge argues against such speculation. We leave this aspect of the systematics to a succeeding generation, with the hope that what we present here will help rather than hinder their efforts.

ACKNOWLEDGMENTS

We are indebted to a number of persons who lent specimens, permitted us to examine lizards at their institutions, or provided in-

formation concerning specimens in their care: Dr. R. W. Axtell, Dr. B. J. Banta, Mr. J. C. Battersby, Dr. D. M. Cochran, Dr. W. B. Davis, Dr. J. R. Dixon, Mr. F. R. Gehlbach, Dr. R. F. Inger, Dr. A. E. Leviton, Dr. C. H. Lowe, Jr., Dr. T. P. Maslin, Dr. G. S. Myers, Mr. W. T. Neill, Dr. A. E. Neuman, Dr. H. M. Smith, Dr. R. C. Stebbins, Dr. W. W. Tanner, Dr. C. F. Walker, and Dr. H. Wer-muth. Our sincere thanks go to these persons, and to Mrs. Frances W. Zweifel for the drawings in figures 1 and 2.

The specimens that were examined are cited by museum numbers, to which the following abbreviations refer:

- A.M.N.H., the American Museum of Natural History
- A.N.S.P., Academy of Natural Sciences of Philadelphia
- B.M.(N.H.), British Museum (Natural History)
- B.Y.U., Brigham Young University
- C.N.H.M., Chicago Natural History Museum
- E.H.T.-H.M.S., former collection of Edward H. Taylor and Hobart M. Smith
- E.R.A.-W.T.N., E. Ross Allen-Wilfred T. Neill British Honduras collection, Ross Allen's Reptile Institute, Silver Springs, Florida
- K.U., University of Kansas Museum of Natural History
- M.C.Z., Museum of Comparative Zoölogy at Harvard College
- M.V.Z., Museum of Vertebrate Zoölogy, University of California, Berkeley
- S.N.H.M., Stanford University Natural History Museum
- T.C.W.M., Texas Coöperative Wildlife Museum, College Station
- U.C., University of Colorado Museum
- U.C.L.A., University of California, Los Angeles
- U.I., University of Illinois Museum of Natural History
- U.M.M.Z., University of Michigan Museum of Zoology
- U.S.N.M., United States National Museum
- Z.M.B., Zoölogisches Museum, Berlin

SYNONYMIES

In the synonymies that open the accounts of each species and subspecies we list names that have been applied in whole or in part to that population. No attempt is made to give all references to each name in the literature; instead we give the first usage of each name or combination that has been applied to the population in question, and include, where

deemed necessary, names used in other important references.

ANALYSIS OF CHARACTERS

SCUTELLATION

The features of scutellation that proved to be of systematic importance are discussed below. Zweifel (1959) and Duellman and Wellman (1960) described these characters. Each character discussed below is treated in the diagnosis of each form.

CIRCUMORBITAL SEMICIRCLES: Usually these small scales, which lie between the supraoculars and the median head shields, do not extend anteriorly beyond the posterior edge of the frontal; such is the condition that we call "normal" (fig. 1A). In some species, notably *calidipes*, *parvisocius*, and *perplexus*,

the circumorbital semicircle series extends anteriorly beyond the posterior edge of the frontal; in *calidipes* the semicircle series usually separate the supraoculars from all the median head shields (fig. 1B).

POSTANTEBRACHIAL SCALES: Granular scales cover the posterior surface of the forearm of some species of *Cnemidophorus*, whereas in others there is a patch of more or less enlarged scales there. We designate these scales as granular (example, *perplexus*), slightly enlarged (*motaguae*), or enlarged (*septemvittatus*) (fig. 2).

SCALES BEARING FEMORAL PORES: The number of femoral pores varies among species as well as geographically within species. We give the total count of pores on both femora. The number of pores on one leg often differs from that on the other; hence, we find that

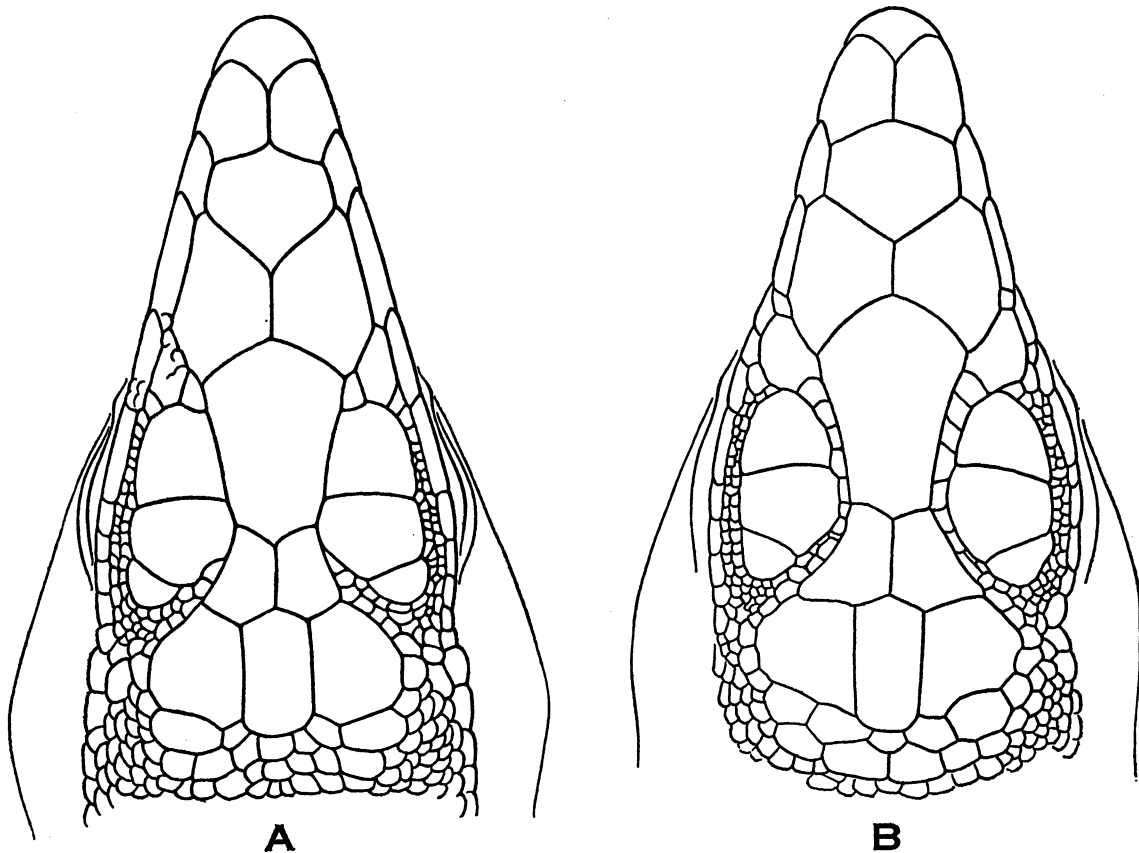


FIG. 1. Dorsal surface of head of two species of *Cnemidophorus* to show variation in extent of circumorbital scale row. A. *C. costatus mazatlanensis*; normal extent of circumorbitals, terminating short of the frontal-frontoparietal suture. B. *C. perplexus*; maximum extent of circumorbitals, separating the second, third, and fourth supraoculars from the median head shields.

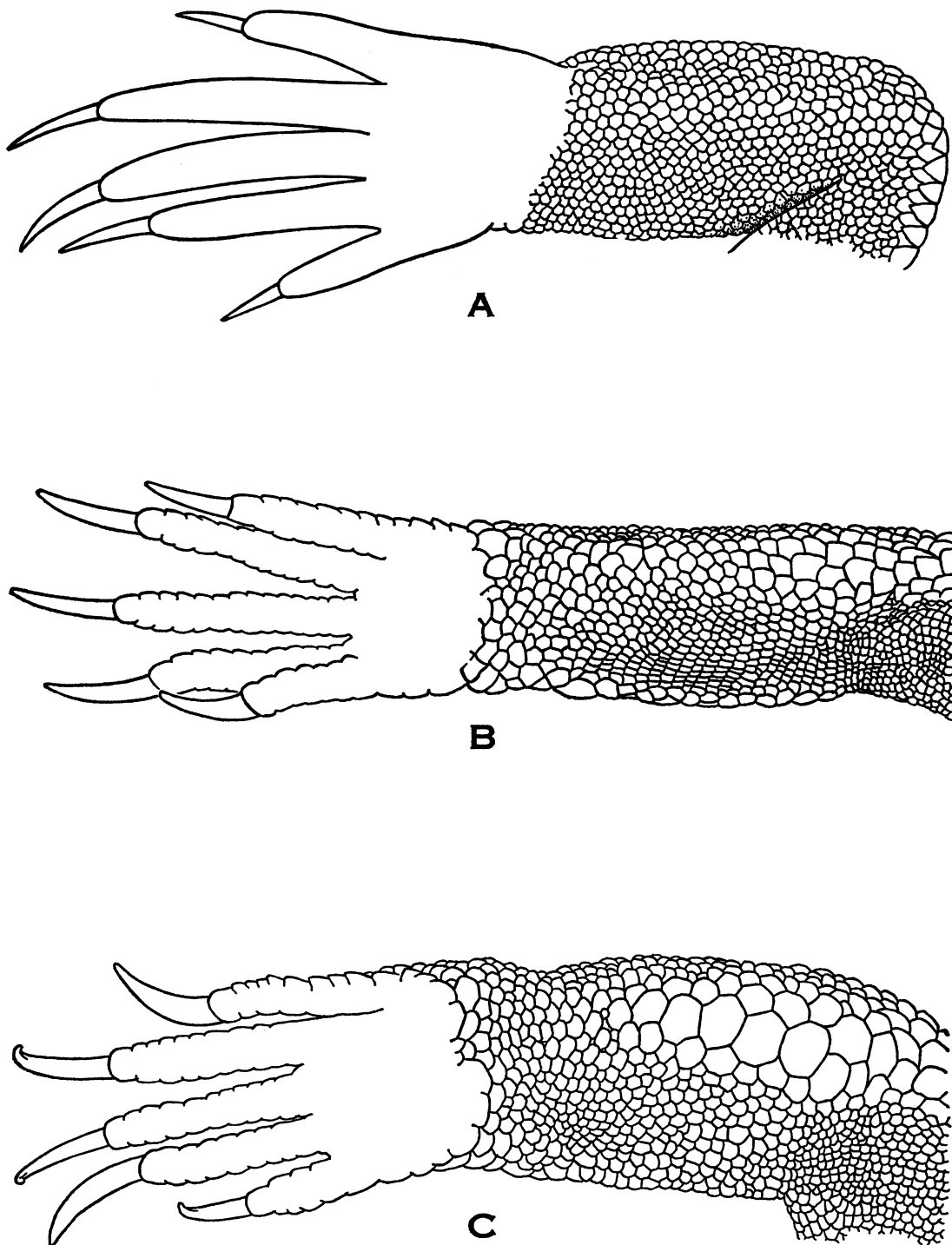


FIG. 2. Posterior side of foreleg of three species of *Cnemidophorus*, illustrating size variation in postantebrachial scales. A. *C. perplexus*, granular scales. B. *C. motaguae*, slightly enlarged scales. C. *C. s. septemvittatus*, enlarged scales.

the combined count gives a more accurate character. There is no sexual dimorphism in the number of femoral pores.

DORSAL GRANULES: Granular scales cover the dorsal surface of the body, neck, and limbs of *Cnemidophorus*. The size of these granules may vary geographically within a species; the size of the granules may be strikingly different in different species. The size of these granules is best expressed by a count of the number around the circumference of the midbody (excluding the enlarged ventrals). The relative size of the dorsal granules probably is the most important single character in the systematic study of the genus. The significance of this character is discussed by Lowe and Zweifel (1952), Lowe (1956), Zweifel (1959), and Duellman and Wellman (1960).

COLOR AND PATTERN

DORSAL PATTERN: As hatchlings, lizards of the *sexlineatus* group have a dorsal pattern of light stripes on a dark ground color. The number of stripes varies from five to eight. The primary stripes are a pair of laterals, a pair of dorsolaterals, and a pair of paravertebrals. The paravertebrals arise level with the parietal scales. In *burti*, some specimens of which have only five stripes, the paravertebrals may fuse to form a middorsal stripe. In those species that have seven stripes there is a median vertebral stripe arising level with the interparietal. In some species the vertebral stripe may be split to form two narrow vertebral stripes, giving a total of eight.

Lizards of the *sexlineatus* group usually show considerable ontogenetic change in color and pattern. In some species, such as *exsanguis* and *sexlineatus*, the stripes persist throughout life. One of the most common manifestations of color pattern is the development of light spots in the dark dorsal interspaces. In many species the light stripes present in the young later fragment into spots, and in some species, such as *mexicanus* and *motaguae*, the pattern of large adults consists solely of light spots on a darker dorsum. In others, such as *calidipes*, the spots in the dark interspaces fuse with the spots formed by the fragmentation of the stripes to form vertical light bars. In others, such as *costatus costatus* and *sacki*, the spots become large and diffuse, so that the darker ground

color persists only as dark reticulations on the dorsum. Among the subspecies of a single variable species such as *costatus*, virtually the whole color-pattern gamut of the genus may be seen. In each account, when information is available, we give a description of the dorsal pattern of the juvenile and adult male.

Many specimens of the species that undergo striking ontogenetic change in pattern are females or of intermediate sizes. Unless the worker knows the animals with which he is working, identification of these specimens is best made on the basis of scutellation and locality.

SPACING OF PARAVERTEBRAL STRIPES: The relative distance between the paravertebral stripes is of importance in separating some populations of *Cnemidophorus*. Of course, in large adults of the species that lose the stripes, this character cannot be used. The relative spacing of the paravertebral stripes is expressed by counting the number of dorsal granules between the stripes at midbody. To allow for variation in the size of the granules, the ratio of the number of granules that separate the paravertebral stripes to the number of granules around the midbody (PV/GAB) should be calculated. Zweifel (1959, p. 67) discusses the usefulness of this character.

COLOR OF CHIN AND THROAT: Some of the most striking differences in coloration exist in the color of the chin and throat in adult males of the *sexlineatus* group. The chin and throat may be pink, blue, tan, black, white, or mottled. Because the pink, blue, and tan fade rapidly in preservative, this character is of limited use in the study of preserved material.

COLOR OF CHEST AND ABDOMEN: Adults of some species, notably *gularis* and *costatus*, have a black or bluish black chest and abdomen, whereas others, such as *sexlineatus* and *burti*, are pale blue or white. In some species, there is noticeable sexual dimorphism in ventral coloration; for example, adult males of *calidipes* have a black chest and abdomen and a pink throat, whereas the females are white below.

SIZE

The species, and less so the subspecies, of *Cnemidophorus* differ in maximum size. The extremes are attained by *Cnemidophorus*

TABLE 1

CHARACTERISTICS OF THE SPECIES AND SUBSPECIES OF THE *sericeatus* GROUP OF *Cnemidophorus*

Species or Subspecies	Dorsal Granules	Granules between Paravertebrals	PV/GAB	Femoral Pores	Postante-brachials	Supra-orbital Semi-circles	Maximum Size (in Mm.)	Number of Stripes in Juveniles	Stripes Persistent	Dorsal Pattern of Large Adults	Chin of Males
<i>angusticeps</i>	91-132	6-19	0.05-0.19	31-47	Slightly enlarged	Normal	115	6+1	Some	Spots (often diffuse) in dark fields; in some fused with stripes	—
<i>burii burii</i>	85-101 (93.3)	0-7 (1.5)	0.00-0.08 (0.016)	30-38 (34.0)	Enlarged	Normal	96	5-6	Yes	Spotting in dark fields only in largest adults	White
<i>burii stictogrammus</i>	98-115 (104.7)	5-11 (8)	—	32-44 (38.3)	Enlarged	Normal	130	6	No	Light spots on dark dorsum	White
<i>burii xanthonotus</i>	85	4-6	—	33-37 (35.5)	Enlarged	Normal	99	6	Some	Gray-green; reddish orange back; pale spots	White
<i>calidipes</i>	66-86 (75.0)	—	—	31-47 (39.0)	Enlarged	Extend anterior	79	7-8	No	Pale brown with light flecks and blue bars	Pink
<i>communis communis</i>	105-175	8-18 (14.3)	0.06-0.15	38-53	Slightly enlarged	Normal	135	6	Nape	Greenish gray with yellow spots	Pink
<i>communis mariarum</i>	136-154 (144.8)	15-25 (20.0)	0.10-0.17 (0.138)	36-50 (43.3)	Slightly enlarged	Normal	120	6	No	Cross bars anteriorly; spotted posteriorly	Pink
<i>costatus costatus</i>	88-105 (96.3)	—	0.10-0.20 (0.154)	32-44 (36.2)	Enlarged	Normal	110	6+1	No	Greenish tan with brown cross bars	Pink
<i>costatus barrancorum</i>	91-119 (103.1)	10-20 (15.7)	0.10-0.19 (0.150)	30-40 (35.4)	Enlarged	Normal	107	6+1	Yes	Pale spots in dark fields	White
<i>costatus griseocephalus</i>	97-119 (107.5)	11-23 (16.2)	0.10-0.18 (0.153)	30-39 (34.2)	Enlarged	Normal	110	6+1	No	Head and nape blue-gray; light spots on black body	Pale bluish white
<i>costatus huico</i>	91-118 (105.4)	10-20 (14.0)	0.05-0.19	36-46 (40.2)	Enlarged	Normal	106	6+1 or 2	Nape	Stripes replaced by spots	Pink or red-brown
<i>costatus mazatlanensis</i>	95-121 (105.4)	11-20 (14.6)	0.11-0.20 (0.139)	33-45 (37.8)	Enlarged	Normal	104	6	Yes	Light spots in dark fields; stripes partially replaced by spots	Pale blue with black spots, rarely wholly black
<i>costatus nigrigularis</i>	95-120 (107.2)	10-20 (15.9)	0.10-0.20 (0.148)	32-41 (36.8)	Enlarged	Normal	114	6	Nape	Spotted	Black
<i>costatus occidentalis</i>	97-118 (106.3)	9-18 (13.8)	0.09-0.18 (0.130)	32-45 (38.8)	Enlarged	Normal	126	6+1	Some	Cross bars anteriorly; spotted posteriorly	Pink
<i>costatus zweijeli</i>	91-117 (106.2)	—	0.06-0.16 (0.097)	32-49 (41.1)	Enlarged	Normal	132	6	No	Spots in dark fields and in place of stripes; middorsum green	Pink with blue spot or bar
<i>exsanguis</i>	62-86	2-8 (4.6)	—	30-44 (36.8)	Enlarged	Normal	95	6	Yes	Spots in dark fields	White
<i>gularis</i>	84-96 (88.4)	8-18 (12.7)	0.09-0.19 (0.143)	28-39 (33.3)	Enlarged	Normal	90	6+1 or 2	Yes	Spots in dark fields	Pink or red
<i>inornatus</i>	55-78 (62.0)	7-11 (8.6)	—	33-39 (35.0)	Slightly enlarged	Normal	70	6-8	Yes	No spots in dark fields	Pale blue

TABLE 1—(Continued)

Species or Subspecies	Dorsal Granules	Granules between Paravertebrals	PV/GAB	Femoral Pores	Postante-brachials	Supra-orbital Semi-circles	Maximum Size (in Mm.)	Number of Stripes in Juveniles	Stripes Persistent	Dorsal Pattern of Large Adults	Chin of Males
<i>labialis</i>	60	8	0.13	—	Slightly enlarged	Normal	63	7	Yes	No spots in dark fields	Blue
<i>mexicanus</i>	82-98 (89.3)	11-16 (12.2)	0.11-0.16 (0.131)	28-37 (32.5)	Enlarged	Normal	89	6+1	No	Greenish gray anteriorly; greenish tan posteriorly; yellow spots	Pale blue
<i>molaguae</i>	113-140	—	—	39-54	Slightly enlarged	Normal	145	6	No	Grayish brown anteriorly; grayish green posteriorly; yellow spots	Cream with tint of pink
<i>parnisocius</i>	86-104 (93.5)	9-14 (11.6)	0.10-0.14 (0.124)	33-46 (40.5)	Slightly enlarged	Extend anterior	80	6+1	Yes	Spots in dark fields; bars on flanks	Pink?
<i>perplexus</i>	71-80 (74.9)	9-13 (10.2)	—	34-40 (37.3)	Granular	Extend anterior	86	7	Yes	Indistinct light spots in dark fields; vertebral stripe wavy	Pale bluish white
<i>sacki sacki</i>	121-158 (138.1)	—	—	35-50 (41.5)	Slightly enlarged	Normal	152	6+1	No	Dark cross bars on tan dorsum	Tan
<i>sacki gigas</i>	124-163 (137.7)	—	—	32-49 (42.3)	Slightly enlarged	Normal	140	6	No	Dark reticulations and spots on tan dorsum	Pale pink
<i>septemvitatus septemvitatus</i>	77-98 (84.9)	4-15 (7.5)	0.04-0.18 (0.084)	30-41 (36.7)	Enlarged	Normal	105	6+1	Yes	Stripes faded on posterior one-third; spots in dark fields	White or pale blue with black spots; faintly pink?
<i>septemvitatus pallidus</i>	78-95 (86.1)	—	—	33-43 (36.8)	Enlarged	Normal	87	7	Yes	Grayish green with only faint stripes and faint spots in dark fields	Pale bluish white
<i>septemvitatus scalaris</i>	69-101	3-13	0.04-0.16	30-42 (35.8)	Enlarged	Normal	96	6 or 6+1	Usually no	Vertical light and dark bars on flanks; dorsum spotted or barred	Pink
<i>septemvitatus semifasciatus</i>	74-110 (91.6)	5-23 (14.2)	0.06-0.21 (0.152)	31-45 (37.5)	Enlarged	Normal	99	6+1 or 2	Yes	Stripes on nape or anterior one-third; spots diffuse	Rusty orange, with black spots
<i>sextineatus</i>	68-110	8-22	0.10-0.22	25-35	Slightly enlarged	Normal	77	6+2	Yes	No spots in dark fields	White
<i>velox</i>	63-85 (73.1)	5-10 (7.7)	—	31-37 (33.8)	Slightly enlarged	Normal	85	6+1	Yes	No spots in dark fields	Pale blue

labialis, which reaches a known maximum snout to vent length of 63 mm., and *C. sacki sacki*, which reaches 152 mm.

Sexual dimorphism in size is common to most species, with the males attaining a notably greater size than females. Two small, striped species (*inornatus* and *sexlineatus*) show no such dimorphism, a fact perhaps of some phylogenetic significance. Large adults of many species are poorly represented in collections. Adults of some of the species are extremely wary and difficult to collect, and they are inactive during part of the year (winter and dry season) when juveniles and subadults sometimes may still be found in abundance.

IDENTIFICATION OF THE SPECIES AND SUBSPECIES IN THE *sexlineatus* GROUP

The variation in size and scutellation, and the ontogenetic changes in color pattern, make the construction of a key to the identification of these lizards more than usually difficult. After considerable deliberation we have eliminated a key and have included in its place a table showing, so far as we can determine, the condition of each character in every species and subspecies. We feel that the "key characters" presented in this way and used in conjunction with geography will facilitate the identification of specimens (table 1).

THE *SEXLINEATUS* SPECIES GROUP

Burt (1931a, p. 20) and subsequent authors recognize five species groups within the genus *Cnemidophorus*: *lemniscatus*, *hyperythrus*, *tessellatus*, *sexlineatus*, and *deppei*. The three species of the *lemniscatus* group are South American, with one ranging to northern Central America. A key character tying these species together and differentiating them from other species is the possession of five rather than the usual three enlarged parietal scales. The *hyperythrus* group accommodates a single polytypic species that inhabits extreme southern California, Baja California, and the adjacent islands. The principal distinguishing feature of this group is the single rather than paired frontoparietal scale. The *deppei* group, with three species in México and northern Central America (Duellman and Wellman, 1960), is distinguished from other groups by the fact that there are normally three rather than four enlarged supra-

oculars. Other characters define these groups, but those cited are the most obvious and consistent.

The *tessellatus* and *sexlineatus* groups are readily distinguishable from the other three groups on the basis of characters mentioned in the preceding paragraph, but the distinction between these two groups is not nearly so well defined. The differences briefly cited by Burt (*loc. cit.*) in his key to the groups of *Cnemidophorus*, "Sides of young completely striped, and spots, if present, confined to the dark interspaces [*sexlineatus*]," and "Sides of young not completely striped, but with tessellations, cross-bars or spots [*tessellatus*]," are inadequate. So far as we know, all forms of the *sexlineatus* group conform to Burt's diagnosis, but some regularly assigned to the *tessellatus* group (e.g., *C. tigris aethiops*) would key out to the *sexlineatus* group.

All species of both the *tessellatus* and the *sexlineatus* groups share features of head scutellation that set them apart from the other three groups: four supraoculars and three enlarged parietals. A typical member of the *sexlineatus* group has a pattern of narrow light stripes on a dark ground color at hatching, the postantibrachial scales enlarged, and the mesoptychial scales (those preceding the gular fold) abruptly larger than the scales within the gular fold. All species we assign to this group conform to the typical juvenile color pattern, but there is variation in the other two characters, as is brought out in the species accounts. The juvenile color pattern is variable within the *tessellatus* group, and the mesoptychial scales may be large or small. The postantibrachials, however, are always small.

Among the species we treat as members of the *sexlineatus* group, *Cnemidophorus perplexus* has perhaps the weakest claim to membership. We hope that anatomical studies such as are being carried on by Kathleen Beargie will clarify relationships among the many species of *Cnemidophorus* and provide a firmer basis than is now available for a subdivision of the genus.

ALL-FEMALE POPULATIONS OF *CNEMIDOPHORUS*

The first suggestion that there might be all-female populations of *Cnemidophorus* came with Minton's ("1958" [1959], p. 44) report

TABLE 2
ALPHABETICAL SYNONYMY OF THE *sexlineatus* GROUP

Trivial Name, Author, Date	Present Name
<i>angusticeps</i> Cope, 1877	<i>angusticeps</i>
<i>arizonae</i> Van Denburgh, 1896	<i>inornatus</i>
<i>australis</i> Gadow, 1906	<i>sacki sacki</i>
<i>balsas</i> Gadow, 1906	<i>costatus costatus</i>
<i>barrancorum</i> Zweifel, 1959	<i>costatus barrancorum</i>
<i>bocourtii</i> Boulenger, 1885	<i>mexicanus</i>
<i>burti</i> Taylor, 1938	<i>burti burti</i>
<i>calidipes</i> Duellman, 1955	<i>calidipes</i>
<i>communis</i> Cope, 1877	<i>communis communis</i>
<i>copei</i> Gadow, 1906	<i>communis communis</i>
<i>costatus</i> Cope, 1877	<i>costatus costatus</i>
<i>exsanguis</i> Lowe, 1956	<i>exsanguis</i>
<i>fallax</i> Merrem, 1820	<i>sexlineatus</i>
<i>gigas</i> Davis and Smith, 1952	<i>sacki gigas</i>
<i>griseocephalus</i> Zweifel, 1959	<i>costatus griseocephalus</i>
<i>gularis</i> Baird and Girard, 1852	<i>gularis</i>
<i>huico</i> Zweifel, 1959	<i>costatus huico</i>
<i>innotatus</i> Burger, 1950	<i>velox</i>
<i>inornatus</i> Baird, 1858	<i>inornatus</i>
<i>labialis</i> Stejneger, 1890	<i>labialis</i>
<i>mariarum</i> Günther, 1885	<i>communis mariarum</i>
<i>mazatlanensis</i> Zweifel, 1959	<i>costatus mazatlanensis</i>
<i>meeki</i> Gadow, 1906	<i>gularis</i>
<i>mexicanus</i> Peters, 1869	<i>mexicanus</i>
<i>motaguae</i> Sackett, 1941	<i>motaguae</i>
<i>neomexicanus</i> Lowe and Zweifel, 1952	<i>perplexus</i>
<i>nigrigularis</i> Zweifel, 1959	<i>costatus nigrigularis</i>
<i>occidentalis</i> Gadow, 1906	<i>costatus occidentalis</i>
<i>octolineatus</i> Baird, 1858	<i>inornatus</i>
<i>oligoporus</i> Hoffman, 1957	<i>sexlineatus</i>
<i>pallidus</i> , new subspecies	<i>septemvittatus pallidus</i>
<i>parvisocius</i> Zweifel, 1960	<i>parvisocius</i>
<i>pauciporus</i> Hoffman, 1957	<i>sexlineatus</i>
<i>perplexus</i> Baird and Girard, 1852	<i>perplexus</i>
<i>sackii</i> Wiegmann, 1834	<i>sacki sacki</i>
<i>scalaris</i> Cope, 1892	<i>septemvittatus scalaris</i>
<i>semifasciatus</i> Cope, 1892	<i>septemvittatus semifasciatus</i>
<i>septemvittatus</i> Cope, 1892	<i>septemvittatus septemvittatus</i>
<i>sericeus</i> Cope, 1892	<i>gularis</i>
<i>sexlineata</i> Linnaeus, 1766	<i>sexlineatus</i>
<i>stictogrammus</i> Burger, 1950	<i>burti stictogrammus</i>
<i>tigris</i> Cope, 1886 (<i>nec</i> Baird and Girard)	<i>septemvittatus scalaris</i>
<i>typica</i> Gadow, 1906	<i>mexicanus</i>
<i>velox</i> Springer, 1928	<i>velox</i>
<i>xanthonotus</i> Duellman and Lowe, 1953	<i>burti xanthonotus</i>
<i>zweifeli</i> Duellman, 1960	<i>costatus zweifeli</i>

TABLE 3

CHRONOLOGICAL SYNONYMY OF THE FORTY-SIX NEW NAMES PROPOSED IN THE *sexlineatus* GROUP^a

Date, Original Name, Author, and Genus if Other Than <i>Cnemidophorus</i>	Present Name
1766 <i>sexlineata</i> Linnaeus [<i>Lacerta</i>]	<i>sexlineatus</i>
1820 <i>fallax</i> Merrem [<i>Lacerta</i>]	<i>sexlineatus</i>
1834 <i>sackii</i> Wiegmann	<i>sacki sacki</i>
1852 <i>perplexus</i> Baird and Girard	<i>perplexus</i>
1852 <i>gularis</i> Baird and Girard	<i>gularis</i>
1858 <i>octolineatus</i> Baird	<i>inornatus</i>
1858 <i>inornatus</i> Baird	<i>inornatus</i>
1869 <i>mexicanus</i> Peters	<i>mexicanus</i>
1877 <i>angusticeps</i> Cope	<i>angusticeps</i>
1877 <i>communis</i> Cope	<i>communis communis</i>
1877 <i>costatus</i> Cope	<i>costatus costatus</i>
1885 <i>mariarum</i> Günther	<i>communis mariarum</i>
1885 <i>bocourti</i> Boulenger	<i>mexicanus</i>
1886 <i>gularis tigris</i> Cope (<i>nec</i> Baird and Girard)	<i>septemvittatus scalaris</i>
1890 <i>labialis</i> Stejneger	<i>labialis</i>
1892 <i>septemvittatus</i> Cope	<i>septemvittatus septemvittatus</i>
1892 <i>gularis scalaris</i> Cope	<i>septemvittatus scalaris</i>
1892 <i>gularis sericeus</i> Cope	<i>gularis</i>
1892 <i>gularis semifasciatus</i> Cope	<i>septemvittatus semifasciatus</i>
1896 <i>arizonae</i> Van Denburgh	<i>inornatus</i>
1906 <i>gularis meeki</i> Gadow	<i>gularis</i>
1906 <i>communis occidentalis</i> Gadow	<i>costatus occidentalis</i>
1906 <i>communis copei</i> Gadow	<i>communis communis</i>
1906 <i>communis australis</i> Gadow	<i>sacki sacki</i>
1906 <i>mexicanus typica</i> Gadow	<i>mexicanus</i>
1906 <i>mexicanus balsas</i> Gadow	<i>costatus costatus</i>
1928 <i>gularis velox</i> Springer	<i>velox</i>
1938 <i>burti</i> Taylor	<i>burti burti</i>
1941 <i>motaguae</i> Sackett	<i>motaguae</i>
1950 <i>sackii stictogrammus</i> Burger	<i>burti stictogrammus</i>
1950 <i>sackii innotatus</i> Burger	<i>velox</i>
1952 <i>neomexicanus</i> Lowe and Zweifel	<i>perplexus</i>
1952 <i>gigas</i> Davis and Smith	<i>sacki gigas</i>
1953 <i>sacki xanthonotus</i> Duellman and Lowe	<i>burti xanthonotus</i>
1955 <i>calidipes</i> Duellman	<i>calidipes</i>
1956 <i>sacki exsanguis</i> Lowe	<i>exsanguis</i>
1957 <i>sexlineatus oligoporus</i> Hoffman	<i>sexlineatus</i>
1957 <i>sexlineatus pauciporus</i> Hoffman	<i>sexlineatus</i>
1959 <i>sacki huico</i> Zweifel	<i>costatus huico</i>
1959 <i>sacki nigrigularis</i> Zweifel	<i>costatus nigrigularis</i>
1959 <i>sacki mazatlanensis</i> Zweifel	<i>costatus mazatlanensis</i>
1959 <i>sacki griseocephalus</i> Zweifel	<i>costatus griseocephalus</i>
1959 <i>sacki barrancorum</i> Zweifel	<i>costatus barrancorum</i>
1960 <i>parvisocius</i> Zweifel	<i>parvisocius</i>
1960 <i>sacki zweifeli</i> Duellman	<i>costatus zweifeli</i>
1962 <i>septemvittatus pallidus</i> , new subspecies	<i>septemvittatus pallidus</i>

^a *Cnemidophorus gadovi* Burger, 1950, was thought to belong to this group, but is a synonym of *C. tigris aethiops* of the *tessellatus* group (Zweifel, 1956).

that he had never seen a male of *Cnemidophorus tessellatus*. Quantitative evidence is given by Tinkle (1959, p. 197) who finds only females among 65 specimens of *tessellatus*. He feels that additional collecting will eventually produce males, but in view of the convincing report of parthenogenesis in *Lacerta saxicola* by Darevskii (1958), the possibility of the true absence of males in some *Cnemidophorus* must be given careful attention. T. Paul Maslin, University of Colorado, is engaged in a study of this problem with reference to *C. tessellatus* and other forms suspected of lacking males. There are several forms of the *sexlineatus* group for which there is no con-

vincing evidence of the presence of male individuals. These are *C. exsanguis*, *C. velox*, *C. perplexus*, and western populations currently assigned to the widely distributed *C. inornatus*. We have examined males of all other forms assigned to the *sexlineatus* group.

Because of the uncertainty of our meager knowledge regarding the possibility of parthenogenesis of some populations, we have not stressed this point in determining species relationships. If it is established that parthenogenesis truly occurs in *Cnemidophorus*, this genus notorious for its taxonomic difficulties will be subjected to additional complications.

SYNOPSIS OF THE SPECIES AND SUBSPECIES

Cnemidophorus angusticeps Cope

Plate 24

Cnemidophorus angusticeps COPE, 1877, p. 95.
SMITH, 1939, p. 24.

Cnemidophorus sackii, COPE, 1866, p. 125.

Cnemidophorus sexlineatus var. *angusticeps*,
BOULENGER, 1885, p. 366.

Cnemidophorus sexlineatus var. *mexicanus*, BOU-
LENGER, 1887, p. 505.

Cnemidophorus gularis angusticeps, COPE, 1892,
p. 46.

Cnemidophorus sexlineatus, IVES, 1892, p. 459.
BARBOUR AND COLE, 1960, p. 150.

Cnemidophorus communis copei, GADOW, 1906,
p. 352.

Cnemidophorus sexlineatus perplexus, BURT,
1931a, p. 97.

Cnemidophorus gularis, STUART, 1935, p. 47.
SCHMIDT, 1941, p. 480. NEILL AND ALLEN, 1959a,
p. 43; 1959b, p. 236.

Cnemidophorus sackii angusticeps, SMITH AND
TAYLOR, 1950a, p. 351; 1950b, p. 183.

TYPE: The type series was collected by Schott in Yucatán (Cope, 1877, p. 95). Cope (1892, p. 46) mentions four specimens from Yucatán in the United States National Museum, but the catalogue of that museum lists six specimens collected by Schott: U.S.N.M. Nos. 24875–24878 and 12284 (two specimens); No. 24878 has changed hands and is now M.C.Z. No. 46945. Smith and Taylor (1950b, p. 183) list U.S.N.M. Nos. 24876–24878 as cotypes and (1950a, p. 351; 1950b, p. 183) restrict the type locality to Chichen Itzá, Yucatán.

RANGE (FIG. 3): The Yucatán Peninsula.

SPECIMENS EXAMINED: *México*: "Yucatán" (U.S.N.M. Nos. 24875–24877, 12284 [two specimens], cotypes of *angusticeps*). Yucatán: Piste (U.C. Nos. 12571–12574, 12576–12588, 12590, 12592, 12594, 12595, 12597–12599, 12601–12619, 12621–12624, 12626–12633, 12635–12652, 12655–12661, 12663–12678, 12680–12684; A.M.N.H. Nos. 84509–84518); 9 kilometers north of Mérida on Progreso road (U.C. Nos. 12566–12570, 12575, 12593); Chichen Itzá (U.C. Nos. 12685, 12687; A.M.N.H. Nos. 38877–38891, 38946, 84518). *British Honduras*: Belize District: 13 miles west and 1.5 miles south of Belize (E.R.A.-W.T.N. Nos. BH-703, 704, 1084); 18 miles west and 5.5 miles south of

Belize (E.R.A.-W.T.N. No. BH-1083); 7.5 miles south and 1 mile east of Boom (E.R.A.-W.T.N. No. BH-1085); 8 miles west and 4.5 miles south of Belize (E.R.A.-W.T.N. No. BH-1086); 2.5 miles south of Boom (E.R.A.-W.T.N. No. BH-1087). *Guatemala*: El Petén: La Libertad (U.M.M.Z. Nos. 74980–74989, 74990 [two specimens], 74991 [two specimens], 74992 [four specimens], 74993 [four specimens]); Toocog, 15 kilometers southeast of La Libertad (K.U. Nos. 58195–58197).

Localities for this species in addition to those from which we have examined specimens are: Progreso, Yucatán (Barbour and Cole, 1960, p. 150); Tunkas, Yucatán (Ives, 1892, p. 459); Cobá, Quintana Roo (Smith, 1939, p. 25); Champotón, Campeche (Smith and Taylor, 1950b, p. 183) and, questionably, Cozumel Island, Quintana Roo (Boulenger, 1887, p. 505). We question the record for Cozumel Island because no additional records have appeared, and recently T. Paul Maslin and his party failed to find *angusticeps* on Cozumel, although they collected *C. deppei* there in abundance and had secured numerous *angusticeps* on the mainland of Yucatán only a few days before.

The distribution of *angusticeps* is probably discontinuous. Both Stuart (1935, p. 47) and Neill and Allen (1959a, p. 45) emphasize the association of this species with savanna vegetation in Guatemala and British Honduras. The central part of the Yucatán Peninsula, where *angusticeps* has not been found, is dominated by rain forest (Paynter, 1955, map 2).

DIAGNOSTIC CHARACTERS: Because this species has not previously been studied in detail, we examined a large number of specimens and report on them in the following section. Ranges of variation only are given here.

Maximum snout-vent length, 115 mm.; 91–132 ($N=118$) dorsal granules around mid-body; 31–47 ($N=118$) femoral pores; post-antibrachials slightly to moderately enlarged; circumorbital semicircle series usually terminating posterior to the frontal-frontoparietal suture. Paravertebral lines separated by from six to 19 scales ($N=111$); PV/GAB, 0.05–0.19 ($N=111$).

Juveniles with six or seven fine, pale lines

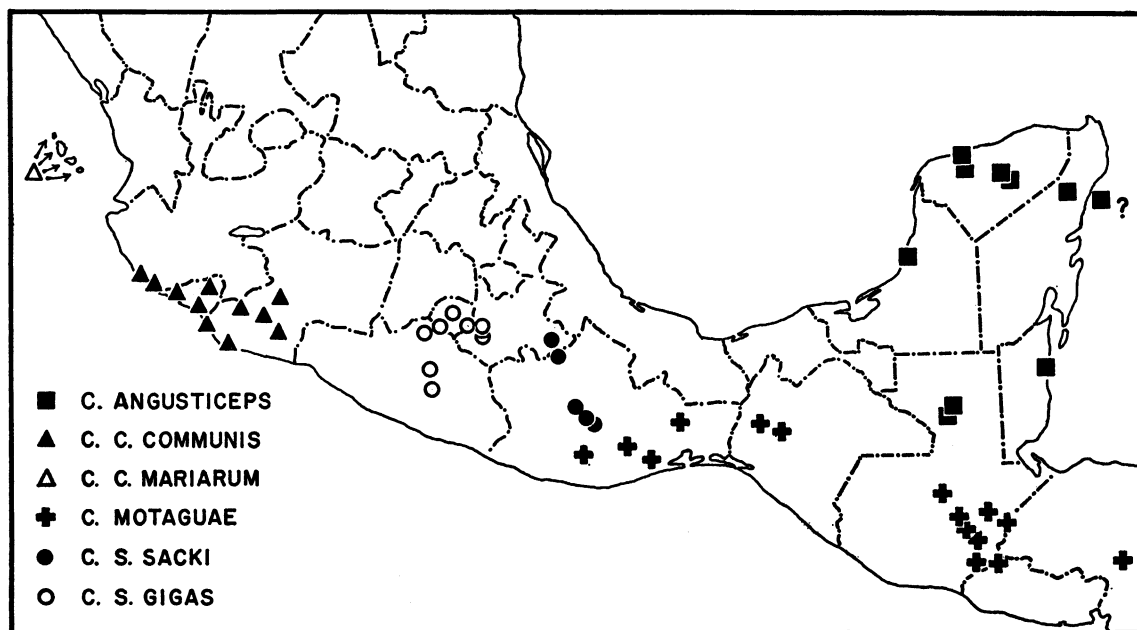


FIG. 3. Distribution of four species of *Cnemidophorus* in southern Mexico and northern Central America.

on black background. Vertebral line distinct, indistinct, or absent, rarely paired. Adult pattern highly variable (pl. 24); some trace of striping usually retained, though stripes may merge with lichen-like markings in dark fields. Small, distinct spots persisting in some adults and rarely dominating pattern. Adult males with throat, chest, and abdomen black. Chin pale, but color not recorded. Black ventral color developing at unusually small size, some lizards less than 70 mm. in snout to vent length wholly black beneath.

REMARKS: Through the courtesy of Dr. T. Paul Maslin, we have examined a large series of *angusticeps* from a single locality, Piste, Yucatán. The series is remarkable for its variation in pattern and scutellation. The first impression was that two sibling species are represented in the series, but the lack of bimodality in scale counts and the absence of any correlation between pattern and scale count make it relatively certain that only a single highly variable species is involved.

Thirty-six males in the Piste series have a GAB average of 115.5 ± 1.3 (101–132), compared with a mean of 113.2 ± 1.6 (91–124) for 40 females. The absence of sexual dimorphism is indicated; the mean for the pooled samples

is 114.1 ± 1.0 (91–132, $N=78$). A similar lack of sexual dimorphism in femoral pores is seen: males average 39.9 ± 0.4 (36–46, $N=38$); females average 40.2 ± 0.4 (35–45, $N=40$). The pooled mean is 40.1 ± 0.3 (35–46, $N=78$). The spacing of the paravertebral stripes is highly variable; PV/GAB ranges from 0.05 to 0.16, mean 0.117.

We have examined too few specimens from other parts of Yucatán to determine whether other local populations are as variable in dorsal granules as is the population of Piste. The specimens illustrated in plate 24 indicate that wide variation in color pattern is not limited to Piste.

Specimens from British Honduras and Guatemala differ significantly from the Piste series in both the size of the dorsal granules and the number of femoral pores. The mean number of dorsal granules around midbody is 98.2 ± 0.6 (92–105, $N=29$) and the mean number of femoral pores 35.0 ± 0.5 (31–40, $N=29$). The difference in the GAB means between the samples is of an order of magnitude similar to that between some sympatric species in the *sexlineatus* group. The spacing of the paravertebral stripes is inherently so variable that we attach little significance to the

slightly higher range and average PV/GAB ratio in the lizards from British Honduras and Guatemala: 0.141 (0.08–0.19).

The seven specimens from British Honduras are all small (largest, 68 mm. S-V), so nothing is known of the possible adult variation in pattern. Neill and Allen (1959, p. 237) felt that the population they sampled around Belize belonged to a small species, but probably they were misled by the early development of dark ventral coloration (and sexual maturity?) in this species. The lizards from La Libertad, Guatemala, are similar to those from British Honduras in all pertinent respects, but reach a length of at least 95 mm. Only four of the 22 specimens from La Libertad (all males) are 80 mm. or more in length. All are striped, and the three smaller lizards (80–92 mm.) have light spots in the dark fields. The largest specimen, 95 mm., has unspotted dark fields that are somewhat lighter centrally.

A strong case could be presented for a division of *angusticeps* into a northern and a southern race, based on scale counts. We refrain from proposing a new subspecies at the present time in the hope that additional material will become available. The adult pattern variation in the southern type is not well enough known, and more details of distribution are needed.

Cnemidophorus angusticeps occurs with no other species of the *sexlineatus* group, and its position within the group with respect to other species is not clear. Stuart (1935, p. 47) and Neill and Allen (1950a, p. 43; 1950b, p. 236) referred the southern population to *C. gularis*, and there is considerable similarity to that species. Both are moderate-sized, striped lizards with dark bellies. *Cnemidophorus gularis* is a smaller species, with fewer granules around midbody. So far as is presently known, the ranges of the two forms are separated by a distance of over 500 miles.

Cnemidophorus burti burti Taylor,
new combination

Plate 29

Cnemidophorus burti TAYLOR, "1936" [1938a], p. 485. SMITH AND TAYLOR, 1950b, p. 185. ZWEIFEL AND NORRIS, 1955, p. 235. ZWEIFEL, 1959, p. 73.

Cnemidophorus gularis, VAN DENBURGH, 1922,

p. 503 (part; specimens from San Pedro Bay and Guaymas, Sonora).

Cnemidophorus sexlineatus perplexus, BURT, 1931a, pp. 132, 137 (part; specimens from San Pedro Bay and Guaymas, Sonora).

TYPE: C.N.H.M. No. 100004 (formerly E.H.T.-H.M.S. No. 269), collected near La Posa, 10 miles northwest of Guaymas, Sonora, México, on July 4, 1934, by Edward H. Taylor.

RANGE (FIG. 4): The vicinity of Guaymas, Sonora.

SPECIMENS EXAMINED: Two miles northeast of Guaymas (A.M.N.H. Nos. 74729, 80597, 80598); south slope of Cerro Bocochibampo, north side of Bahía Bocochibampo (S.N.H.M. Nos. 15496–15498); Bahía San Carlos, 10 miles west of Guaymas (A.M.N.H. Nos. 57246, 78911–78915, and one untagged); east shore of Bahía San Pedro (S.N.H.M. Nos. 16606–16609).

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 96 mm. Eighty-five to 101 (93.3 ± 1.4 , $N=15$) granules around midbody, and none to 7 (1.5 ± 0.4 , $N=15$) scales between paravertebral stripes. PV/GAB ratio ranging from 0.00 to 0.08 (0.016 ± 0.006 , $N=15$); 30–38 (34.0 ± 0.7 , $N=15$) femoral pores; postantebrachial scales enlarged.

Typically a five- or six-lined lizard with relatively indistinct spotting developing in the dark fields only of largest individuals. Paravertebral stripes frequently (nine of 15 specimens) fused at midbody, giving rise to five-lined pattern. One specimen with stripes separated by seven scales, but maximum separation of four scales in others. Ventral surfaces pale and immaculate in juveniles and adults of both sexes.

REMARKS: We give this species relatively brief treatment, as it is being studied by Charles H. Lowe, Jr. In 1956, Lowe showed that Burger (1950) confused two sympatric species in describing *Cnemidophorus sackii stictogrammus*. One of these forms was named *C. sackii exsanguis* by Lowe; the other he recognized as *C. stictogrammus*. Both occur in Arizona and northern Sonora.

Until recently there was little reason to suspect a close relationship between *C. stictogrammus* and *C. burti*, as they differ in size, pattern, and scutellation. However, in 1958 Lowe and Zweifel collected specimens in west-

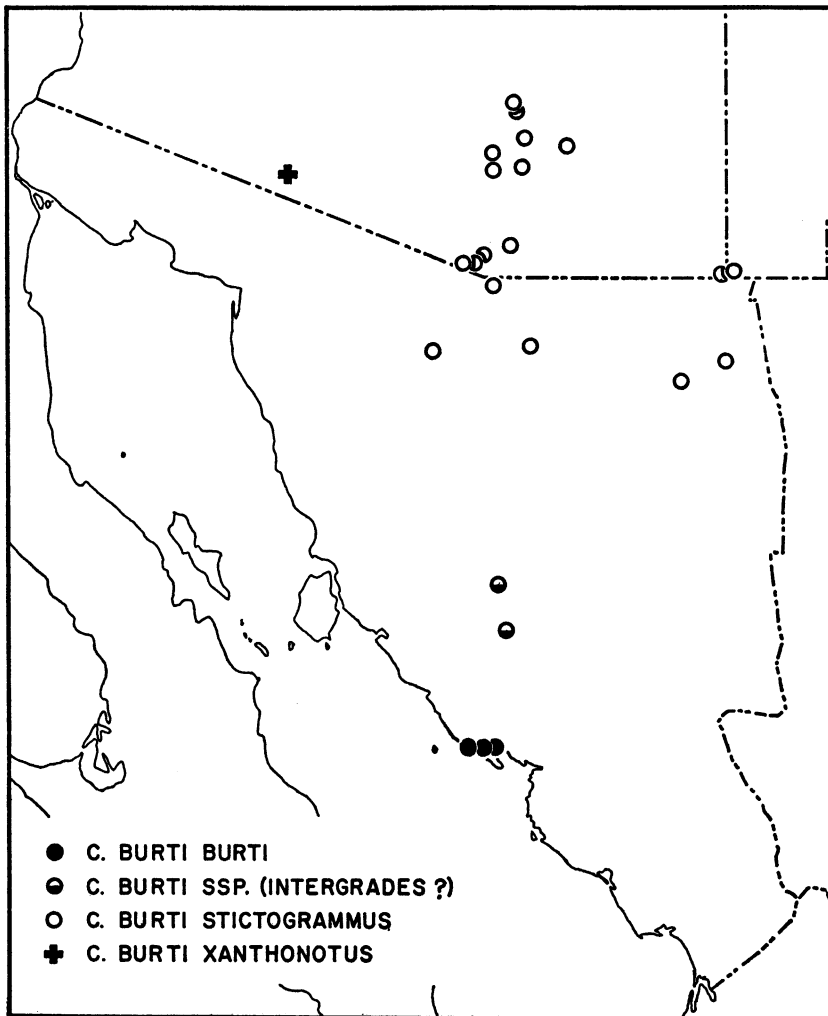


FIG. 4. Distribution of *Cnemidophorus burti* in Sonora, Arizona and New Mexico. Records for Arizona in part taken from the literature. All others represent specimens examined.

central Sonora that are intermediate both morphologically and geographically (pl. 29). Four specimens from the Sierra Tetalejo, 5 miles southeast of La Pintada (about 30 miles south of Hermosillo) have 91, 92, 95, and 96 (mean 93.5) granules around midbody, so resemble *C. b. burti* in respect to scutellation. Two of these specimens have the paravertebral stripes fused, and a third has a separation of only three scales (the stripes are not visible in the fourth specimen), so in this feature also there is close similarity to *C. b. burti*. In spotting, however, there is a strong resemblance to *C. b. stictogrammus*, for all four

lizards are well spotted (the smallest, a female 78 mm. in snout to vent length) and the largest (S-V, 104 mm.) shows scarcely a trace of striping. Although the sample includes only four specimens, two of these exceed the maximum known length for *C. b. burti*, so apparently the Sierra Tetalejo population is intermediate in size, or perhaps closer to *C. b. stictogrammus*. A feature shared by *burti*, *stictogrammus*, and the intermediate population is the bright orange-brown color of the rump, hind legs, and base of tail.

Another specimen of intermediate type is U.C. No. 8605 from 5 miles north of Hermo-

sillo. This is a heavily spotted lizard with 91 scales around midbody and barely four scales between the paravertebral stripes. It was referred to *C. stictogrammus* by Zweifel (1959, p. 101). Although we are calling these intermediate lizards intergrades, it is probable that they represent a population of sufficient constancy to deserve taxonomic recognition.

The problem of the relationship of *C. burti* to *C. costatus*-like lizards in central Sonora is taken up in another place (see pp. 182-183).

Cnemidophorus burti stictogrammus

Burger, new combination

Cnemidophorus sackii stictogrammus BURGER, 1950, p. 5.

Cnemidophorus stictogrammus, LOWE, 1956, p. 146.

TYPE: U.S.N.M. No. 132456, collected at Yank's Spring, 6 miles southeast of Ruby, Santa Cruz County, Arizona, by Max Hensley and W. Leslie Burger.

RANGE (FIG. 4): South-central Arizona, the extreme southeastern corner of Arizona and the adjacent southwestern corner of New Mexico, and northern Sonora. Lowe (1956, p. 149) gives locality records for Arizona. The presence of this species in New Mexico is shown by K.U. No. 49700 from Guadalupe Canyon, Hidalgo County, 2 miles east of the Arizona-New Mexico line and 3 miles north of the Mexican Boundary. In July, 1961, Charles J. Cole collected specimens in the Arizona portion of Guadalupe Canyon in Cochise County 0.4 mile (A.M.N.H. Nos. 86960-86961) and 2.8 miles (A.M.N.H. Nos. 86958-86959) southwest of the Arizona-New Mexico state line. These records evidently represent an extension northward from Sonora rather than eastward from south-central Arizona (fig. 4).

SPECIMENS EXAMINED: Sonora: 2 miles south of Nogales (U.S.N.M. Nos. 15751, 15752); 4.5 miles south of Tubutama (S.N.H.M. Nos. 15501, 15502); 18 and 19 miles north of Bavispe (S.N.H.M. Nos. 15506, 15226); Pilares (U.M.M.Z. No. 78427); El Tigre Mountains (U.M.M.Z. No. 78430); 15 miles (by road) east-northeast of Imuris (A.M.N.H. No. 84832).

DIAGNOSTIC CHARACTERS: Maximum

snout-vent length, in excess of 130 mm.; 98-115 (104.7 ± 1.2 , $N=17$) granules around midbody; 5-11 (8) scales separating paravertebral stripes; 32-44 (38.3, $N=21$) femoral pores; postantibrachial scales enlarged.

Juvenile dorsal pattern of six light stripes on a dark, unspotted ground, replaced in large adult individuals by light spots with little or no trace of stripes remaining (Zweifel, 1959, pl. 46, fig. 3). Ventral surfaces pale and immaculate in both sexes.

Cnemidophorus burti stictogrammus differs from typical *burti* in size (130+ as against 96 mm., S-V), scutellation (average of 104.7 compared to 93.3 GAB), the attainment of a completely spotted pattern, and a wider spacing of the paravertebral stripes. Apparently *C. b. stictogrammus* and *C. b. xanthonotus* differ similarly in size and scutellation, but *xanthonotus* is as yet poorly known.

REMARKS: *Cnemidophorus burti stictogrammus* is the largest race of its species. Pairs or even trios of closely related species of *Cnemidophorus* often are found together, and usually consist of species of different sizes (Zweifel, 1960; Duellman, 1960b). It is noteworthy that *stictogrammus* shares all its range with a smaller species, *C. exsanguis*, while *C. b. burti* and *C. b. xanthonotus* are the only lizards of the *sexlineatus* group in their respective regions. It may be that, where closely related species are sympatric, competition is reduced by selection for different maximum sizes.

Cnemidophorus burti xanthonotus Duellman and Lowe, new combination

Cnemidophorus sacki xanthonotus DUELLMAN AND LOWE, 1953, p. 2.

TYPE: U.M.M.Z. No. 105426, collected in the north fork of Alamo Canyon, Ajo Mountains, Pima County, Arizona, on June 15, 1951, by Charles H. Lowe, Jr.

RANGE (FIG. 4): Known only from the Ajo Mountains and Puerto Blanco Mountains, Organ Pipe Cactus National Monument, Pima County, Arizona.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 99 mm.; 85 granules around midbody in the single specimen counted; paravertebral stripes separated by four to six scales at midbody; 33-37 (35.5)

femoral pores; postantebrachial scales enlarged.

Diagnostic features of color pattern given in original description as: "(1) a striking reddish-brown to reddish-orange suffusion of color on the dorsal body surface sharply delimited at the dorsolateral contours; (2) ground color of lateral surfaces of body and upper surfaces of neck, legs, and feet a sharply contrasting dark grayish-green; (3) from 0 to 6 (usually less than 4) variably well defined longitudinal light body stripes; (4) no vertebral (middorsal) stripe; (5) numerous small, well defined, light colored spots evenly distributed on the body and neck, present on the upper surfaces of the base of the tail roughly in two longitudinal rows in the dark fields between the narrow light stripes, occasionally in the dark middorsal field between the paravertebral light stripes, and sometimes directly on the light body stripes; (6) spots on the dorsal surface of the body light orange-red in color; . . ." (Duellman and Lowe, 1953, p. 2).

REMARKS: This form might almost as well be regarded as a subspecies of *Cnemidophorus exsanguis*, but the relatively large size attained, the presence of males in *xanthonotus*, and the complete loss of striping occasionally seen in *xanthonotus* suggest a closer relationship to *C. burti stictogrammus*. Additional collections from northern Sonora and southwestern Arizona are needed to provide for the proper evaluation of this form.

Cnemidophorus calidipes Duellman

Cnemidophorus calidipes DUELLMAN, 1955, p. 1; 1960b, p. 97.

TYPE: U.M.M.Z. No. 112672 from Capirio, Michoacán, México; collected July 3, 1955, by William E. Duellman.

RANGE (FIG. 7): The valley of the Río Tepalcatepec in Michoacán; see Duellman (1960b, p. 99) for list of localities.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 79 mm.; 66–86 (75.0 ± 0.4 , $N=134$) dorsal granules around midbody; 31–47 (39.0 ± 0.3 , $N=134$) femoral pores; postantebrachials markedly enlarged; supra-orbital semicircle series usually encircling the second, third, and fourth supraoculars.

Juveniles with seven or eight (vertebrals fused in some) creamy white longitudinal

stripes on a black dorsum. Through ontogenetic change in color pattern, dorsal ground color changing from brown to cocoa-tan, spots developing in dark fields, stripes fragmenting into spots, and spots fusing laterally into vertical bars that are pale blue in adult males. Adult males with pink throats and black bellies and chests.

REMARKS: From the sympatric species, *C. costatus zweifeli* and *C. communis communis*, *calidipes* differs in having fewer dorsal granules, being smaller, having complete or nearly complete semicircle series, and lacking a greenish dorsum. *Cnemidophorus calidipes* may be most closely related to *Cnemidophorus parvisocius* in the upper Balsas Basin, which is a species of similar size with a nearly complete semicircle series and a moderate number of dorsal granules. The ranges of the two species are separated by a distance of about 450 kilometers (fig. 7).

Cnemidophorus communis communis Cope

Cnemidophorus communis COPE, 1877, p. 95.

Cnemidophorus communis copei GADOW, 1906, pp. 346–352 [numerous cotypes from several localities in the British Museum (Natural History) and Chicago Natural History Museum collections]. SMITH AND TAYLOR, 1950a, p. 328 (restrict the type locality to Colima, Colima); 1950b, p. 182 [designate B.M.(N.H.) No. 1906.7.9.5 as lectotype].

Cnemidophorus sackii communis, SMITH AND TAYLOR, 1950b, p. 182 (part).

Cnemidophorus sacki copei, PETERS, 1954, p. 18. DUELLMAN, 1954, p. 12 (part, specimens from Coalcomán, Michoacán).

Cnemidophorus communis communis, ZWEIFEL, 1959, pp. 74–79.

TYPE: Lectotype designated by Zweifel (1959, p. 74): U.S.N.M. No. 31542 from Colima, Colima, México; collected by John Xantus.

RANGE (FIG. 3): Coastal lowlands of Jalisco, Colima, and Michoacán, the Colima Plateau, low valleys in the Sierra de Coalcomán, and the Tepalcatepec Valley in Michoacán.

SPECIMENS EXAMINED: Zweifel (1959, p. 78) lists specimens examined from Colima and Jalisco. Those examined from Michoacán are: Aguililla (U.M.M.Z. No. 119551); 8 miles south of Arteaga (U.M.M.Z. No. 119554 [two specimens]); 12 miles south of Arteaga (U.M.M.Z. No. 119553 [two speci-

mens)]; Apatzingán (C.N.H.M. Nos. 36969, 109501, and 109502; U.S.N.M. Nos. 135969, 135971); 3 miles west of Apatzingán (K.U. No. 29292); Coahuayana (U.M.M.Z. Nos. 104510 [two specimens], 104516); Coalcomán (U.M.M.Z. Nos. 104513–104515, 104517–104520, 104521 [three specimens], 104522, 104751–104758 [34 specimens]); El Ticuiz (U.M.M.Z. No. 114727); between El Ticuiz and Ojos de Agua de San Telmo (U.M.M.Z. No. 104511); La Placita (U.M.M.Z. Nos. 104512, 114728 [five specimens]); Pómaro (U.M.M.Z. No. 104524 [two specimens]); Río Chachán (U.S.N.M. No. 63769); Salitre de Estopilas (U.M.M.Z. No. 104523); 3 miles west of San Juan de Lima (U.M.M.Z. No. 114729).

DIAGNOSTIC CHARACTERS: This summary is based on 110 specimens (no juveniles are available) from throughout the range of the species. Geographic variation is discussed below; hence, only the ranges of variation and not averages are presented here.

Maximum snout-vent length, 135 mm.; 105–175 dorsal granules at midbody; 8–18 granules between paravertebral stripes; PV/GAB, 0.06–0.15; 38–53 femoral pores; postantebrachials moderately enlarged.

Smallest specimens seen (50 mm., snout-vent length) having a dark brown dorsum, six distinct greenish yellow longitudinal stripes, and small yellowish spots posteriorly in dark fields. Ground color in adults changing from brown to greenish gray or olive tan, and yellow spots replacing stripes, except on nape, where stripes faintly persist. Adult males with pink throat, blue chest, and black belly.

REMARKS: Zweifel (1959, p. 75) discussed variation in specimens from Colima. (See

also table 4.)

Zweifel (1959, p. 75) comments on the high number of dorsal granules in the sample from Manzanillo, Colima, and suggests that the high average number is a local condition and not characteristic of the coastal populations. This suggestion is borne out by specimens from the coast of Michoacán. Duellman and Wellman (1960, p. 43) note that specimens of *Cnemidophorus lineatissimus lineatissimus* from Manzanillo have a greater number of dorsal granules than specimens from the rest of the range. The number of femoral pores is high in the samples from Manzanillo and from the coast of Michoacán, but alike in the other samples. Although the specimens from the Sierra de Coalcomán have a much lower number of dorsal granules than the other samples, they show no significant differences in femoral pores or coloration. Additional material is needed for an adequate understanding of the geographic variation in this form to be gained.

Cnemidophorus costatus zweifeli and *C. calidipes* occur sympatrically with *Cnemidophorus communis communis* in the Tepalcatepec Valley in Michoacán. *Cnemidophorus costatus* is like *communis* in being of large size, but differs in having fewer dorsal granules, abruptly enlarged postantebrachials, and a color pattern not consisting of rows of small pale spots. *Cnemidophorus calidipes* is a small species having a maximum snout to vent length of 79 mm., fewer than 90 dorsal granules around midbody, and complete or nearly complete supraorbital semicircle series.

Zweifel (1959, pp. 71–72) discusses the use of the specific name *communis* and the placement of *Cnemidophorus communis copei* Gadow.

TABLE 4

VARIATION IN SCUTELLATION OF SEVERAL POPULATIONS OF *Cnemidophorus communis communis*

	Granules at Midbody			PV/GAB			Femoral Pores		
	Range	(Mean $\pm \sigma_m$)	N	Range	(Mean $\pm \sigma_m$)	N	Range	(Mean $\pm \sigma_m$)	N
Colima (all localities)	—	—	—	0.057–0.148	(0.100 \pm 0.003)	50	—	—	—
Manzanillo, Colima	142–175	(155.1 \pm 2.7)	11	—	—	—	42–54	(47.5 \pm 1.1)	11
Colima, Colima	118–154	(137.9 \pm 1.3)	34	—	—	—	39–51	(43.9 \pm 0.5)	34
Coast of Michoacán	129–146	(136.3 \pm 1.3)	15	0.059–0.099	(0.076 \pm 0.033)	15	43–52	(48.3 \pm 0.7)	15
Sierra de Coalcomán	105–144	(119.7 \pm 1.0)	44	0.064–0.112	(0.079 \pm 0.005)	43	38–48	(42.3 \pm 0.4)	44
Tepalcatepec Valley	124–137	(128.3)	6	0.080–0.088	(0.085)	4	39–43	(41.3)	6

***Cnemidophorus communis mariarum* Günther**

Cnemidophorus mariarum GÜNTHER, 1885-1902, p. 28. GADOW, 1906, p. 329.

Cnemidophorus sexlineatus gularis, BURT, 1931a, p. 116 (part).

Cnemidophorus sackii mariarum, SMITH AND TAYLOR, 1950b, p. 183.

Cnemidophorus communis mariarum, ZWEIFEL, 1959, p. 79.

TYPE: No type specimen designated. Smith and Taylor (1950b, p. 183) list B.M.(N.H.) Nos. 1881.10.1.81, 1881.10.1.82, and 1881.10.1.86-1881.10.1.88 as cotypes. The cotypes were collected on the Tres Marias Islands, Nayarit, México, by Alphonse Forrer in 1881.

RANGE (FIG. 3): The four islands of the Tres Marias Group.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 120 mm.; 136-154 (144.8 ± 1.0 , $N=24$) granules around midbody; PV/GAB, 0.10-0.17 (0.138 ± 0.005 , $N=20$), excluding specimens from San Juanito Island which have more closely spaced stripes (Zweifel, 1959, p. 80); 36-50 (43.3 ± 0.7 , $N=23$) femoral pores; postantebrachial scales slightly enlarged.

Juveniles with six primary stripes on a dark brown ground color, some with a pair of faint stripes in pale vertebral field. Adult lizards spotted on posterior part of trunk, but dark fields broken into cross bars anteriorly. Chin pink, chest and abdomen dark blue in some large adults.

REMARKS: The majority of specimens of *mariarum* are juveniles. The maximum size probably exceeds that given above, and details of variation in color pattern of adults are poorly known.

Cnemidophorus costatus costatus

Cope, new combination

Cnemidophorus costatus COPE, 1877, p. 95.

Cnemidophorus gularis costatus, COPE, 1892, p. 50.

Cnemidophorus mexicanus balsas GADOW, 1906, p. 363 (no type designated among numerous cotypes from Morelos and Guerrero). SMITH AND TAYLOR, 1950a, p. 336 (restrict type locality to Cuernavaca, Morelos); 1950b, p. 181 [designate B.M.(N.H.) No. 1906.6.1.71, now B.M.(N.H.) No. 1946.9.8.20, *fide* J. C. Battersby, lectotype].

Cnemidophorus sexlineatus gularis, BURT, 1931a,

p. 97 (part; specimens from Guerrero, Morelos, and Puebla).

Cnemidophorus sackii sackii, SMITH, 1949, p. 41. SMITH AND TAYLOR, 1950b, p. 180.

Cnemidophorus sacki sacki, ZWEIFEL, 1959, p. 70. DUELLMAN, 1960a, p. 595. DAVIS AND DIXON, 1961, p. 52.

TYPE: U.S.N.M. No. 31359 from "Mexico"; collected by Adolphe Boucard. Smith and Taylor (1950b, p. 181) restrict the type locality to Cuernavaca, Morelos, México.

RANGE: The upper Balsas Basin in Guerrero, México, Morelos, and Puebla.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 110 mm.; 88-105 (96.3 ± 0.4 , $N=106$) dorsal granules around midbody; PV/GAB, 0.10-0.20 (0.154 ± 0.006 , $N=72$); 32-44 (36.2 ± 0.3 , $N=106$) femoral pores; postantebrachial scales enlarged.

Juveniles with six creamy white, longitudinal stripes on brownish black dorsum and some with faint vertebral stripe. During growth stripes fragmenting into spots, and pale spots developing in dark fields. Spots expanding and diffusing, resulting, in adults, in a pale tan or greenish tan dorsum with irregular dark brown cross bars (Zweifel, 1959, pl. 46, figs. 1-2). Throat pink in adult males.

REMARKS: It was to this population that Smith (1949, p. 41) erroneously assigned the specific name *sacki*. His conclusions were based on photographs of the type of *sacki* (Z.M.B. No. 884), an immature male having a snout to vent length of 106 mm., distinct lateral and dorsolateral stripes, and 125 dorsal granules around the body. Possibly Smith was not aware of the size or the scutellation of this specimen. Individuals of *costatus costatus* having a snout to vent length of 100 mm. have no trace of longitudinal stripes; furthermore the highest number of dorsal granules at midbody is 105, a number far below that in the type specimen of *sacki*. We apply the name *sacki* to the lizards that previously have been known as *Cnemidophorus sacki australis* (see discussion of *Cnemidophorus sacki sacki*), which leaves *Cnemidophorus costatus* Cope (1877) as the next available name for this Balsas population. The type of *costatus* (U.S.N.M. No. 31359) is an adult male, with a snout to vent length of 85 mm., 99 dorsal granules around midbody, and

35 femoral pores. The color pattern is not fully developed, for the dark cross bars are broken medially and are absent posteriorly, where spots persist.

Cnemidophorus mexicanus balsas is evidently a synonym of *C. c. costatus*. According to J. C. Battersby, the lectotype is an adult male, with a snout to vent length of 93 mm., 98 dorsal granules at midbody, and 32 femoral pores. Data on the other specimens in the type series [B.M.(N.H.) Nos. 1946.9.8.21–1946.9.8.32], kindly furnished by Mr. Battersby, show that they all fall within the ranges of variation of *costatus*.

Cnemidophorus costatus costatus occurs sympatrically with *Cnemidophorus sacki gigas* from which it differs in having fewer dorsal granules and enlarged postantibrachials and being smaller in the adult. Specimens are lacking from the middle Balsas Basin to show definite intergradation between *costatus costatus* and *costatus zweifeli*. Specimens of the latter subspecies from eastern Michoacán show tendencies towards *costatus*; thus, we assume that they are conspecific (see Duellman, 1960a).

Cnemidophorus costatus barrancorum
Zweifel, new combination

Cnemidophorus sacki barrancorum ZWEIFEL, 1959, p. 102. TANNER AND ROBISON, 1959, p. 82.

Cnemidophorus sexlineatus gularis, BURT, 1931a, p. 116 (part).

TYPE: M.V.Z. No. 50724, collected at Rancho Guiracoba, about 20 miles southeast of Alamos, Sonora, México, on August 7, 1950, by Richard G. Zweifel.

RANGE: The barranca region of the Sierra Madre Occidental in southwestern Chihuahua and adjacent Sonora. Locality records are given by Zweifel (1959, p. 105). Specimens collected by W. W. Tanner at Urique, Chihuahua (B.Y.U. Nos. 14326, 14328–14332), provide an additional locality.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 107 mm.; 91–119 (103.1 ± 1.4 , $N=21$, topotypes) granules around midbody; PV/GAB, $0.10-0.19$ (0.150 ± 0.005 , $N=20$); 10–20 (15.7 , $N=21$) scales between the paravertebral stripes; 30–40 (35.4 ± 0.6 , $N=22$) femoral pores; postantibrachial scales enlarged.

Large adult lizards retaining at least a dis-

tinct trace of the juvenile striped pattern, but spotting in some specimens well developed in dark fields. Chin pale and immaculate, other ventral surfaces rarely showing much darkening.

REMARKS: This subspecies is known from relatively few specimens from a restricted area, and more information on distribution and variation is needed for a clarification of the relationship to populations of *costatus* on the coastal plain, and to *C. exsanguis* and *C. septemvittatus* on the Mexican Plateau.

Cnemidophorus costatus griseocephalus
Zweifel, new combination

Cnemidophorus sacki griseocephalus ZWEIFEL, 1959, p. 96.

TYPE: A.M.N.H. No. 75930, collected 11.4 miles east of Navojoa, Sonora, México, on August 21, 1956, by Richard G. Zweifel.

RANGE: Southern Sonora and northern Sinaloa; largely on the coastal plain, replaced by *C. c. barrancorum* inland.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 110 mm.; 97–119 (107.5 ± 0.8 , $N=52$) granules around midbody; 11–23 (16.2 ± 0.5 , $N=34$) granules between paravertebral stripes; PV/GAB, $0.10-0.18$ (0.153 ± 0.005 , $N=34$); 30–39 (34.2 ± 0.3 , $N=52$) femoral pores; postantibrachial scales enlarged.

Young lizards striped, with unspotted dark lateral fields separating six primary stripes; vertebral field slightly lighter. Dorsal surface of body of large individuals spotted; all trace of striping lost. Black ground color of body contrasting with blue-gray of head and neck. Chin immaculate pale blue, chest and abdomen frequently very dark blue, almost black, in large lizards.

REMARKS: The details of the variation and distribution of *griseocephalus* can be found in the original description (Zweifel, 1959, pp. 96–102).

Cnemidophorus costatus huico Zweifel

Cnemidophorus sacki huico ZWEIFEL, 1959, p. 85.

Cnemidophorus communis occidentalis, GADOW, 1906, p. 342 (part).

Cnemidophorus sexlineatus gularis, BURT, 1931a, pp. 116–117 (part).

Cnemidophorus sackii communis, SMITH AND TAYLOR, 1950b, p. 182 (part).

C. [nemidophorus] costatus huico, ZWEIFEL, 1961, p. 100.

TYPE: A.M.N.H. No. 75570, collected by J. Bordaz and E. Goldschmidt at Peñitas, Nayarit, México, in 1956.

RANGE: Vicinity of Concordia, Sinaloa, south to Tepic, Nayarit; also Isabel Island. Intergrades with *C. c. mazatlanensis* in the vicinity of Presidio, Sinaloa, and with *C. c. occidentalis* a few miles south of Tepic, Nayarit.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 106 mm.; 91–118 (104.4 ± 0.7 , $N=90$) granules around midbody; 10–20 (14.0 ± 0.3 , $N=69$) granules between paravertebral stripes; PV/GAB, 0.05–0.19, highest average inland in northeastern Nayarit (0.142 ± 0.004 , $N=24$), lowest average on Isabel Island (0.093 ± 0.005 , $N=13$); 36–46 femoral pores (40.2 ± 0.3 , $N=91$); postantebrachial scales enlarged.

Juvenile individuals with six prominent light stripes on a dark brown background, and one or a pair of faint, indistinct vertebral stripes. Stripes disappearing from body of large adults, though more persistent on neck, and replaced by spots. Chin pink to reddish brown, chest and abdomen frequently dark blue.

REMARKS: This form is treated in detail in the original description (Zweifel, 1959, pp. 85–89). Grant and Smith (1960) confused this form with a subspecies of *C. septemvittatus* (Zweifel, 1961).

Cnemidophorus costatus mazatlanensis

Zweifel, new combination

Cnemidophorus sacki mazatlanensis ZWEIFEL, 1959, p. 89.

Cnemidophorus communis occidentalis, GADOW, 1906, p. 342 (part).

Cnemidophorus sexlineatus gularis, BURT, 1931a, p. 117 (part).

Cnemidophorus sackii communis, SMITH AND TAYLOR, 1950b, p. 182 (part).

TYPE: A.M.N.H. No. 75921, collected 2 miles north of Coyotitán, Sinaloa, México, on August 19, 1956, by Richard G. Zweifel.

RANGE: The coastal plain of Sinaloa from Mazatlán to Coyotitán.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 104 mm.; 95–121 (105.4 ± 1.1 , $N=34$) granules around midbody;

PV/GAB 0.11–0.20 (0.139 ± 0.003 , $N=34$); 11–20 (14.6 , $N=34$) scales between the paravertebral stripes; 33–45 (37.8 ± 0.4 , $N=33$) femoral pores; postantebrachial scales enlarged.

Juvenile pattern of six light lines on a dark ground color, and a pale vertebral field without distinct lines, altering in large adults chiefly through appearance of light spots in fields. Stripes never completely replaced by spots, though all stripes not clearly visible in all large adult lizards. Chin white (pale blue), with black spots or, in a few, wholly black. Chest and abdomen pale in most individuals, with only edges of scales dark, in rare instances wholly black.

REMARKS: The variation and intergradation of *mazatlanensis* with adjacent subspecies are treated in detail in the original description (Zweifel, 1959, pp. 89–93).

Cnemidophorus costatus nigrigularis

Zweifel, new combination

Cnemidophorus sacki nigrigularis ZWEIFEL, 1959, p. 93.

TYPE: A.M.N.H. No. 75925, collected 10.5 miles northwest of Culiacán, Sinaloa, México, on August 20, 1956, by Richard G. Zweifel.

RANGE: The coastal plain of central Sinaloa.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 114 mm.; 95–120 (107.2 ± 1.0 , $N=44$) granules around midbody; PV/GAB, 0.10–0.20 (0.148 ± 0.004 , $N=28$); 10–20 (15.9 , $N=23$) scales between the paravertebral stripes; 32–41 (36.8 ± 0.4 , $N=45$) femoral pores; postantebrachial scales enlarged.

Juveniles with six prominent stripes and a pale vertebral field. Dorsal body surface of large adult individuals spotted, with traces of stripes persisting on neck in some. Ventral surfaces of large adults from chin to posterior end of abdomen typically wholly black.

REMARKS: See Zweifel (1959, pp. 93–96) for discussion of variation and distribution of this subspecies.

Cnemidophorus costatus occidentalis Gadow

Cnemidophorus communis occidentalis GADOW, 1906, p. 339 (part).

Cnemidophorus sexlineatus gularis, BURT, 1931a, p. 116 (part).

Cnemidophorus sacki communis, SMITH AND TAYLOR, 1950b, p. 182 (part).

Cnemidophorus sacki occidentalis, ZWEIFEL, 1959, p. 81.

Cnemidophorus costatus occidentalis, ZWEIFEL, 1961, p. 103.

TYPE: B.M.(N.H.) No. 1892.2.8.33, from Ixtlán, Nayarit, México, designated as lectotype by Smith and Taylor (1950b, p. 182).

RANGE: Southern Nayarit and northern Jalisco to northwestern Michoacán.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 126 mm.; 97–118 (106.3 ± 0.6 , $N=62$) granules around midbody; 9–18 (13.8 , $N=44$) granules between paravertebral stripes; PV/GAB, $0.09\text{--}0.18$ (0.130 ± 0.003 , $N=50$); 32–45 (38.8 ± 0.3 , $N=67$) femoral pores; postantibrachial scales enlarged.

Striped body pattern of juveniles replaced in large adults by dark cross bars anteriorly, in some specimens crossing the dorsum, and light spots on rump. Adult individuals usually with pink to reddish brown chin, chest and abdomen predominantly dark blue.

REMARKS: For a detailed discussion of this form, see Zweifel (1959, pp. 81–85). See also Zweifel (1961) for a discussion of the relationship of this form to *C. septemvittatus subsp.*

Cnemidophorus costatus zweifeli Duellman

Cnemidophorus sacki zweifeli DUELLMAN, 1960a, p. 589.

Cnemidophorus costatus zweifeli, DUELLMAN, 1961, p. 83.

TYPE: U.M.M.Z. No. 119542 from Capirio, Michoacán, México; collected by William E. Duellman, Jerome B. Tulecke, and John Wellman.

RANGE: The valley of the Río Tepalcatepec in Michoacán; it probably occurs in adjacent Jalisco and in the western part of the Balsas Basin in southeastern Michoacán and adjacent Guerrero.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 132 mm.; 91–117 (106.2 ± 0.4 , $N=191$) granules around midbody; PV/GAB, $0.06\text{--}0.16$ (0.097 ± 0.007 , $N=105$); 32–49 (41.1 ± 0.2 , $N=189$) femoral pores; postantibrachial scales enlarged.

Juveniles with six distinct, creamy white, longitudinal stripes on brownish black dorsum, and in some a faint creamy tan vertebral

stripe. Ontogenetic change in coloration resulting in fragmentation of stripes into spots, development of pale spots on flanks, change in dorsal ground color from black to tan, and development of pale greenish middorsal area, which in most large adults includes paravertebral rows of spots. Pink throat of adult males with a median blue spot or transverse band.

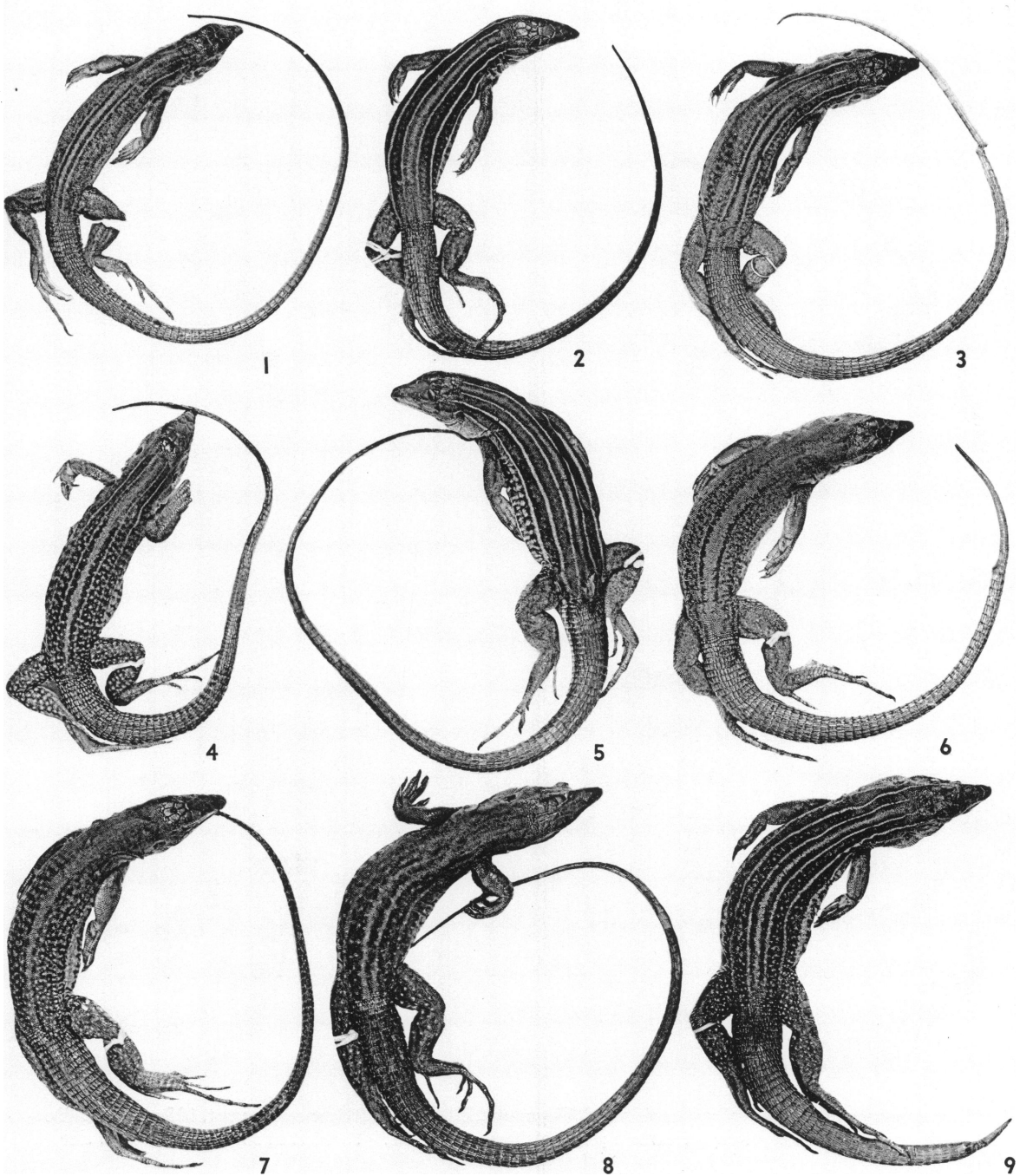
REMARKS: Specimens from the Balsas Valley in southeastern Michoacán are like typical *zweifeli* in coloration but show trends towards *costatus costatus* in scutellation (see Duellman, 1960a, p. 592).

Occurring sympatrically with *Cnemidophorus costatus zweifeli* are two other species in the *sexlineatus* group: *communis communis* and *calidipes*. The former is like *zweifeli* in being of moderately large size, but *communis* has more dorsal granules (105 to 144) and has a greenish dorsum with yellow spots. *Cnemidophorus calidipes* is a small species having a maximum snout to vent length of 79 mm., a maximum of 86 dorsal granules at midbody, and a more extensive circumorbital series.

POPULATIONS OF *Cnemidophorus costatus* NOT ALLOCATED TO SUBSPECIES

Although the variation and distribution of most subspecies of *Cnemidophorus costatus* have been fairly well worked out, there remain populations at the northern and southern extremes of the range of the species that invite further study.

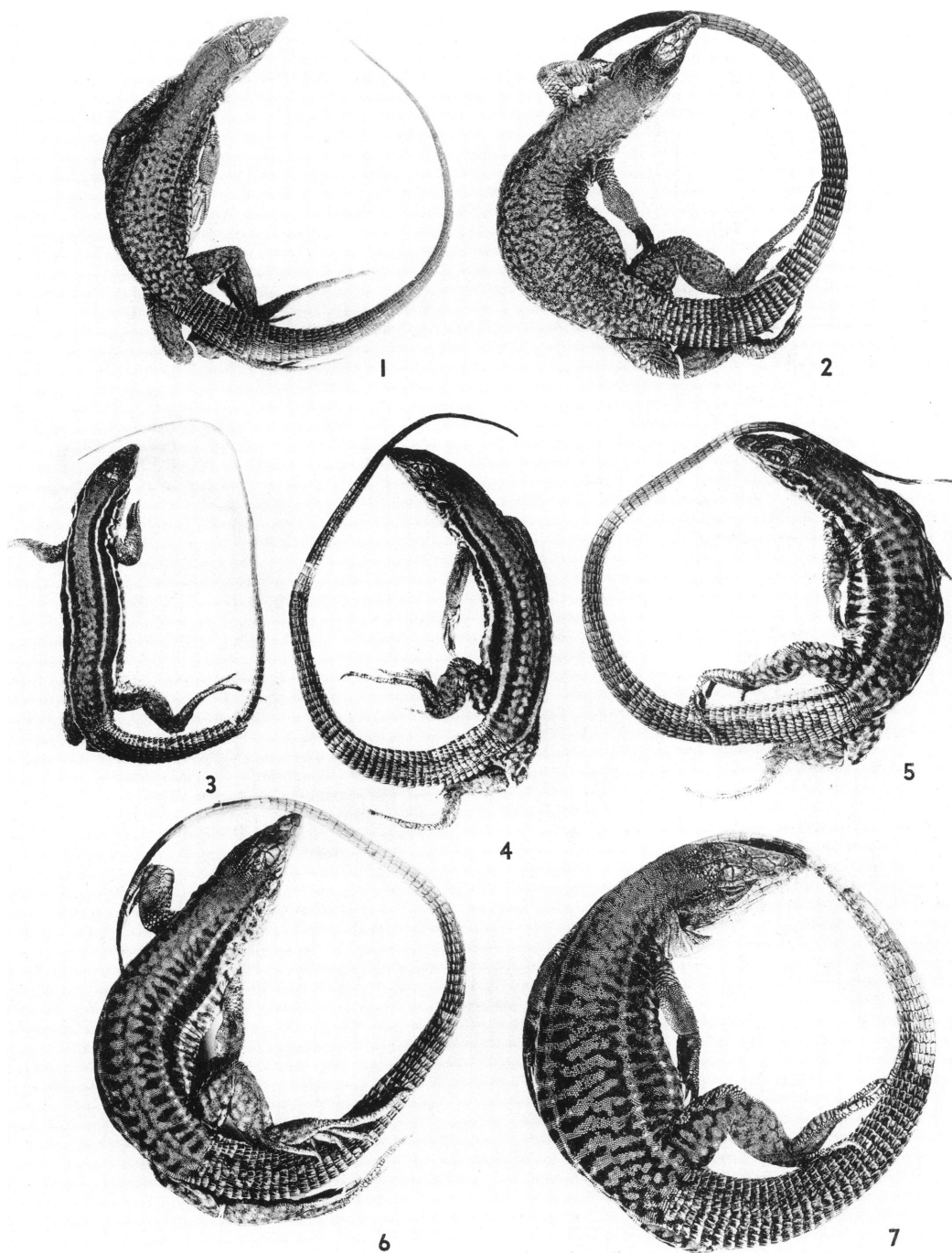
NORTHERN POPULATIONS: The principal problems in the north involve the racial identity of lizards inhabiting central Sonora, in the region east of Hermosillo, and the relationship of these lizards to those we assign to *Cnemidophorus burti*. In August, 1960, Zweifel, H. Pough, C. Cole, and K. John collected eight specimens of *Cnemidophorus costatus* at two localities in central Sonora, 13 and 25 miles east (by road) of Mazatán (A.M.N.H. Nos. 84953–84960). Pertinent characteristics of the lizards are: GAB, 90–106 (96.5 , $N=8$); femoral pores, 30–35 (32.0 , $N=8$); paravertebral stripes separated by 7–13 scales (10.4 , $N=7$); PV/GAB, $0.07\text{--}0.13$ (0.107 , $N=7$). The largest specimen measures 104 mm. from snout to vent. It is a male with a dorsal pattern of small pale dots and only the faintest trace of striping present on the neck. Other



Males of *Cnemidophorus angusticeps* from Yucatán, showing variation in spotting and striping. 1. U.C. No. 12587; snout to vent, 73 mm.; Pisté. 2. U.C. No. 12685; snout to vent, 77 mm.; Chichen Itzá. 3. U.C. No. 12686; snout to vent, 80 mm.; Chichen Itzá. 4. U.C. No. 12566; snout to vent, 80 mm.; 9 kilometers north of Mérida. 5. U.C. No. 12623; snout to vent, 81 mm.; Pisté. 6. U.C. No. 12569; snout to vent, 88 mm.; 9 kilometers north of Mérida. 7. U.C. No. 12567; snout to vent, 90 mm.; 9 kilometers north of Mérida. 8. U.C. No. 12647; snout to vent, 90 mm.; Pisté. 9. U.C. No. 12630; snout to vent, 94 mm.; Pisté. All to same scale

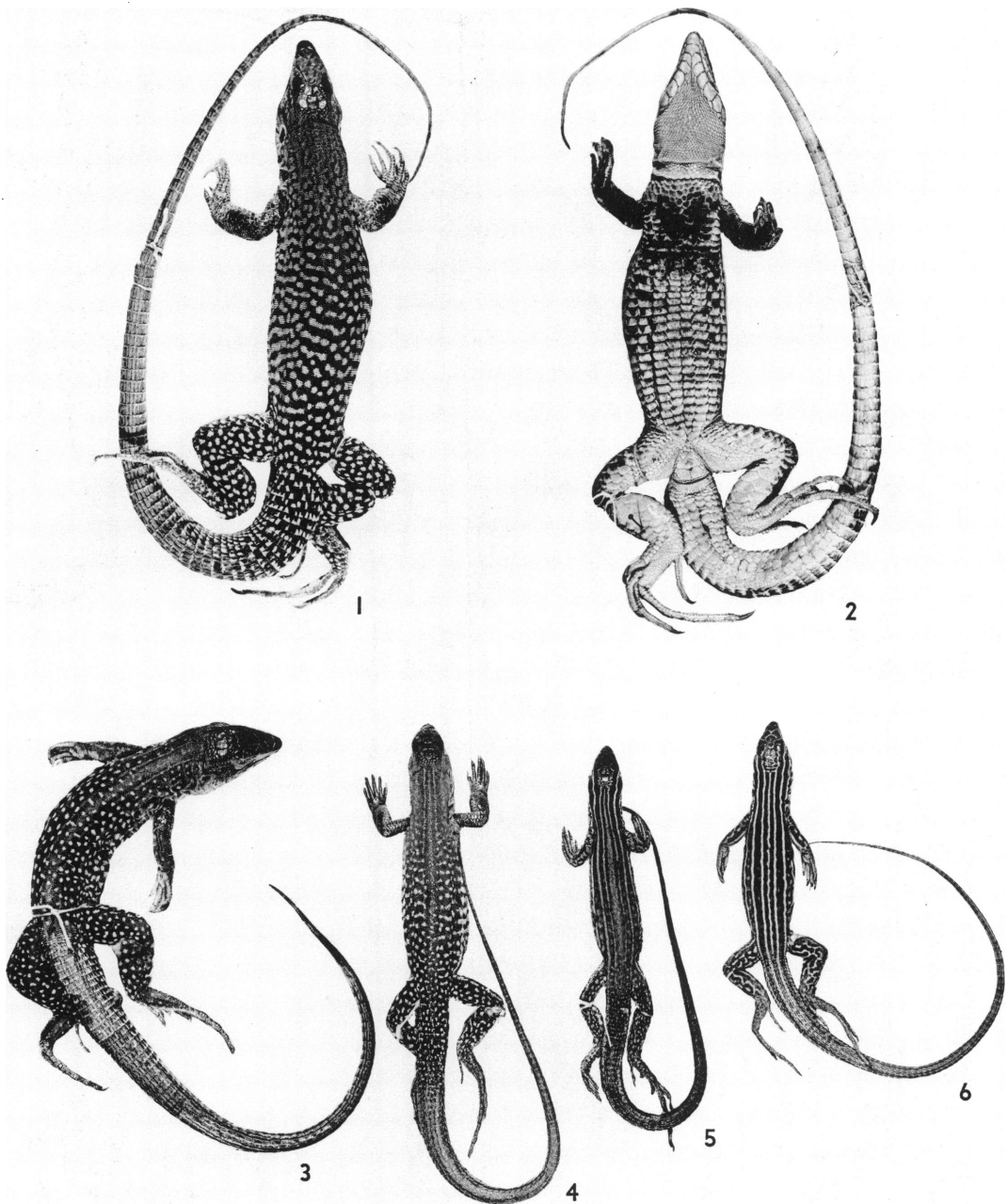


Type specimen of *Cnemidophorus sacki sacki* Wiegmann, Z.M.B. No. 884; snout to vent, 105 mm. 1. Dorsal surface; note similarity to specimens in plate 26, figures 4 and 5. 2. Ventral surface. Natural size



1, 2. *Cnemidophorus sacki gigas*. 1. U.C. No. 8575; snout to vent, 97 mm.; 10 miles east of Cuernavaca, Morelos. 2. U.C. No. 8578; snout to vent, 114 mm.; 10 miles east of Cuernavaca, Morelos. 3-7. *Cnemidophorus sacki sacki*. 3. U.C. No. 8491; snout to vent, 81 mm.; 25 miles east of Oaxaca, Oaxaca. 4. U.C. No. 8497; snout to vent, 92 mm.; 13 miles east of Oaxaca, Oaxaca. 5. U.C. No. 8499; snout to vent, 100 mm.; 13 miles east of Oaxaca, Oaxaca. 6. U.C. No. 8494; snout to vent, 113 mm.; 25 miles east of Oaxaca, Oaxaca. 7. U.C. No. 8502; snout to vent, 130 mm.; 13 miles east of Oaxaca, Oaxaca.

All to same scale



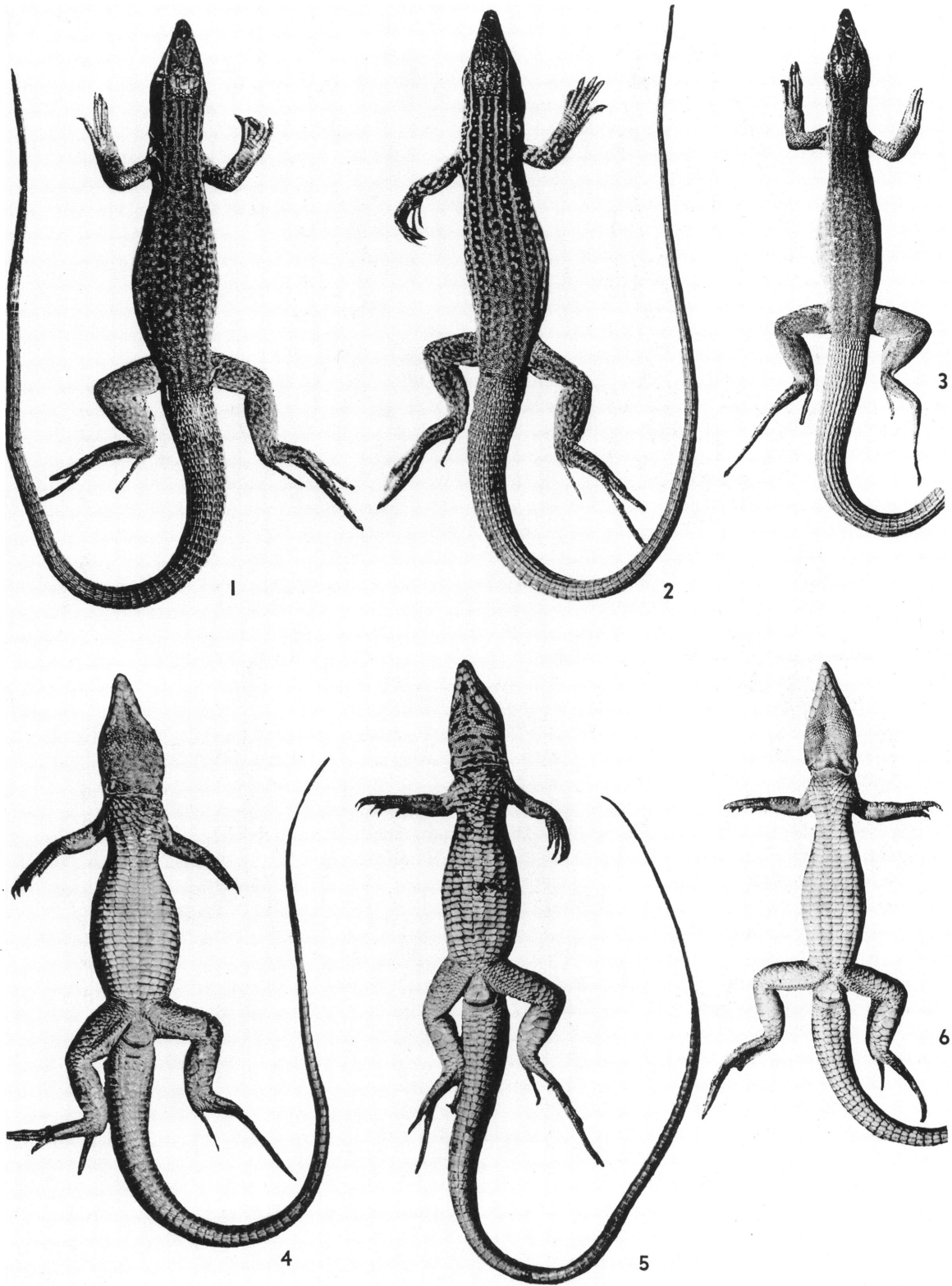
1, 2. *Cnemidophorus septemvittatus scalaris*, K.U. No. 51880, adult male; snout to vent, 108 mm.; 6 miles northeast of Laguna, Chihuahua. 2. Same specimen, ventral surface

3. *Cnemidophorus septemvittatus* ssp., U.I.M.N.H. No. 46678; adult male; snout to vent, 87 mm.; Barranca de Oblatos, Jalisco

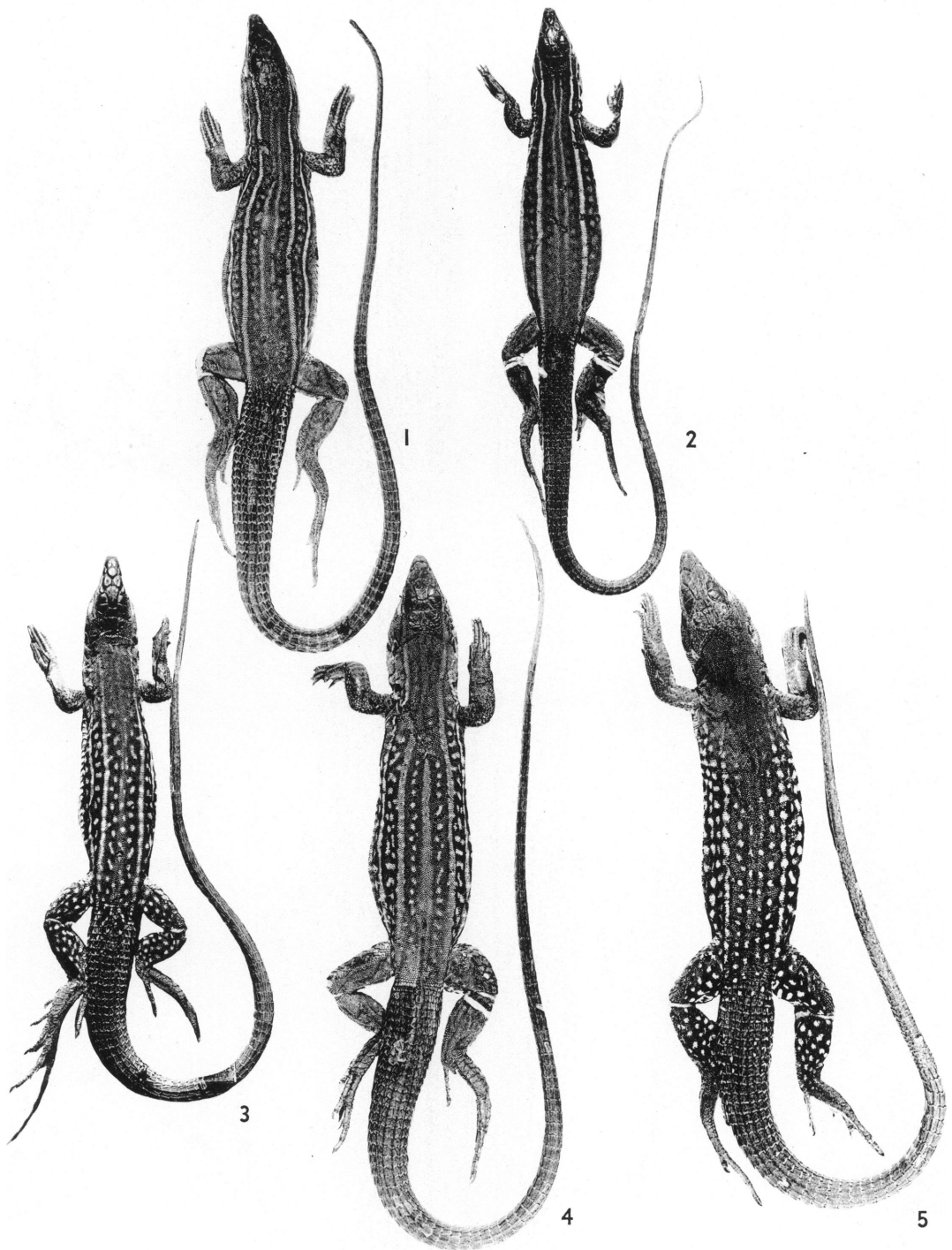
4, 5. *Cnemidophorus calidipes*. 4. A.M.N.H. No. 79051; adult male; snout to vent, 72 mm.; 11.8 miles east of Apatzingán, Michoacán. 5. A.M.N.H. No. 79050; adult female; snout to vent, 63 mm.; Capirio, Michoacán

6. *Cnemidophorus perplexus*, A.M.N.H. No. 72986; adult female; snout to vent, 59 mm.; 8.7 miles west and 22.8 miles south of New Bingham, Socorro County, New Mexico

All to same relative scale



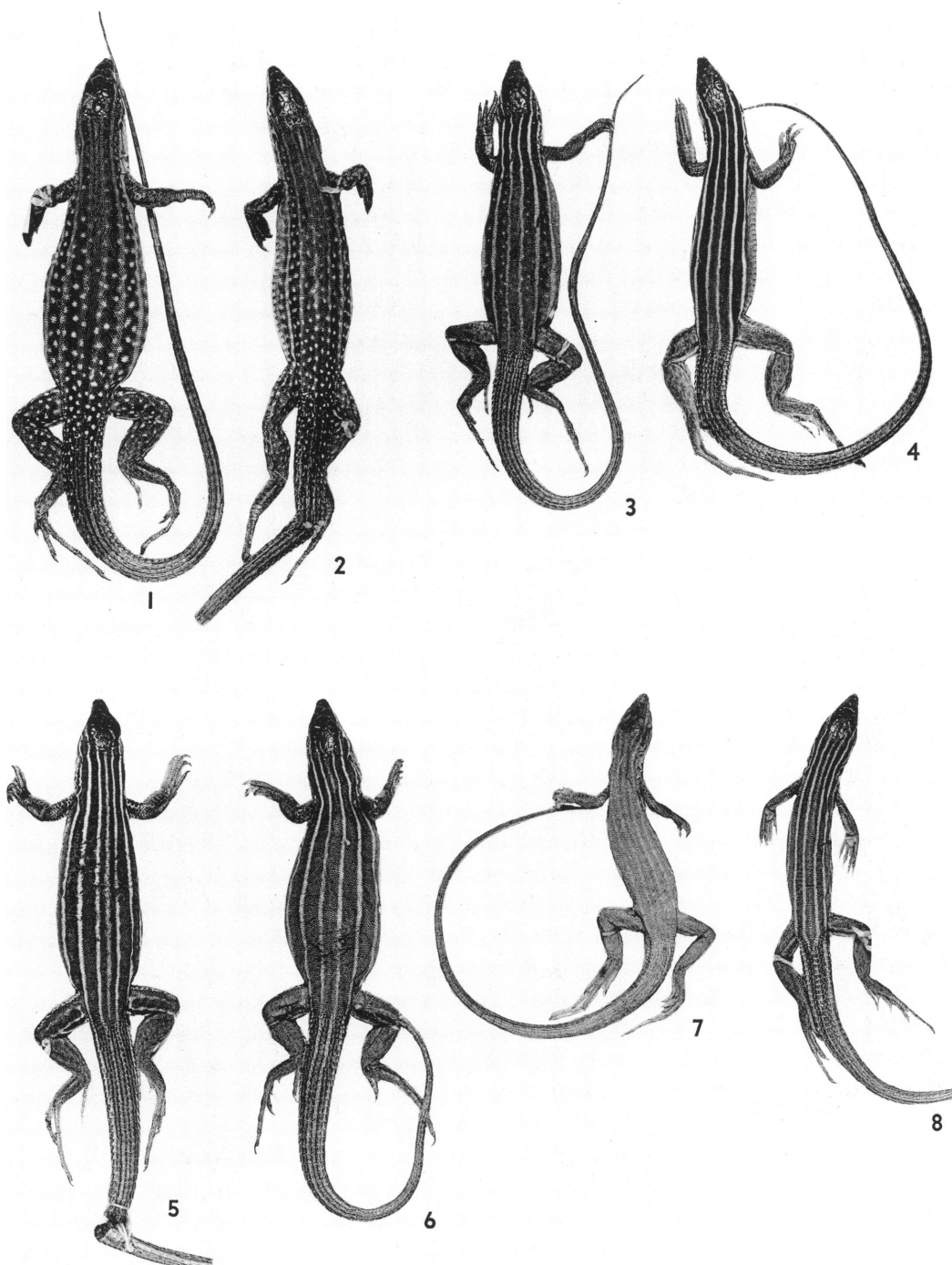
Three subspecies of *Cnemidophorus septemvittatus* from Coahuila, México. 1. *C. s. semifasciatus*, A.M.N.H. No. 77287; adult male; snout to vent, 90 mm.; 2 miles west of Parras. 2. *C. s. septemvittatus*, A.M.N.H. No. 77296; adult male; snout to vent, 86 mm.; 36 miles south of Castaños. 3. *C. s. pallidus*, A.M.N.H. No. 77311; adult male, snout to vent, 80 mm.; 3 miles west of Cuatro Ciénegas. 4-6. Ventral surfaces of above specimens in same order. Photographs reproduced to same relative scale from color transparencies of freshly killed lizards, showing shades unaltered by preservative



1. *Cnemidophorus burti burti*, A.M.N.H. No. 80598; male; snout to vent, 87 mm.; 2 miles northeast of Guaymas, Sonora, Mexico.

2-5. *Cnemidophorus burti burti* × *C. b. stictogrammus* from 5 miles southeast of La Pintada, Sonora, México. 2. A.M.N.H. No. 80599; female; snout to vent, 78 mm. 3. A.M.N.H. No. 80600; male; snout to vent, 82 mm. 4. A.M.N.H. No. 80602; adult male; snout to vent, 101 mm. 5. A.M.N.H. No. 80601, adult male; snout to vent, 104 mm.

All to same relative scale

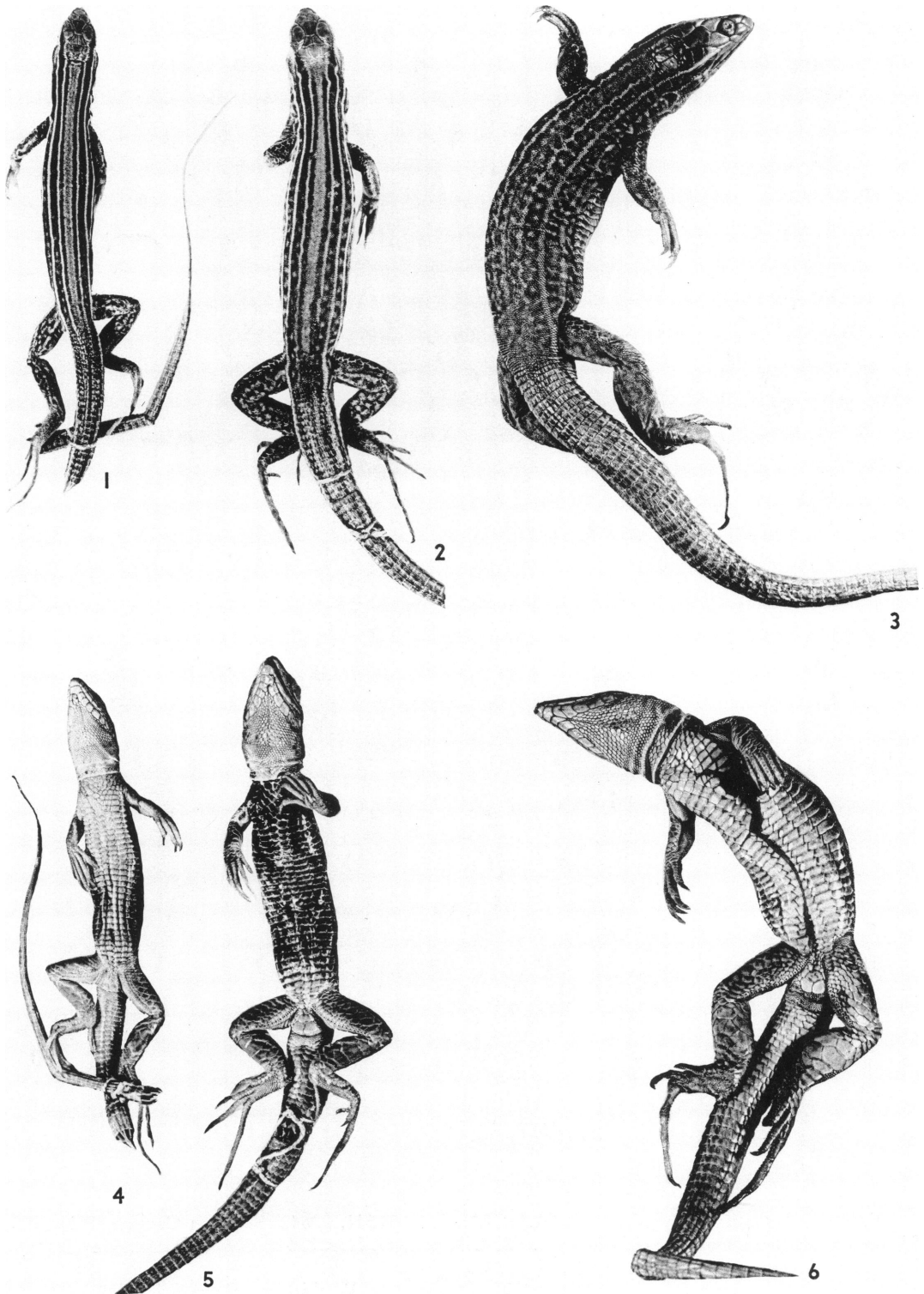


1-4. *Cnemidophorus exsanguis*. 1, 2. A.M.N.H. Nos. 80641, 80632, Skeleton Canyon, Peloncillo Mountains, Hidalgo County, New Mexico. 3, 4. A.M.N.H. Nos. 80654, 80650, Post Office Canyon, Peloncillo Mountains, Hidalgo County, New Mexico

5. *Cnemidophorus velox*, A.M.N.H. No. 81901, Springdale, Washington County, Utah

6-8. *Cnemidophorus inornatus*. 6. A.M.N.H. No. 80624, 8 miles west of Animas, Hidalgo County, New Mexico. 7. A.M.N.H. No. 68400, White Sands, Otero County, New Mexico. 8. A.M.N.H. No. 68401, $\frac{1}{4}$ mile outside of White Sands, Otero County, New Mexico

All to same relative scale



Type specimens of *Cnemidophorus mexicanus*, all catalogued Z.M.B. No. 6209, presumably from Oaxaca, Oaxaca. 1. Snout to vent, 50 mm. 2. Snout to vent, 61 mm. 3. Snout to vent, 82 mm. 4-6. Ventral surfaces of above specimens, in the same order

specimens have six distinct stripes and a pale vertebral band. The fields are clearly spotted in six specimens (80–88 mm. S-V) and faintly spotted in two (77–78 mm. S-V). The large male has ventral surfaces predominantly pale, but each scale has a dark anterior edge. The other lizards are immaculate beneath.

The previous records for *Cnemidophorus costatus* closest to the new localities are about 100 miles southeast (*C. c. barrancorum*) and 100 miles south (*C. c. griseocephalus*). So far as is known, *barrancorum* does not attain a completely spotted condition; otherwise, it is quite similar to the central Sonoran form. The spacing of paravertebral stripes is slightly greater in *barrancorum* as a whole, but the northernmost population of *barrancorum* has narrower spacing than is typical for the subspecies (Zweifel, 1959, p. 104), possibly a tendency towards the central Sonoran type.

Cnemidophorus c. griseocephalus resembles lizards from east of Mazatán in attaining a completely spotted pattern, but differs in color. The contrast between black body, gray head, and yellow spots seen in *griseocephalus* is not apparent in the central Sonoran lizards, the only large male of which had (in life) relatively little contrast between the brown head and body, and had greenish white spots. The paravertebral lines of *griseocephalus* are, on the average, more widely spaced. The ventral surfaces of *griseocephalus* are partly or wholly dark blue in almost all specimens 100 mm. or more in snout to vent length, but the largest of the Mazatán lizards has only a slight indication of darkening. The sample in question differs from both *griseocephalus* and *barrancorum* in having a lower average number of scales around midbody, 96.5, as compared to 107.2 in *griseocephalus* and 103.1 in *barrancorum*.

Lizards that we regard as intermediate between *C. b. burti* and *C. b. stictogrammus* are found approximately 60 miles west of the region where our *costatus* from central Sonora were found (see p. 174). Similarities include the average number of granules around midbody and the attainment of a completely spotted pattern. The paravertebral stripes are fused or narrowly separated in the western lizards, well separated in those from east of Mazatán. The conspicuous orange-brown color of the rump and tail common to all *C.*

burti is replaced in the lizards from central Sonora by greenish brown.

Although the lizards from east of Mazatán are in some ways intermediate between *costatus* and *burti*, we prefer to await additional collections and studies before proposing that all belong to one species. The central region of Sonora has as yet been poorly explored by herpetologists, and we hope that collectors who penetrate this region will make an effort to fill in the geographic gaps in collections.

SOUTHERN POPULATIONS: *Cnemidophorus costatus costatus* is found in the Balsas Basin of western Puebla, but specimens from the vicinity of Cholula southeastward to Tlaco-tepec are not readily assignable to subspecies or even certainly to *C. costatus*.

Two lizards from Cholula (A.M.N.H. Nos. 19166 and 19167) have 82 and 96 granules around midbody, and one from "west of Puebla" (A.M.N.H. No. 19168) has 85. The largest specimen, with a snout to vent length of 98 mm., retains distinct paravertebral stripes but has well-developed dark and light bars on the sides and spotted hind limbs, a pattern rather similar to that of typical *costatus*. A female 91 mm. from snout to vent shows scarcely a trace of striping, is uniform brown middorsally, and has spotted hind legs. There is little fusion of dark fields to form vertical bars. The third specimen, 81 mm. from snout to vent, has six stripes, a pale vertebral field that is faintly doubled anteriorly, and dark, unspotted, dorsolateral, lateral, and lower lateral fields.

The scale counts of these three lizards are not much help in specific allocation; 96 is typical of *C. c. costatus*, but 82 and 85 are low and much more in line with those of *C. septemvittatus*. Relatively large size and color pattern favor *costatus*, but at such a high elevation (about 7000 feet), one would expect to find *septemvittatus*.

Five specimens from west-central Puebla present similar difficulties. These are from Santa Catarina (A.M.N.H. Nos. 19162, 19163), 5 kilometers west-northwest of Tecamachalco (K.U. No. 60065), and 13 kilometers northwest of Tlaco-tepec (K.U. Nos. 60066, 60067). The range in granules around midbody is 81–94, mean 86.2. Two specimens of 92 mm. in snout to vent length have well-

developed dark and light vertical bars from axilla to groin, the vertebral region largely free of markings, and the hind legs and rump spotted. A third adult, 84 mm. in snout to vent length, is similar except that the back has light spots spreading transversely and almost confluent with the lateral bars. The pattern of these specimens could be derived from that of *C. c. costatus*, in which barring is typically confined to the posterior part of the trunk. The contrast between light and dark in these specimens is much greater than is seen in *costatus*, implying a different color in life. Two smaller lizards have the classic pattern of stripes and spots.

Again, it is difficult to say whether these lizards are closer to *costatus* or to *septemvittatus*. Even *C. mexicanus* of central Oaxaca could be involved; it is much like the lizards from Puebla in size and scutellation. A species that lies geographically between *C. mexicanus* and the Puebla sample is *C. parvisocius*, which is amply distinguished from both by its small postantibrachials and well-developed circumorbital series.

The distribution and variation of lizards of the *sexlineatus* group in southern Mexico, especially in Puebla and Oaxaca, are obviously in need of intensive study. *Cnemidophorus c. costatus* should be followed to the east, to see whether it intergrades with the populations we describe from the vicinity of Puebla City and west-central Puebla. The interrelationships of *costatus*, Oaxacan *septemvittatus* (see p. 201), *parvisocius*, and *mexicanus* should be worked out in the field. Among the giant forms, the specific status of *motaguae* and *sacki* remains to be confirmed in the field.

***Cnemidophorus exsanguis* Lowe,**
new combination

Plate 30, figures 1-4

Cnemidophorus sacki exsanguis LOWE, 1956, p. 138.

Cnemidophorus gularis, RUTHVEN, 1907, p. 556 (part).

Cnemidophorus sexlineatus gularis, BURT, 1931a, p. 97 (part).

Cnemidophorus sexlineatus perplexus, BURT, 1931a, p. 122 (part).

Cnemidophorus gularis octolineatus, SMITH, 1946, p. 409 (part).

Cnemidophorus sackii stictogrammus BURGER,

1950, p. 5 (part). SMITH AND TAYLOR, 1950b, p. 183 (part). CHRAPLIWY AND FUGLER, 1955, p. 126 (part).

TYPE: U.C.L.A. No. 3737, collected at Socorro, Socorro County, New Mexico, on August 10, 1948, by Richard G. Zweifel and Kenneth S. Norris.

RANGE (FIG. 5): From Trans-Pecos Texas westward through southern New Mexico, northern Chihuahua, and northeastern Sonora to central Arizona. Lowe (1956, p. 149, fig. 1) gives a list of localities in Arizona and maps the distribution in that state. The range in New Mexico has not been accurately determined but includes most of the southern part of the state north at least to Socorro. In Texas, *exsanguis* ranges at least as far east as the vicinity of Alpine, Brewster County (Zweifel, 1959, p. 73; Milstead, 1961, p. 136).

Inasmuch as the distribution of *exsanguis* in México has received little mention in the literature, we list the specimens that we have examined.

SPECIMENS EXAMINED: Sonora: 14 miles north of Bavispe (S.N.H.M. No. 15503); 18 miles north of Bavispe (S.N.H.M. Nos. 15507, 15508); 20 miles north of Bavispe (S.N.H.M. No. 15505); 13 miles east of Bavispe (S.N.H.M. No. 15504); 14 miles east of Bavispe (S.N.H.M. Nos. 15511-15513); 3 miles east of Imuris (S.N.H.M. Nos. 15499, 15500); 33 miles east-southeast of Nogales (S.N.H.M. No. 15509); 31 miles southwest of Nogales (U.C. Nos. 8662-8665); vicinity of Cananea (A.M.N.H. Nos. 67538, 67539, 67541); Moctezuma (M.V.Z. Nos. 21021-21024, 21026-21028); 1 mile south of Moctezuma (M.V.Z. No. 26147); 2 miles southwest of Magdalena (M.V.Z. No. 21018); Santa Cruz (U.M.M.Z. No. 78425, and one untagged); Pílares (U.M.M.Z. Nos. 78426, 78427, and one untagged, 78428, and one untagged); El Tigre Mountains (U.M.M.Z. No. 78429); El Tigre Mine (U.M.M.Z. No. 114171, and two untagged); 4 miles south of border monument 69 (U.M.M.Z. No. 78431); 20 miles northwest of Oputo (U.M.M.Z. No. 114172, and one untagged); Piñetos Camp, 32 miles south of Nogales (U.S.N.M. Nos. 17211-17214). Chihuahua: Lake Santa María (C.N.H.M. No. 2534); 30 miles west of Casas Grandes near Cuerba (C.N.H.M. 62417); 2 miles north of Colonia Juárez (B.Y.U. Nos.

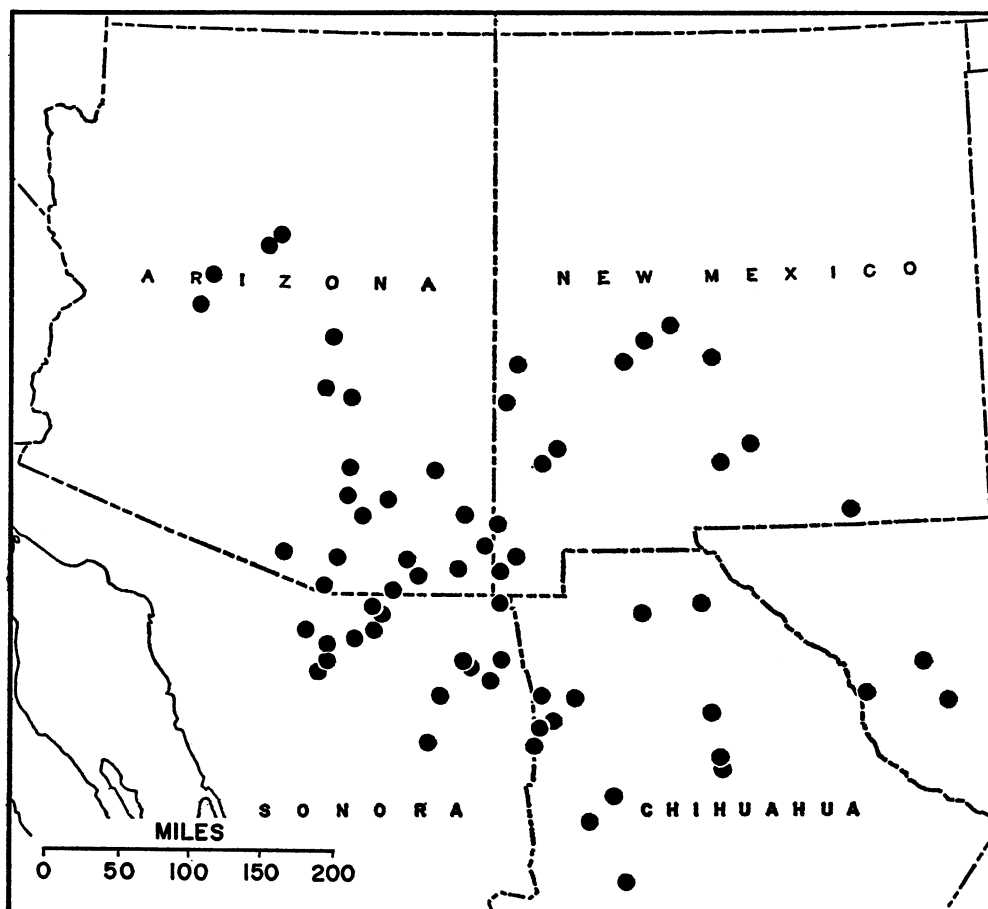


FIG. 5. Distribution of *Cnemidophorus exsanguis*. Records for Arizona and Texas taken in part from the literature. All others represent specimens examined.

13353, 13354); Pacheco (B.Y.U. No. 14146); Río Bavispe below Three Rivers on the Sonora-Chihuahua border (B.Y.U. Nos. 13364-13366, 13444, 13460, 13462, 13464, 13468, 13472, 13474, 13504, 13594); Miñaca (M.V.Z. Nos. 59172-59176); Río Gavilan, 7 miles southwest of Pacheco (M.V.Z. Nos. 46673-46675, 46677); Ramos (M.V.Z. No. 46676); Río Papigochic near Ciudad Guerrero (U.C.L.A. No. 6363); 37 miles south, 3 miles west, of Ciudad Juárez (K.U. No. 33761); 4 miles south, 1 mile east, of Moctezuma (K.U. No. 33895); 20 miles south of Gallegos (K.U. No. 33898); 7.5 miles south of Gallegos (A.M.N.H. No. 68304); 10 miles west of Namiquipa (A.M.N.H. No. 68327).

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, about 95 mm., but rarely exceeding 90 mm.; numbers of granules

around midbody lowest in east and highest in west, e.g., Socorro County, New Mexico, 62-71 (68.7, $N=20$), Steam Pump, Pima County, Arizona, 76-86 (81.0, $N=22$); 2-8 scales separating paravertebral stripes (4.6, $N=24$); 30-44 (36.8, $N=62$, specimens from Sonora and Chihuahua) femoral pores; post-antibrachial scales enlarged.

Lowe (1956, p. 138) gave the following diagnostic characters: "A moderately large subspecies of *Cnemidophorus sacki* (as now understood) characterized by . . . six complete light-colored longitudinal body stripes which are *persistent* throughout life; (3) adults with small light colored spots in the dark fields of the upper surfaces of the body; (4) hatchlings without spots on body; (5) light spots predominantly in the lateral and dorsolateral dark fields, fewest in the mid-

dorsal field, and commonly overlapping the light stripes; (6) tail tan, pinkish, greenish-brown or olive-greenish." Ventral surfaces pale and immaculate in animals of all ages.

REMARKS: In the absence of any evidence of intergradation with other forms, there is no reasonable alternative to regarding *exsanguiis* as a distinct species. Sympatric contacts exist between *C. exsanguiis* and several presumably related forms: *C. velox* (Lowe, 1955b); *C. burti stictogrammus* (Lowe, 1956); *C. perplexus* (Lowe and Zweifel, 1952); and *C. gularis* (Zweifel, 1959, p. 73; Milstead, 1961, p. 136). There exists a remote possibility of intergradation between *exsanguiis* and *C. septemvittatus* in the Big Bend region of Texas, or on the Mexican Plateau. Also, the possibility of intergradation between *C. costatus barrancorum* and *C. exsanguiis* should be considered by future workers (Zweifel, 1959, pp. 104–105).

Although there is casual mention in the literature of males of this form (e.g., Maslin, 1959a, figs. 3 and 4), all adult specimens examined by us are females. We suspect that *exsanguiis* is one of those species that lack males.

Cnemidophorus exsanguiis varies in scutellation and color over its wide range, and a detailed study will likely show the desirability of subspecific or even specific splitting. A particularly sharp break in color and scutellation coincides with the southern part of the Arizona-New Mexico boundary. The average and range of variation for scales around midbody given by Lowe (1956, p. 140) are derived from a pooled sample of specimens from both Arizona and New Mexico and obscure the difference between these populations.

Commenting on the sympatric occurrence of *exsanguiis* and *gularis* in western Texas, Milstead (1961, p. 136) states that "sympatry, especially when it is limited to marginal areas of range, is not by itself sufficient cause for naming two forms as distinct species." These species differ in color pattern, scutellation, the absence of males of *exsanguiis* and, as Milstead notes, in ecological preferences. Milstead's report, verifying as it does an earlier report of sympatry (Zweifel, 1959, p. 73), seems to offer the best possible evidence for specific status of the forms.

Cnemidophorus gularis Baird and Girard

Cnemidophorus gularis BAIRD AND GIRARD, 1852, p. 128. GADOW, 1906, p. 330 (part). SCHMIDT AND OWENS, 1944, p. 107.

Cnemidophorus gularis gularis, COPE, 1892, p. 45.

Cnemidophorus gularis sericeus COPE, 1892, p. 48 (type specimen, U.S.N.M. No. 15650, collected at San Diego, Texas, by Wm. Taylor).

Cnemidophorus gularis meeki GADOW, 1906, p. 332 (numerous cotypes from several localities). SMITH AND TAYLOR, 1950b, p. 184 (designate C.N.H.M. No. 1294 from Montemorelos, Nuevo León, as lectotype).

Cnemidophorus sexlineatus gularis, BURT, 1931a, p. 97 (part).

Cnemidophorus sackii gularis, SMITH AND TAYLOR, 1950b, p. 183.

TYPE: The lectotype, U.S.N.M. No. 3022a, was chosen from 14 cotypes, U.S.N.M. Nos. 3022 and 2989, by Smith and Taylor (1950b, p. 184). The type locality, "Indianola and the Valley of the Rio Grande del Norte," was restricted to the mouth of the Devil's River, Texas, by Smith and Taylor (*loc. cit.*).

RANGE: Southern Oklahoma and most of Texas (excluding the eastern and western edges, Conant, 1958, map 71, p. 324), southward through northeastern Coahuila, Nuevo León, and Tamaulipas to eastern San Luis Potosí and northern Veracruz. Coahuila was not included in the range given by Smith and Taylor (1950b, p. 184), but the specimens from Coahuila reported by Schmidt and Owens (1944, p. 107) as *C. gularis* have been examined by us and are correctly identified.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, about 85–90 mm.; 84–96 (88.4, $N=36$, specimens from Coahuila and San Luis Potosí) granules around midbody; PV/GAB, 0.09–0.19 (0.143, $N=35$); paravertebral stripes separated by 8–18 scales (12.7, $N=37$); 28–39 (33.3, $N=38$) femoral pores; postantibrachial scales enlarged.

Six primary stripes of juveniles persisting in large adults. Single vertebral stripe or pair of stripes; vertebral stripes usually less well defined than others, may fuse or spread over vertebral field. Dorsolateral light stripe continuing onto tail, where bordered above and below by dark pigment. Dark fields of body liberally spotted in adults, largest specimens with spots of field below lateral line spreading

upward to touch that line. Adult males with chin pink or red, chest and abdomen blue-black; females retaining pale cream ventral surfaces throughout life.

REMARKS: Within the range outlined above, *C. gularis* is a rather uniform and distinctive species. Possible subspecific relationships with forms on the southwestern periphery of the range remain to be worked out.

***Cnemidophorus inornatus* Baird**

Plate 30, figures 6-8

Cnemidophorus inornatus BAIRD, 1858, p. 255. GADOW, 1906, p. 373. BURGER, 1950, p. 2. SMITH AND TAYLOR, 1950b, p. 184.

Cnemidophorus octolineatus BAIRD, 1858, p. 255 (type specimen, U.S.N.M. No. 3009, collected at Pesquería Grande, Nuevo León, by Lt. Couch). GADOW, 1906, p. 373.

Cnemidophorus arizonae VAN DENBURGH, 1896, p. 344 (type specimen, S.N.H.M. No. 2631, collected by W. W. Price at Fairbank, Cochise County, Arizona).

Cnemidophorus sexlineatus, GADOW, 1906, p. 302 (part). RUTHVEN, 1907, p. 570.

Cnemidophorus sexlineatus gularis, BURT, 1931a, p. 98 (part).

Cnemidophorus sexlineatus perplexus, BURT, 1931a, p. 122 (part).

Cnemidophorus perplexus, SCHMIDT AND SMITH, 1944, p. 86. SMITH, 1946, p. 412. LOWE AND ZWEIFEL, 1952, p. 243. MILSTEAD, 1957a, p. 228.

Cnemidophorus sacki stictogrammus, CHRAPLIWY AND FUGLER, 1955, p. 126 (part).

TYPE: U.S.N.M. No. 3032 (two specimens), collected by Lieutenant Couch at Pesquería Grande (= Villa García), Nuevo León, México.

RANGE: The Chihuahuan Desert, from western Nuevo León northward and westward to west Texas, southern New Mexico, and southeastern Arizona.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, about 70 mm.; 55-78 (62.0 ± 0.69 , $N=20$) dorsal granules around midbody; 141-173 (153.7 ± 2.0 , $N=20$) granules occiput to rump; 7-11 (8.6 ± 0.28 , $N=20$) scales between paravertebral stripes; 33-39 (35.0 , $N=12$) femoral pores; postantibrachial scales only slightly enlarged. Data on femoral pores taken from specimens from Cochise County, Arizona; other scale counts from

specimens from Socorro County, New Mexico (Lowe and Zweifel, 1952, p. 243).

Juvenile dorsal pattern of six to eight light lines on dark ground retained throughout life without significant change. No spots or other pale markings in dark fields. Some individuals at type locality with uniform dorsum lacking stripes (R. W. Axtell, personal communication). Adult males with pale blue ventral surfaces, females much whiter. Tail bright blue in hatchlings, fading with growth, becoming gray-blue in large adults.

REMARKS: At least three persons (Charles H. Lowe, Jr., Ralph Axtell, and Kenneth Williams) are independently studying this species, so we refrain from any extensive comment. Variation in number of dorsal stripes is evident, with eight stripes seen in the eastern part of the range and six the more usual number in the west. The name *C. arizonae* Van Denburgh, 1896, is available for western populations. The lizards occupying the White Sands of southern New Mexico are notable for their pale coloration, with stripes scarcely discernible (Lowe and Norris, 1956).¹

In extensive experience with this species in southeastern Arizona and southwestern New Mexico, we have noted no individuals showing the sexual dimorphism in color characteristic of eastern populations. Twenty-eight specimens of adult size selected at random are all females. If our inference that males are not present in these western populations is correct, it will be of great interest to determine whether there is intergradation with populations with normal sex ratio or not. Darevskii (1958) reports intergradation between parthenogenetic and normal populations of *Lacerta saxicola*.

¹ In a paper published since this manuscript went to press, Axtell (1961) verifies the presence of both striped and unstriped individuals at the type locality of *C. inornatus* and *C. octolineatus* and concludes that a single species is represented by the two forms. He restricts *C. i. inornatus* to southeastern Coahuila and west-central Nuevo León and describes a new subspecies, *C. i. heptagrammus*, which "occurs from northwestern Coahuila and eastern Chihuahua, Mexico, northward through Trans-Pecos Texas, and up the valley of the Pecos River to east-central New Mexico" (p. 156). *Cnemidophorus inornatus* from the sizable remainder of the range are presently of indeterminate taxonomic status.

***Cnemidophorus labialis* Stejneger**

Cnemidophorus labialis STEJNEGER, 1890, p. 643. GADOW, 1906, p. 374. BURT, 1931a, p. 141. TEVIS, 1944, p. 16. SMITH AND TAYLOR, 1950b, p. 185. SAVAGE, 1954, p. 329.

TYPE: U.S.N.M. No. 15596, collected by L. Belding. The type locality was given by Stejneger (1890, p. 643) as "Cerro Island [=Cedros Island], Lower California," but Savage (1954, pp. 329–331) suggests that the type locality is Bahía San Quintín, not Cedros Island. Neither *C. labialis* nor *C. hyperythrus beldingi*, both supposedly collected by Belding on Cedros Island, has since been found there, but both occur at Bahía San Quintín where Belding also collected.

RANGE (FIG. 6): The Pacific coast of northern Baja California, from Bahía San Quintín to Miller's Landing. If the type locality was incorrectly recorded in the original description, as seems likely, *C. labialis* is known from only three localities: Bahía San Quintín, Socorro (about 20 miles south of San Quintín), and Miller's Landing. A gap of about 180 miles separates Miller's Landing from So-

corro, but *labialis* probably has a continuous distribution along the coast. The distribution of localities of capture is undoubtedly related to the course of the main road, which turns inland at Socorro and does not closely approach the coast to the south until Miller's Landing is reached.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 63 mm. (A.M.N.H. No. 65960, Miller's Landing); 60 granules around midbody in one specimen; eight scales separating paravertebral stripes, PV/GAB, 0.13, in one specimen; 11–17 femoral pores on one side; circumorbital semicircles not extending so far as frontal-frontoparietal suture; anterior nasal often in contact with second supralabial; postantibrachials scarcely enlarged; mesoptichials enlarged.

Typically seven light lines on a dark, unspotted ground color, though vertebral stripe in some specimens forking anteriorly or faintly doubled throughout its length (Burt, 1931, p. 142).

REMARKS: Because *Cnemidophorus labialis* inhabits a relatively inaccessible strip of coastline, it has not often been collected and is little known. Even its inclusion within the *sexlineatus* group may be open to question, for Tevis (1944, p. 17) reports a specimen that could be interpreted as a hybrid between *hyperythrus* and *labialis*.

The single specimen of *labialis* in the collection of the American Museum (A.M.N.H. No. 65960, Miller's Landing) has 60 granules around midbody. This number is rather low but is matched in some specimens of *C. inornatus*. Four specimens of *C. hyperythrus*, a somewhat similar species with which *labialis* is reportedly sympatric, have 78 to 81. Any further study of the relationships of these lizards must give close attention to this character.

Tevis (1944, p. 17) notes that these lizards have brilliant blue ventral coloration, but the possibility of sexual dimorphism is not mentioned.

***Cnemidophorus mexicanus* Peters**

Plate 31

Cnemidophorus mexicanus PETERS, 1869, p. 62. *Cnemidophorus bocourti* BOULENGER, 1885, p. 367 [type specimen, B.M.(N.H.) No. 1946.8.8.60, formerly B.M.(N.H.) No. 1857.10.28.81, *vide* J. C.

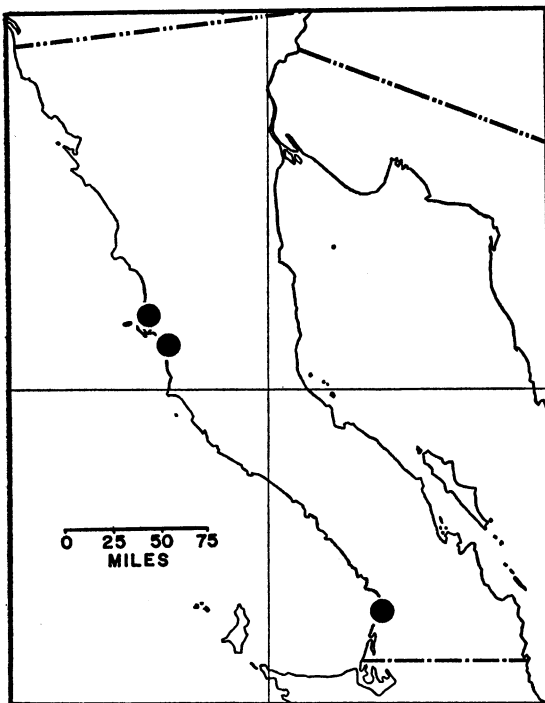


FIG. 6. Distribution of *Cnemidophorus labialis* in Baja California del Norte, México.

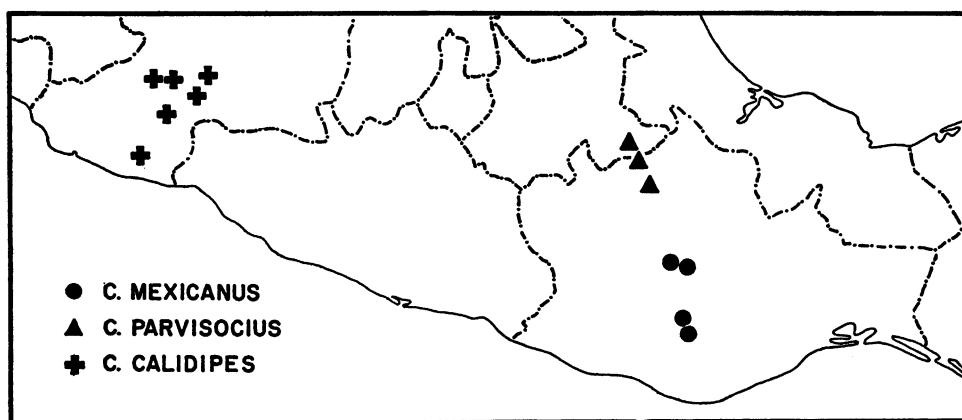


FIG. 7. Distribution of three species of *Cnemidophorus* in southern México.

Battersby]. SMITH AND TAYLOR, 1950b, p. 181 (type localities "Mexico" and "California" restricted to Oaxaca, Oaxaca).

Cnemidophorus mexicanus var. *typica* GADOW, 1906, p. 360 (part; 23 cotype specimens, including the three cotypes of *C. mexicanus* Peters, "supposed to be from the neighborhood of the town of Oaxaca," and 20 specimens from Oaxaca and Totolapan referable to *C. s. sackii*).

Cnemidophorus sexlineatus gularis BURT, 1931a, p. 97 (part).

Cnemidophorus sackii bocourti, SMITH AND TAYLOR, 1950b, p. 181 (part).

Cnemidophorus sackii sackii, SMITH AND TAYLOR, 1950b, p. 181 (part).

TYPE: Three syntypes (Z.M.B. No. 6209) from "Mexico"; collected by Uhde. Smith and Taylor (1950b, p. 181) restricted the type locality of *mexicanus* to Izúcar de Matamoros, Puebla, a locality not within the known range of the species as it is now understood. An examination of the syntypes shows that they are representative of a population of lizards inhabiting the valley of Oaxaca; we here restrict the type locality to Oaxaca, Oaxaca, México.

RANGE (FIG. 7): The semi-arid valleys of central Oaxaca.

SPECIMENS EXAMINED: Vicinity of Miahuatlán (A.M.N.H. Nos. 19028–19034, 19036, 19038–19040); between Miahuatlán and Ejutla (A.M.N.H. No. 19261); Monte Alban (U.M.M.Z. No. 118723); Oaxaca (A.M.N.H. Nos. 18921, 19107); 8 miles southeast of Oaxaca (K.U. No. 43596); 10.8 miles southeast of Oaxaca (U.M.M.Z. Nos. 114706 [14 specimens], 114707 [18 specimens]); Rancho

San Felipe (U.M.M.Z. No. 11356 [three specimens]); between Tlacolula and San Pablo Mitla (A.M.N.H. Nos. 19041–19044, 19130–19136).

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 89 mm.; 82–98 (89.3 ± 0.5 , $N=61$) dorsal granules at midbody; 11–16 (12.2 ± 0.6 , $N=28$) dorsal granules between paravertebral stripes; PV/GAB, 0.11–0.16 (0.131 ± 0.005 , $N=28$); 28–37 (32.5 ± 0.4 , $N=44$) femoral pores; postantibrachials enlarged.

Juveniles with six creamy yellow longitudinal stripes and a faint middorsal stripe on unspotted, or faintly spotted, dark brown dorsum; tail orange-tan. Dorsal ground of adults greenish gray, often grayish tan posteriorly, with pale yellow spots and no stripes. Adult males with bluish white chests, bluish black bellies, and pale blue throats.

REMARKS: An examination of the syntypes of *Cnemidophorus mexicanus* and the comparison of these with data on the type of *Cnemidophorus bocourti* [B.M.(N.H.) No. 1946.8.8.60] provided by Mr. J. C. Battersby show that these specimens are samples of the same species. The three syntypes of *mexicanus* have 83, 87, and 89 dorsal granules around the midbody and 31, 32, and 36 femoral pores. The type of *bocourti* has 88 dorsal granules and 31 femoral pores. Of the three syntypes of *mexicanus*, only one is of adult size. It has a snout to vent length of 83 mm., pale venter, and a dorsal color pattern of pale stripes and light spots in the dark fields. It is slightly atypical in that most in-

dividuals of this size have lost the stripes.

Two large species of *Cnemidophorus* (*motaguae* and *sacki*) occur sympatrically with *bocourti*. Both large species attain a snout to vent length of more than 140 mm. and have small postantibrachials and more than 100 dorsal granules at midbody. The relationship of *C. mexicanus* to *C. costatus* and *C. parvisocius* remains to be worked out in the field.

***Cnemidophorus motaguae* Sackett**

Cnemidophorus motaguae SACKETT, 1941, p. 1.

Cnemidophorus sackii bocourti, SMITH AND TAYLOR, 1950b, p. 181 (part, record for Piedra Parada, Chiapas). MERTENS, 1952, p. 55, pl. 13, fig. 76.

Cnemidophorus sacki motaguae, STUART, 1954, pp. 17–18.

Cnemidophorus sackii, SCHMIDT AND STUART, 1941, pp. 244–245. ALVAREZ DEL TORO, 1960, pp. 110–112.

TYPE: A.N.S.P. No. 22143, from the Motagua River Valley, about 10 kilometers northeast of Zacapa, Departamento Zacapa, Guatemala; collected by J. Townsend Sackett.

RANGE (FIG. 3): Discontinuous in sub-humid environments from central Oaxaca through the middle Grijalva Valley in the central depression of Chiapas, the Salamá Basin, and upper Motagua Valley in Guatemala, also in central Honduras, southeastern Guatemala, and adjacent El Salvador.

SPECIMENS EXAMINED: *México*: Chiapas: 4 kilometers west of Berriozabal (U.M.M.Z. Nos. 94879–94881); northeast edge of Tuxtla Gutierrez (U.M.M.Z. Nos. 94882–94885); 2 kilometers east of Tuxtla Gutierrez (U.M.M.Z. Nos. 94886–94887); 10 kilometers west of Tuxtla Gutierrez (U.M.M.Z. No. 94876 [seven specimens]); 11 kilometers west of Tuxtla Gutierrez (U.M.M.Z. No. 94878 [12 specimens]); Oaxaca: Lagunas (C.N.H.M. No. 1488 [10 specimens]); Matías Romero (A.M.N.H. No. 65807); vicinity of Miahuatlán (A.M.N.H. Nos. 19035, 19037); between Miahuatlán and Ejutla (A.M.N.H. Nos. 19259, 19262–19263); 3 miles south of Nejapa (K.U. Nos. 43594–43595); 12 miles south and 5 miles east of Nejapa (K.U. No. 33508); Santa Lucía (A.M.N.H. No. 65806). *Guatemala*: Baja Verapaz: 5.3 kilometers north of Salamá (K.U. Nos. 58191–58194); Jutiapa: vicinity of Jutiapa (U.M.M.Z. Nos. 106965–

106968 [26 specimens]); Progreso: near El Rancho (K.U. Nos. 58181–58190; U.M.M.Z. No. 106959 [three specimens]); Zacapa: 5 kilometers southwest of Río Hondo (K.U. Nos. 58170–58180); 24 kilometers northeast of Río Hondo (K.U. Nos. 58168–58169). *Honduras*: Francisco Morazan: El Zamorano (A.M.N.H. Nos. 70460–70465, 70467–70469, 70474–70477, 70480–70481, 70483–70484, 70489, 70493, 70498); Tegucigalpa (A.M.N.H. No. 69086). Mertens (1952, p. 55, pl. 13, fig. 76) records and figures a specimen from Metapán, Departamento Santa Ana, El Salvador.

DIAGNOSTIC CHARACTERS: This summary is based on 112 specimens from throughout the range of the species. Geographic variation is discussed below; hence, only the ranges of variation, not averages, are given here.

Maximum snout-vent length, 145 mm.; 113–140 granules around midbody; 39–54 femoral pores; postantibrachials only slightly enlarged (fig. 2B).

Anterior dorsal ground color in adults grayish brown; at midbody and posteriorly grayish green. Small yellow spots present on back and upper surfaces of limbs. Belly bluish black posteriorly. Throat in adult males cream color, with a faint tint of pink. Juveniles with dark brown dorsum, with six longitudinal stripes. Lateral and dorsolateral stripes broad and yellow, paravertebral stripes narrow, indistinct, pale tan. Spots present in dark fields between stripes and in paravertebral stripes of subadults having snout to vent lengths of less than 80 mm. Some individuals having snout to vent lengths of 100 mm., with faint lateral and dorsolateral stripes, but usually stripes completely replaced by spots. Pale vertebral field of juveniles usually persisting in spotted adults as a broad streak slightly lighter than ground color.

REMARKS: This widespread species has a discontinuous range. The population in central Oaxaca is far removed from the others, and those in the middle Grijalva Valley, the Salamá Basin, and the upper Motagua Valley are isolated from one another at the present time (Stuart, 1954, p. 18). To determine what differences, if any, exist among these populations, our samples have been compared in detail (table 5).

TABLE 5
VARIATION IN SCUTELLATION OF SEVERAL POPULATIONS OF *Cnemidophorus motaguae*

	Granules at Midbody			Femoral Pores		
	Range	(Mean $\pm \sigma_m$)	N	Range	(Mean $\pm \sigma_m$)	N
Oaxaca	120-138	(129.1 \pm 1.2)	17	39-54	(46.5 \pm 1.0)	17
Grijalva Valley, Chiapas	114-127	(121.0 \pm 0.8)	20	45-51	(47.7 \pm 0.4)	20
Motagua Valley, Guatemala	113-130	(120.8 \pm 0.8)	29	42-50	(45.9 \pm 0.4)	29
Southeastern Guatemala	121-136	(128.4 \pm 0.8)	25	40-49	(44.7 \pm 0.5)	25
Central Honduras	120-140	(127.0 \pm 1.0)	21	39-47	(43.6 \pm 0.5)	21

The populations inhabiting the Grijalva and Motagua valleys differ from the others in having a slightly lower number of dorsal granules at midbody; however, in the number of femoral pores they seem to be in a line for a trend in variation from a low number of femoral pores to the east to a higher number in the west. The sample from Oaxaca is out of line insofar as the average number of femoral pores is concerned, but the highest count (54) was obtained from that sample. No noticeable differences in coloration or size have been noted among these samples. Thus, we conclude that these populations are representative of a monotypic species.

Adults of two other species in the *sexlineatus* group have a greenish dorsum with pale spots. One of these, *mexicanus*, occurs sympatrically with *motaguae* in central Oaxaca; *mexicanus* is a small species with a maximum snout to vent length of 89 mm., enlarged postantibrachials, and fewer than 100 dorsal granules at midbody. The other form is *C. c. communis* of Michoacán, Colima, and Jalisco; *communis* is like *motaguae* in attaining a large size and in having a high number of dorsal granules, but it differs in having enlarged postantibrachials.

The 10 specimens from Lagunas (C.N.H.M. No. 1488) are syntypes of *Cnemidophorus communis australis* Gadow. Smith and Taylor (1950b, p. 182) restrict the type locality of *australis* to Cuicatlán, Oaxaca, and designate B.M.(N.H.) No. 1906.7.19.11 as the lectotype of *australis*. Information provided by Mr. J. C. Battersby clearly shows that the lectotype of *australis* is not the same species as the one we call *motaguae*, but instead is a specimen of *Cnemidophorus sacki sacki*, as defined in this paper.

Cnemidophorus motaguae is a well-defined form but was denied recognition by previous authors because of confusion with *C. mexicanus* (*bocourti* of most authors). The two are superficially similar in adult color pattern but are easily distinguishable in size and scutellation. Stuart (1954) recognized *motaguae* (as a subspecies of the catch-all *sacki*) but did not realize that the range of *motaguae* extends west of the Isthmus of Tehuantepec and overlaps that of *C. mexicanus*.

Cnemidophorus parvisocius Zweifel

Cnemidophorus parvisocius ZWEIFEL, 1960, p. 1.

Cnemidophorus communis australis GADOW, 1906, p. 352 (part).

Cnemidophorus sexlineatus gularis, BURT, 1931a, p. 117 (part).

TYPE: A.M.N.H. No. 65774, collected by H. O. Wagner at Cuicatlán, Oaxaca, México, between June 7 and June 12, 1944.

RANGE (FIG. 7): Northern Oaxaca and adjacent Puebla; known only from Cuicatlán and Teotitlán, Oaxaca, and between Venta Salada and San Sebastian, Puebla.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 80 mm.; 86-104 (93.5 \pm 0.8, $N=26$) granules around midbody; PV/GAB, 0.10-0.14 (0.124 \pm 0.004, $N=14$); 9-14 scales between paravertebral stripes (11.6, $N=14$); 33-46 (40.5 \pm 0.6, $N=27$) femoral pores; postantibrachial scales not or very slightly enlarged; third supraocular separated from frontoparietal by circumorbital scales.

Six primary stripes present in juveniles, and a faint vertebral stripe may be present in rare cases. Light spots appearing in dark fields of adults, and fusing into vertical bars on sides. Chin pale, probably pink in life;

other ventral surfaces dark, probably blue or black in life.

REMARKS: This species is known only from specimens in which the features of color pattern cannot fully be distinguished. Information on the color in life is needed.

***Cnemidophorus perplexus* Baird and Girard**

Plate 27, figure 6

Cnemidophorus perplexus BAIRD AND GIRARD, 1852, p. 128. GADOW, 1906, p. 368 (part; specimens from Bernalillo County, New Mexico). BURGER, 1950, p. 3. MASLIN, BEIDLEMAN, AND LOWE, 1958, p. 344. POUGH, (in press). WRIGHT AND DEGENHARDT, (in press).

Cnemidophorus sexlineatus perplexus, BURT, 1931a, p. 122 (part).

Cnemidophorus neomexicanus LOWE AND ZWEIFEL, 1952, pp. 230-247 (type locality, 8.7 miles west and 22.8 miles south of New Bingham Post-office; Socorro County, New Mexico; type specimen, M.V.Z. No. 55807). LAWRENCE, 1955, p. 141.

TYPE: U.S.N.M. No. 3060, lectotype designated by Burt (1931a, p. 122). Type locality restricted to the "valley of the Rio Grande in Sandoval County, N. Mex., in the vicinity southwest of Santa Fe" (Maslin, Beidleman, and Lowe, 1958, p. 344).

RANGE (FIG. 8): The valley of the Rio Grande and adjacent regions from the vicinity of Santa Fe, New Mexico, to El Paso, Texas (Lawrence, 1955, p. 141); known away from this valley only from the south boundary of White Sands National Monument, Otero County, New Mexico, in the Tularosa Valley, and from the vicinity of Lordsburg, Hidalgo County, New Mexico (Pough, in press). This species is to be expected in northern Chihuahua.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 86 mm.; 71-80 (74.9 \pm 0.62, $N=20$) granules around midbody; 178-198 (184.3 \pm 1.2 $N=19$) granules from occiput to rump; 9-13 (10.2 \pm 0.28, $N=20$) scales separating paravertebral stripes; 34-40 (37.3, $N=14$) femoral pores; circumorbital series of scales in most specimens extending anterior to suture between second and third supraoculars (fig. 1B); postantibrachials granular (fig. 2A).

Pattern of seven light stripes retained throughout life. Stripes equally distinct from dark ground color, but vertebral stripe wavy.

Dark fields obscurely spotted in both large and small lizards, ventral surfaces immaculate pale blue in life. Tail bright blue in hatchlings, fading to blue-gray in adults. Detailed description of this species given by Lowe and Zweifel (1952).

REMARKS: There is no more aptly named species in the genus than *Cnemidophorus perplexus*. The name was misapplied to several species, and more than one hundred years passed between publication of the original description and the time the name was correctly associated with a natural population. A century after the description of *perplexus*, Lowe and Zweifel (1952) described *Cnemidophorus neomexicanus*. Owing to inaccurate descriptions of *perplexus* in the literature, incorrect restriction of type locality, and other factors, these authors did not recognize their new species as *perplexus*, but, in giving a detailed description of the distribution and variation of *neomexicanus*, they laid the groundwork for the proper allocation by Maslin, Beidleman, and Lowe (1958).

The type locality of *perplexus* given in the original description, "Valley of the Rio San Pedro of the Rio Grande del Norte" (Baird and Girard, 1852) is, according to Smith and Taylor (1950a, p. 363), the Devils River, Val Verde County, Texas. However, Maslin and his co-authors carefully traced the itinerary of the collector, William Gamble, and deduced that the lectotype was collected along the Rio Grande southwest of Santa Fe, New Mexico, in July, 1841. A comparison with the several species of *Cnemidophorus* that Gamble might have encountered led to the decision that *C. neomexicanus* is in reality *C. perplexus*.

The type locality as restricted by Maslin and his co-authors was north of the admittedly imperfectly known range of *neomexicanus*. However, this problem was eliminated by Wright and Degenhardt (in press), who not only collected the species in the region specified by Maslin and his co-authors but found it along a "San Pedro Creek" that in all probability is Gamble's "Rio San Pedro." Independently, in June, 1960, Zweifel verified the presence of the species in the vicinity of Santa Fe by collecting *C. perplexus* at 19 miles southwest of Santa Fe, Santa Fe County, and 3 miles north of Peña Blanca, Sandoval County.

With the elimination of the problem of type locality, two points remain that cast a slight doubt upon the conspecificity of *neomexicanus* and *perplexus*: the type specimen of *perplexus* is larger than any specimen among the 48 reported by Lowe and Zweifel (86 mm. from snout to vent as opposed to 76.4 mm.); and the series of circumorbital scales is much less extensive in the type than is usual for *neomexicanus*.

Four of 15 specimens collected in the vicinity of Santa Fe measure 77 and 78 mm. from snout to vent, so are slightly larger than the largest previously recorded as *neomexicanus*. However, the size of the type still remains unique. None of the individuals from the vicinity of Santa Fe has such short circumorbital series as the type of *perplexus*, in which the row of scales on each side terminates opposite the suture between frontal and frontoparietal scales. The type of *perplexus* is not outside the range of variation in other specimens, however, for one from near San Marcial, Socorro County (A.M.N.H. No. 84818), has circumorbital series terminating short of the frontal-frontoparietal suture.

We agree with Maslin, Beidleman, and Lowe that the type of *perplexus* is closely similar to *neomexicanus* in most respects and are satisfied that *neomexicanus* is a synonym of *perplexus*. It is remarkable, however, that the single specimen collected by Gamble should be so aberrant in size and scutellation that it is not duplicated or even closely approached among 48 specimens examined by Lowe and Zweifel and 16 additional individuals obtained subsequent to the description of *C. neomexicanus*.

Cnemidophorus perplexus belongs to that group of species in which males appear to be lacking. Maslin tells us that he has seen only females of *perplexus*, and 13 adult specimens in the collection of the American Museum that can be sexed with certainty are all females. Lowe and Zweifel (1952, p. 235) mention a male specimen, but in view of later evidence the presence of males in this species requires confirmation.

***Cnemidophorus sacki sacki* Wiegmann**

Plate 25; plate 26, figures 3-7

Cnemidophorus sacki WIEGMANN, 1834, pp. 27-29.

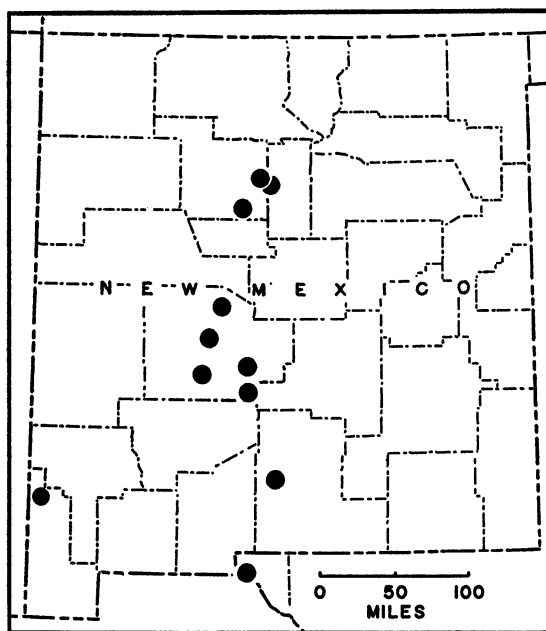


FIG. 8. Distribution of *Cnemidophorus perplexus* in New Mexico and Texas.

Cnemidophorus communis australis GADOW, 1906, pp. 348, 349, 352-356 (21 syntypes from Lagunas, Oaxaca, Cuicatlán, Oaxaca, and Cozumel Island, Yucatán). SMITH AND TAYLOR, 1950a, p. 338 (type locality restricted to Cuicatlán); 1950b, p. 182 [B.M.(N.H.) No. 1906.7.19.11 designated lectotype].

Cnemidophorus mexicanus typica GADOW, 1906, pp. 360-363 (part; specimens from Oaxaca and Totolapan, Oaxaca).

Cnemidophorus sexlineatus gularis, BURT, 1931a, p. 97 (part).

Cnemidophorus sackii sackii, SMITH, 1949, p. 41.

Cnemidophorus sackii australis, SMITH AND TAYLOR, 1950b, p. 181 (part).

TYPE: Z.M.B. No. 884 from "Mexico"; collected by F. Deppe; type locality erroneously restricted to Cuernavaca, Morelos, by Smith (1949, p. 41). On the basis of our present knowledge of the species, the type locality can be restricted to Oaxaca, Oaxaca, México.

RANGE (FIG. 3): Semi-arid basins from southeastern Puebla to central Oaxaca.

SPECIMENS EXAMINED: Oaxaca: Cuicatlán (A.M.N.H. Nos. 65776-65777, C.N.H.M. No. 1022 [three specimens]); 3 miles west of Mitla (K.U. Nos. 43587-43588); vicinity of Oaxaca (A.M.N.H. Nos. 19108-19114); 3 miles southeast of Oaxaca (K.U. Nos. 43581-

43586); 10.8 miles southeast of Oaxaca (U.M.M.Z. No. 114705 [six specimens]); 25 miles east of Oaxaca (U.C. Nos. 8491–8496); 11.5 miles northwest of Oaxaca (K.U. Nos. 39718–39719); Teotitlán (A.M.N.H. Nos. 65743–65747, and 13 untagged); Tlacoahuatla, 13 miles east of Oaxaca (U.C. Nos. 8497–8502); between Tlacolula and San Pablo Mitla (A.M.N.H. Nos. 19132–19134, 19138–19204); west of Oaxaca (Z.M.B. No. 1783, two syntypes of *C. mexicanus typica*). Puebla: Between Venta Salada and San Sebastian (A.M.N.H. No. 18998). "Mexico" (Z.M.B. No. 884, type specimen).

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 152 mm.; 121–158 (138.1 ± 1.1 , $N=73$) granules around midbody; 35–50 (41.5 ± 1.5 , $N=50$) femoral pores; postantebrachial scales only slightly enlarged.

Adults with dark brown cross bars on tan or greenish tan dorsum, dark brown flanks with tan vertical bars, and dark brown limbs with tan blotches. In life adult males with tan throats and black bellies with bluish white spots. Juveniles with broad yellow lateral and dorsolateral stripes, faint narrow paravertebral stripes, and a broad tan middorsal stripe.

REMARKS: Mr. J. C. Battersby informs us that the lectotype of *C. sacki australis* has 124 dorsal granules at midbody, 47 femoral pores, and a dorsal pattern of dark cross bars. The specimen is a male with a snout to vent length of 138 mm. It is therefore certain that *australis* is a synonym of *sacki*, and *australis* cannot be applied to the sympatric species recently described as *C. parvisocius* by Zweifel (1960).

On the basis of photographs of the holotype, Smith (1949, p. 41) concluded that *sacki* was the correct name for a population of *Cnemidophorus* inhabiting the upper Balsas Basin. This decision formed the basis for the arrangement of the *sacki* complex in a check list of the Mexican lizards by Smith and Taylor (1950b). An examination of the holotype of *Cnemidophorus sacki* reveals that this specimen is an immature male having a snout to vent length of 106 mm., 125 dorsal granules at midbody, 44 femoral pores, small postantebrachials, and distinct lateral and dorsolateral stripes. The lizards to which this name was applied by Smith (*loc. cit.*) have 88 to 105 dorsal granules at midbody, 32 to 44 femoral

pores, and enlarged postantebrachials. Furthermore, most of the lizards in the upper Balsas Basin have, at a snout to vent length of 100 mm. or more, no trace of the longitudinal light stripes that are so prominent in the type of *sacki*. Of those species of *Cnemidophorus* that have fine dorsal granules and small postantebrachials, only those lizards currently called *Cnemidophorus sacki australis* Gadow have the combination of characters present in the type of *sacki*. Consequently, we apply the name *sacki* to the large, finely scaled *Cnemidophorus* with small postantebrachials that lives in central Oaxaca.

Throughout most of its range *Cnemidophorus sacki sacki* occurs sympatrically with *C. mexicanus*, a much smaller species having fewer than 100 dorsal granules at midbody, enlarged postantebrachials, and a color pattern of light spots on a green dorsum. Also living in central Oaxaca, but not to our knowledge occurring sympatrically with *sacki*, is another large, finely scaled species with small postantebrachials; this is *Cnemidophorus motaguae*, which differs from *sacki* in having a color pattern of light spots on a greenish tan dorsum. In the upper Balsas Basin in Guerrero, Morelos, and Puebla is a population of large, finely scaled *Cnemidophorus* that differs from *sacki sacki* in the color pattern of the adults; this population is discussed below. In southeastern Puebla and northern Oaxaca, *sacki* occurs together with *C. parvisocius*, a much smaller species with fewer granules around midbody and more extensive circumorbital series.

***Cnemidophorus sacki gigas* Davis and Smith, new combination**

Plate 26, figures 1, 2

Cnemidophorus gigas DAVIS AND SMITH, 1952, p. 98. PIANKA AND SMITH, 1959, p. 119. ZWEIFEL, 1959, p. 78. DAVIS AND DIXON, 1961, p. 51.

TYPE: T.C.W.M. No. 6804, from 3 kilometers northeast of Puente de Ixtla, Morelos, México; collected by James R. Dixon.

RANGE (FIG. 3): The upper Balsas Basin in Guerrero, Morelos, and Puebla; also southward in Guerrero, barely crossing the low divide in the vicinity of Chilpancingo to the Pacific slopes, but not reaching the coastal lowlands.

SPECIMENS EXAMINED: Guerrero: Mexcala

(U.M.M.Z. Nos. 114710–114711); Chilpancingo (A.M.N.H. Nos. 72525, 72527, U.M.M.Z. Nos. 72426 [two specimens], 88422). Morelos: 10 miles east of Cuernavaca (U.C. Nos. 8574–8578, 8581); 3 miles south of Temixco (U.M.M.Z. No. 114718 [three specimens]); Lago de Tequesquitengo (A.M.N.H. No. 65731, U.M.M.Z. No. 114715 [two specimens]); 7.5 miles west of Yautepec (U.M.M.Z. No. 114717). Puebla: 6.5 miles southwest of Izúcar de Matamoros (K.U. Nos. 44674–44676); 1 mile southeast of Raboso (K.U. No. 44673); 8.8 kilometers northwest of Tehuitzingo (K.U. No. 58198); Tepanco (A.M.N.H. No. 86833). Additional locality records are given by Davis and Smith (1952, p. 98), Davis and Dixon (1961, p. 51), and Pianka and Smith (1959, p. 119).

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 140 mm.; 124–163 (137.7 ± 2.3 , $N=20$) dorsal granules at midbody; 32–49 (42.3 ± 0.9 , $N=20$) femoral pores; postantibrachial scales only slightly enlarged. Adults with a tan or greenish tan dorsum, with dark brown or black reticulations and irregular spots, not forming distinct cross bars. Juveniles with six longitudinal stripes, becoming diffuse and disappearing in subadults having snout to vent lengths of 90 to 100 mm. Bluish white bellies of many adult males heavily mottled with black posteriorly; chin pale pink.

REMARKS: The only apparent difference between *Cnemidophorus sacki sacki* and *C. s. gigas* is in the dorsal coloration. In the former the dark color forms distinct cross bars on the dorsum, whereas in *gigas* the dark color is in the form of reticulations, irregular spots, or both.

From *Cnemidophorus costatus costatus*, with which it occurs throughout most of the upper Balsas Basin, *gigas* can be distinguished by its smaller postantibrachials (large in *costatus*), small dorsal granules (124 to 163 around midbody in *gigas* and 88 to 105 in *costatus*), and much larger size.

Cnemidophorus septemvittatus septemvittatus
Cope, new combination

Cnemidophorus septemvittatus COPE, 1892, p. 40. GADOW, 1906, p. 335.

Cnemidophorus sexlineatus perplexus, BURT 1931a, p. 124.

Cnemidophorus octolineatus, SCHMIDT AND SMITH, 1944, p. 85. SCHMIDT AND OWENS, 1944, p. 107.

Cnemidophorus sackii semifasciatus, BURGER, 1950, p. 4 (part). SMITH AND TAYLOR, 1950b, p. 184 (part). CHRAPLIWY AND FUGLER, 1955, p. 126.

TYPE: U.S.N.M. No. 42141; collected by C. C. Boyle. The type locality given in the original description, "El Dorado Co., Cal.," is obviously in error. Burt (1931a, p. 129) reports that the type of *septemvittatus* is "identical in coloration and in other respects" to a specimen from Marfa, Presidio County, Texas, and assumes that it came from this general locality. Smith and Taylor (1950a, p. 362) follow Burt's lead and restrict the type locality to Marfa.

RANGE (FIG. 9): The Big Bend region of Texas, extreme eastern Chihuahua, and most of Coahuila, excluding the northeastern quarter, the extreme southern portion, and an area of undetermined extent in the middle of the state centered around Cuatro Ciénegas.

SPECIMENS EXAMINED: Texas: Brewster County: Chisos Mountains (A.M.N.H. Nos. 62599, 73565, 77501); Panther Junction, Big Bend National Park (A.M.N.H. No. 77180). Chihuahua: Two miles southeast of Hechicero (K.U. Nos. 33754, 33757, 33767, 33768). Coahuila: Three miles south and 8 miles east of Hechicero, Chihuahua, in Coahuila (K.U. Nos. 33755, 33759); Las Delicias (A.M.N.H. Nos. 67392–67396, and eight untagged); 36 miles south of Castaños (A.M.N.H. Nos. 77294–77300); Cañon del Colorado, Sierra de los Burros (C.N.H.M. Nos. 53927–53929); 5 miles west of Piedra Blanca, Sierra del Carmen (M.V.Z. Nos. 58344–58348); 16 kilometers south of Cuatro Ciénegas (K.U. Nos. 47091–47097).

The exact distributional relationships of the three closely related species *exsanguis*, *septemvittatus*, and *gularis* in the Big Bend region of Texas remain to be worked out. We follow Milstead (1957b, p. 106) and indicate on our maps the presence of *C. exsanguis* in the Sierra Vieja, Presidio County, and *C. s. septemvittatus* at La Mota Mountain, Presidio County, and Black Gap Wildlife Management Area, Brewster County.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 105 mm. (type specimen); 77–98 (84.9 ± 1.0 , $N=30$) granules around midbody; 4–15 (7.5 ± 0.4 , $N=34$) scales sepa-

rating paravertebral stripes; PV/GAB, 0.04–0.18 (0.84 ± 0.006 , $N=29$); 30–41 femoral pores (36.7 ± 0.5 , $N=30$); postantebrachial scales enlarged (fig. 2C).

Six or seven light stripes of juvenile pattern persisting in adult individuals, though some spreading and fading of stripes on posterior third of body. Dark fields becoming spotted as lizard grows, with spotting more prominent towards rear of trunk in most individuals. Ventral ground color white or pale blue in life, some with small black spots on chin, and on chest in a few.

REMARKS: The populations we refer to *C. s. septemvittatus* are similar in scutellation and in certain aspects of color pattern, namely, the pale ventral surfaces and persistent dorsal striping. Specimens from the eastern part of the range (Las Delicias, Coahuila, and the vicinity of Hechicero in Coahuila and Chihuahua) show less spotting than those of similar size from Texas and Castaños in western Coahuila. The Castaños sample has a wider average spacing of the paravertebral stripes than other samples but in the dorsal pattern and the ventral color in life resembles them closely. Wider spacing of the paravertebral stripes may be a tendency towards the pattern of *C. s. semifasciatus*.

The ranges of *C. exsanguis* and *C. s. septemvittatus* approach each other in the Big Bend region of Texas and may touch or overlap. The two species are readily distinguishable on dorsal scutellation, for in the eastern part of its range *exsanguis* has a GAB average of about 70 compared to an average of 89 in four specimens of *septemvittatus* from Texas. The maximum GAB count in 33 specimens of *exsanguis* from eastern New Mexico and Texas is 74, three fewer than the minimum seen in all *septemvittatus*. The two species are also quite different in color and the details of dorsal pattern.

Cnemidophorus gularis ranges into the Big Bend and Coahuila from the east and probably is in contact with *C. s. septemvittatus*, though no actual instances of sympatry are known to us. These species probably cannot be distinguished on the basis of dorsal scutellation, but they differ strikingly in color pattern. The blue chest of adult male *gularis* contrasts with the white venter of both sexes in *septemvittatus*. The dorsal stripes of *gularis*

do not spread or fade posteriorly, and the paravertebrals are usually more widely spaced.

Cope (1892) described *septemvittatus* (p. 40), *semifasciatus* (p. 49), and *scalaris* (p. 47) in the same paper. When resurrecting the name *semifasciatus*, Burger (1950, pp. 4–5) noted that *septemvittatus* (which he regarded as a synonym of *semifasciatus*) had page priority, but he disregarded page priority in favor of *semifasciatus*, on the grounds that the type locality of *septemvittatus* obviously is erroneous, whereas *semifasciatus* is accompanied by "definite and feasible locality data." Smith and Taylor (1950b, p. 184) followed Burger's suggested nomenclature, and Zweifel (1959, pp. 72–73; 1961) tacitly followed Burger in using *scalaris* as the specific name for this group of lizards, implying that he, too, regarded *septemvittatus* and *semifasciatus* as synonyms.

Additional study has convinced us that *septemvittatus* and *semifasciatus* are recognizably distinct entities worthy of taxonomic recognition. With all three Cope (1892) names resurrected, there now seems little excuse for disregarding page priority. Hence, we use *septemvittatus* as the specific name for the whiptail lizards of the Mexican Plateau that were diagnosed as *C. scalaris* by Zweifel (1959, pp. 72–73).

***Cnemidophorus septemvittatus pallidus*,
new subspecies**

Plate 28, figures 3, 6

Cnemidophorus inornatus, SCHMIDT AND OWENS, 1944, p. 106. SMITH AND TAYLOR, 1950b, p. 184.

C.[nemidophorus] sacki semifasciatus, FUGLER AND WEBB, 1956, p. 168.

TYPE: A.M.N.H. No. 77310; collected 3 miles west of Cuatro Ciénegas, Coahuila, by R. G. Zweifel on June 29, 1957.

RANGE (FIG. 9): Known only from the immediate vicinity of Cuatro Ciénegas.

SPECIMENS EXAMINED (PARATYPES): Coahuila: Cuatro Ciénegas (C.N.H.M. Nos. 53919–53922); 3 miles west of Cuatro Ciénegas (A.M.N.H. Nos. 77311–77313).

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 87 mm.; 78–95 (86.1, $N=8$) granules around midbody; 33–43 (36.8, $N=8$) femoral pores; postantebrachial scales enlarged.

This subspecies is distinguishable from

other subspecies of *C. septemvittatus* by its nearly uniform gray-green dorsal coloration, with only the faintest trace of striping visible in living adult individuals.

Cnemidophorus s. pallidus superficially resembles the unstriped morph of *C. inornatus*, but differs in being of larger size (*inornatus* is less than 70 mm. from snout to vent), in having abruptly enlarged postantibrachials, and in most specimens in the size of the dorsal granules (typically fewer than 80 GAB in *inornatus*).

DESCRIPTION OF TYPE SPECIMEN: The type is an adult male with a snout to vent length of 81 mm., and a tail length of 193 mm. (20 mm. regenerated); there are 80 granules around midbody, 190 granules from occiput to rump, and 33 femoral pores; the postantibrachials are abruptly enlarged to about eight times the area of the adjacent lower scales; the circum-orbital semicircles terminate anteriorly short of the frontal-frontoparietal suture.

In preservative (formalin fixation, alcohol storage) the specimen is gray dorsally and white ventrally. A dorsal pattern of seven narrow light stripes reaching from neck to rump barely can be distinguished. Definite traces of spotting are present in the fields, but the character of the spots with reference to possible spreading and fusion cannot be determined. The spacing of the paravertebral stripes cannot accurately be measured. The ventral surfaces are immaculate.

VARIATION IN TYPE SERIES: The ranges and means of GAB and femoral pore counts are given in a preceding paragraph. The specimens are rather uniform in color and pattern, the only minor exception being C.N.H.M. No. 53922, a male 86 mm. in length from snout to vent, which has black spots on the chin. The juvenile pattern is unknown; the smallest specimen in the type series is a gravid female measuring 70 mm. from snout to vent.

In life, the four specimens in the collection of the American Museum were bluish gray on the head and anterior part of the trunk. This color gave way to gray-brown on the rump, hind legs, and base of tail, which in turn was replaced by pale blue on the distal part of the tail. The ventral surfaces were pale blue.

REMARKS: This subspecies has received little mention in the literature. Schmidt and

Owens (1944, pp. 106–107) identified the specimens in the Chicago Natural History Museum as *C. inornatus*, whereas Fugler and Webb (1956, p. 168) recognized that they belonged with the populations included in *C. sackii semifasciatus* by Burger (1950, p. 4). Smith and Taylor (1950b, p. 184) accepted the identification of Schmidt and Owens (*loc. cit.*).

Despite the extremely faded pattern, the light lines of *pallidus* can be traced to the rump. In this feature of pattern as well as in the color of the ventral surfaces, *pallidus* is more similar to *C. s. septemvittatus* than to *C. s. semifasciatus*, which has a reddish chin and chest and stripes only anteriorly.

Cnemidophorus s. septemvittatus has been found 16 kilometers south of Cuatro Ciénegas, thus quite close to the localities for *pallidus*. The specimens from this locality are perhaps slightly paler than is common in this subspecies, but are clearly closer to *septemvittatus* than to *pallidus*.

The specimens of *C. s. pallidus* in the collection of the American Museum were found beside a small stream flowing between very arid hillsides. Mesquites were the dominant trees, and green herbaceous vegetation was largely restricted to the edge of the stream. About 10 of these lizards were seen in the course of a morning's collecting, and only two were as far as 20 feet from the stream. In contrast, *Cnemidophorus tigris marmoratus* ranged much more widely over the canyon. Possibly *pallidus* is more widely dispersed during rainy periods.

Cnemidophorus septemvittatus scalaris

Cope, new combination

Plate 27, figures 1, 2

Cnemidophorus gularis scalaris COPE, 1892, p. 47, pl. 12. SMITH AND MITTLEMAN, 1943, p. 246 (part).

Cnemidophorus scalaris, GADOW, 1906, p. 335, fig. 76. ZWEIFEL, 1959, p. 73.

Cnemidophorus sackii scalaris, SMITH AND TAYLOR, 1950b, p. 182.

Cnemidophorus sacki stictogrammus, CHRAPLIWY AND FUGLER, 1955, p. 126 (part).

TYPE: Seven syntypes, U.S.N.M. Nos. 8319 and 14302; five specimens (No. 8319) from the "Mexican Plateau S. of Chihuahua" collected by J. Potts, and two specimens (No.

14302) from the "City of Chihuahua" collected by Edward Wilkinson (Cope, 1892, p. 47). U.S.N.M. No. 14302a is cited by Smith and Taylor (1950b, p. 182) as lectotype, and these authors restrict the type locality to Chihuahua, Chihuahua.

RANGE (FIG. 9): The Mexican Plateau, from the vicinity of Chihuahua City and western Coahuila southward to northern Aguascalientes.

SPECIMENS EXAMINED: Chihuahua: 17 miles north of Chihuahua (A.M.N.H. No. 71377); 4 miles north, 2 miles west, of Chihuahua (K.U. No. 33762); Chihuahua (A.M.N.H. Nos 82054–82056); 5 miles southeast of Chihuahua (M.V.Z. No. 24358); 16 miles south, 12 miles west, of Chihuahua (K.U. No. 33763); 5 miles east and 5 miles north of Meoqui (K.U. Nos. 33764, 33770); 4 miles east and 4 miles north of Meoqui (K.U. No. 33758); 5 miles east and 3 miles north of Meoqui (K.U. No. 33756); Jiménez (C.N.H.M. No. 1021 [six specimens]); 6 miles northeast of Laguna [35 miles west, 5 miles north, of Chihuahua] (K.U. No. 51880); vicinity of Santa Barbara (A.M.N.H. Nos. 67919, 67920, 67922, 68217, and eight untagged, 68218–68228, 68275); 8 miles east of Santa Barbara (A.M.N.H. No. 67921); 1 mile south of San Francisco (K.U. Nos. 33760, 33765); 2 miles west of Parral (M.V.Z. Nos. 24359–24363); 2 miles southeast of Parral (M.V.Z. Nos. 24364, 24365); Las Trincheras, 9 miles south of Boquilla del Conchos (M.V.Z. Nos. 24367, 24368); 1 mile south of Naica (M.V.Z. No. 24366); 14 miles south of Camargo (M.V.Z. No. 56966). Coahuila: Ten miles northwest of Tanque Alvarez (K.U. No. 33771). Durango: Three miles southwest of Lerdo (A.M.N.H. Nos. 67465–67469, and six untagged, K.U. Nos. 33766, 33769); 8 miles southwest of Lerdo (A.M.N.H. Nos. 67488, 67489); 11 miles southwest of Lerdo (A.M.N.H. No. 67470); 15 miles southwest of Lerdo (A.M.N.H. Nos. 67463, 67464, 67471–67476); La Goma (A.M.N.H. No. 69954); Rodeo (A.M.N.H. Nos. 85268, 85269); Ojo de los Encinos (A.M.N.H. No. 68333); San Isidro (A.M.N.H. No. 68337); Río Nazas at San Salvador (M.V.Z. Nos. 59177–59179); Río Florido at Canutillo (M.V.Z. No. 59180). Zacatecas: Thirty miles east-southeast of Sombrerete

(M.V.Z. Nos. 56967, 56968); 15 miles northwest of Fresnillo (A.M.N.H. Nos. 82158, 82159, 85270). Aguascalientes: One-half mile west of Cosío (S.N.H.M. Nos. 19611, 19612, 19628–19633); 1 mile west of Cosío (S.N.H.M. Nos. 19613–19627).

Taylor's (1952, p. 808) record of *scalaris* from 2 kilometers east of Illescas, San Luis Potosí, evidently applies to the form to which we apply this subspecific name, to judge from his description of the color pattern. Probably *C. s. scalaris* is restricted in San Luis Potosí to the extreme western part of the state.

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 96 mm.; 69–101 ($N=77$) granules around midbody; 3–13 ($N=43$) scales separating paravertebral stripes; PV/GAB, 0.04–0.16 ($N=19$); 30–42 (35.8, $N=84$) femoral pores; postantibrachial scales enlarged.

Six or, rarely, seven light stripes present in juveniles. Dark fields becoming spotted at a relatively small body size, with lateral spots spreading vertically, fusing into light bars separated by dark bars formed by fusion of dark fields. Some individuals with bars crossing dorsum posteriorly, but bars restricted to flanks and upper parts heavily spotted in others. Light lines not obliterated and persisting in some large adult lizards, but bars and spots more common. Throat pink in large males, chest partly or wholly dark blue.

REMARKS: *Cnemidophorus septemvittatus scalaris* is a wide-ranging and highly variable form. A detailed study is needed, both to determine the relationships with neighboring forms and to clarify variation within and among the populations we refer to *scalaris*.

The range in granules around midbody is unusually wide (69–101), but only seven of 77 specimens have fewer than 80. The highest average is that of a sample of 20 specimens from southwest of Lerdo, Durango, 91.1 (85–101). Two other samples of comparable size have lower averages: Santa Barbara, Chihuahua, 82.1 (76–90, $N=17$); Cosío, Aguascalientes, 87.5 (80–97, $N=21$). Six specimens from the immediate vicinity of the type locality, Chihuahua City, average 86.5 (82–92).

Both north and west of Chihuahua City (the exact areas of contact remain to be discovered) *C. s. scalaris* is replaced by *C. ex-*

sanguis. The latter differs from *scalaris* in several ways: lower GAB count, only in rare instances over 80 in *exsanguis* from Chihuahua; ventral surfaces pale white or cream in all *exsanguis* (possibly an all-female species), not red-chinned with blue chest as in male *scalaris*; stripes persistent and spots not fusing into bars in *exsanguis*.

Cnemidophorus s. septemvittatus, which is found to the northeast of the range of *C. s. scalaris*, resembles *exsanguis* (and differs from *scalaris*) in the pale venter and persistent stripes, but is very similar to *scalaris* in scutellation.

Cnemidophorus s. scalaris and *C. s. semifasciatus* may meet in southeastern Coahuila. The chin color is similar in the two, but so far as is known no individual of *semifasciatus* shows a dark blue chest. The barred and spotted pattern of *scalaris*, with striking contrast between light and dark, is quite different from the faded dorsum of *semifasciatus*, which scarcely shows a trace of spotting and retains stripes anteriorly.

To the south of the range of *C. s. scalaris* is found an unnamed, spotted race (pl. 27, fig. 3) referred to by Zweifel (1959, 1961) as "*C. scalaris* ssp." This form differs from *C. s. scalaris* in that barring is absent in most specimens, and the individual spots on the body are much smaller than those in spotted specimens of *C. s. scalaris*. Scutellation and ventral pigmentation are much as in *scalaris*. Whether the unnamed form intergrades with *C. s. scalaris* in central Aguascalientes is uncertain, although it appears to do so (see discussion on p. 200).

There are problems in *C. s. scalaris* that will require specific field work to resolve. Three of four specimens from near Meoqui, Chihuahua, have the lowest GAB counts found (69, 72, 75), but the other has a high count (92). The specimen with the lowest GAB count (K.U. No. 33756) is peculiar in pattern, too, as it has numerous tiny, light spots with no sign of vertical expansion. It, and the other two individuals with low counts, resemble *exsanguis* in scutellation, and K.U. No. 33756 has the appearance of an *exsanguis* that has developed past the usual terminal pattern of spots and stripes. The specimen from 10 miles northwest of Tanque Alvarez, Coahuila (K.U. No. 33771), closely

resembles K.U. No. 33756 in both pattern and scutellation (77 granules around midbody). It comes from well within the area where *C. s. septemvittatus* occurs, which suggests the need for a study that will investigate the possibly specific relationship of the forms.

Cnemidophorus septemvittatus semifasciatus

Cope, new combination

Plate 28, figures 1, 4

Cnemidophorus gularis semifasciatus COPE, 1892, p. 49.

Cnemidophorus semifasciatus, GADOW, 1906, p. 334 (part).

Cnemidophorus sexlineatus gularis, BURT, 1931a, p. 100 (part).

Cnemidophorus sackii semifasciatus, BURGER, 1950, p. 4 (part). SMITH AND TAYLOR, 1950b, p. 184 (part). FUGLER AND WEBB, 1956, p. 167.

TYPE: U.S.N.M. No. 9248, collected by Lieutenant Couch at Auga 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.

RANGE (FIG. 9): Southern Coahuila, from the vicinity of Saltillo westward at least to Parras.

SPECIMENS EXAMINED: Coahuila: Agua Nueva (U.S.N.M. No. 9248); Patos (U.S.N.M. No. 3033); 2 miles west of Arteaga (A.M.N.H. Nos. 77225-77231); 15 miles west of Saltillo (A.M.N.H. No. 77248); 20 miles west of Saltillo (A.M.N.H. Nos. 67361, 67362); 4 miles northwest of General Cepeda (A.M.N.H. No. 77223); 2 miles west of Parras (A.M.N.H. Nos. 77286, 77287).

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, 99 mm.; 74-110 (91.6 ± 2.4 , $N=14$) granules around midbody; 5-23 (14.2 , $N=8$) scales separating the paravertebral stripes; PV/GAB, 0.06-0.21 (0.152 , $N=8$); 31-45 (37.5 ± 1.0 , $N=14$) femoral pores; postantebrachial scales enlarged.

Juvenile lizards with six primary light lines and, in some individuals, one or two vertebral lines. Light areas in dark fields not developing into sharp, discrete spots. Lines and dark fields in large lizards persisting on neck and shoulders but fading posteriorly, with large

adults showing scarcely a trace of striping on posterior two-thirds of body, though faint light spots distinguished in some specimens. Dark fields of juveniles black, stripes greenish gray. Dorsal ground color in adult individuals light brown. Throat and chin rusty orange in adults, with a few tiny black spots present in most specimens. Remaining ventral surfaces unspotted; orange color of chin present on chest and reappearing in anal region.

REMARKS: Burger (1950, pp. 4-5) revived *semifasciatus* and applied the name to lizards from the "Big Bend area of Texas, the adjacent portion of Coahuila, and probably northeastern Chihuahua," though the type locality, Agua Nueva, is in southern Coahuila. He treated Cope's *septemvittatus* as a synonym of *semifasciatus*. We feel that lizards from northern Coahuila and Texas are sufficiently distinct from those of the southern part of Coahuila to warrant subspecific recognition and use *septemvittatus* for the northern population.

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. One specimen has only five scales between the stripes at midbody, but the minimum number in six other specimens is 12 and the maximum 23. There is no evidence of geographic variation in either of these characters, as the extremes are represented by specimens from the Saltillo-Arteaga area.

The orange chin and chest and abrupt fading of the dorsal pattern posteriorly distinguish *semifasciatus* from *septemvittatus* to the north, which is white beneath and shows less anteroposterior differentiation of the dorsal pattern. *Cnemidophorus s. scalaris* to the west has a throat color similar to that of *semifasciatus*, but has the chest dark blue and a vivid spotted and cross-barred dorsal pattern.

POPULATIONS OF *Cnemidophorus septemvittatus* NOT ALLOCATED TO SUBSPECIES

Some of the outstanding problems remaining in the genus *Cnemidophorus* involve

Cnemidophorus septemvittatus. In addition to the populations we have placed in *scalaris*, *pallidus*, *septemvittatus*, and *semifasciatus*, there are several for which the ranges of variation and geographic distribution are so poorly known that we choose not to give them formal taxonomic status. (The reader should not infer that we regard the named populations as adequately investigated.)

Lizards that fit the diagnosis of *Cnemidophorus scalaris* [= *C. septemvittatus*] given by Zweifel (1959, p. 73) occur throughout the southern part of the Mexican Plateau. In the vicinity of Guadalajara, Jalisco, the large males (pl. 27, fig. 3) attain a dorsal pattern of fine light spots on a dark ground color, with little or no fusion to form lateral bars (Zweifel, 1961). This type of pattern predominates in samples from southern Aguascalientes (Río Peñuelas near Aquido, S.N.H.M. Nos. 19676-19689; 24 miles west of Aguascalientes, S.N.H.M. Nos. 19603-19610), but several individuals in samples from the central part of the state around Pabellón and Presa Jocoque show some lateral barring influence of *C. s. scalaris* (S.N.H.M. Nos. 19644-19654, 19672-19675). Specimens from Cosío at the northern edge of the state are assigned to *C. s. scalaris* (see p. 198). We presume that the southern spotted form and *C. s. scalaris* intergrade in central Aguascalientes, though Charles H. Lowe, Jr., who has studied these populations in the field, believes that two species may be involved (personal communication).

Judged from descriptions and locality records given by Taylor (1952, p. 809) and Grant and Smith (1959, p. 55), the spotted form as known from Guadalajara or a similar form ranges northward through central San Luis Potosí, between *C. s. scalaris* on the west and *C. gularis* on the east. Gadow (1906, fig. 77B) illustrates a lizard from Pátzcuaro, Michoacán, which appears to be the Guadalajara form. A series from Lago de Cuitzeo, Michoacán (U.M.M.Z. No. 119558 [42 specimens]), clearly belongs with *septemvittatus* (average of 85.8 granules around midbody, maximum snout to vent length, 95 mm.), but includes no wholly spotted individuals.

Seven specimens from the Distrito Federal (La Villa de Guadalupe, A.M.N.H. Nos. 14221, 14224; 2 miles west of Xochimilco,

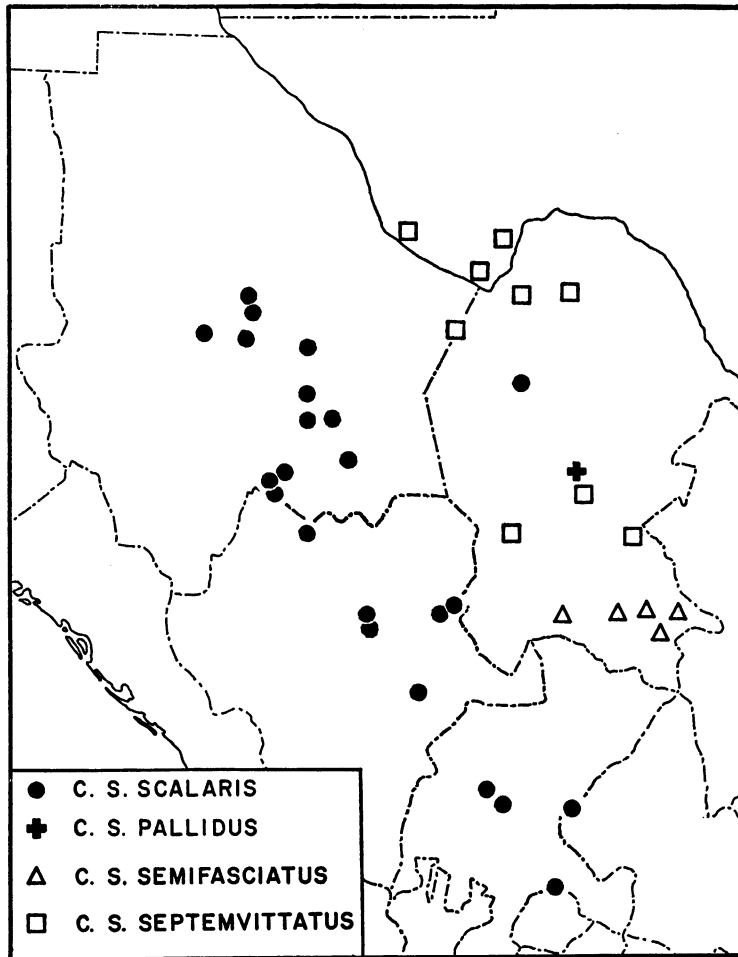


FIG. 9. Distribution of four subspecies of *Cnemidophorus septemvittatus* in Texas and northern México.

A.M.N.H. Nos. 15439–15443) have the size (maximum snout to vent length, 96 mm.) and scutellation (GAB average, 85.0) of *septemvittatus* but differ from the Guadalajara type in retaining stripes in the largest specimens. The dark fields are spotted in these lizards.

Cnemidophorus septemvittatus apparently ranges over most of the Mexican Plateau but is not found in the lowlands bordering the Plateau. Thus a population of this species south of the Río Balsas in northwestern Oaxaca presumably is disjunct from the main range of the species. Eight lizards (3 miles northwest of Yanhuatlán, 8700 feet, T.C.W.M. No. 11377; 8.5 miles east of Huajuapán, 7000 feet, T.C.W.M. Nos. 11378–11382; 9 miles southeast of Huajuapán,

6000 feet, T.C.W.M. No. 12388) collected by James Dixon and Ralph Axtell make up the sample. The dorsal scutellation (GAB mean, 82.4) and enlarged postantibrachials are typical of *septemvittatus*. The largest individual (S-V, 81 mm.) has a rather faded, almost uniform pattern on the dorsum, with some spotting and barring evident laterally, but smaller specimens have the familiar striped and spotted pattern.

We can offer no assurance that all the lizards we refer to *Cnemidophorus septemvittatus* belong to the same species or even, if they do, that *septemvittatus* is the correct name. It is possible that *Cnemidophorus gularis* (an older name) is conspecific with one or more populations we refer to *septemvittatus*,

but direct evidence is lacking. Such evidence must be sought where the forms presumably meet from Texas to San Luis Potosí or Hidalgo. Specific regions where evidence of intergradation or overlap should be sought are: between Monclova and Castaños, Coahuila (*gularis* and *septemvittatus*); between Monterrey, Nuevo León, and Saltillo, Coahuila (*gularis* and *semifasciatus*); and in east-central San Luis Potosí (*gularis* and *septemvittatus* ssp., Guadalajara type).

Some problems within *C. s. scalaris* are mentioned in the account of that subspecies. A detailed field study in southwestern Coahuila will probably be essential to any thorough treatment of *scalaris*. In this region one may expect the meeting of *septemvittatus* from the north, *semifasciatus* from the east, and *scalaris* from the west. To complicate matters further, we have examined a specimen from 26 miles southwest of San Pedro de las Colonias, Coahuila (K.U. No. 33809), that has a faded pattern much like that of *C. s. pallidus*.

***Cnemidophorus sexlineatus* (Linnaeus)**

Lacerta sexlineata LINNAEUS, 1766, p. 364.

Lacerta fallax MERREM, 1820, p. 63 (type locality "Carolina").

Cnemidophorus sexlineatus, DUMÉRIL AND BIBRON, 1839, p. 131.

Cnemidophorus sexlineatus sexlineatus, BURT, 1931a, p. 76.

Cnemidophorus sexlineatus oligoporus HOFFMAN, 1957a, p. 153 (type specimen, U.S.N.M. No. 135232, collected at Griffith, Alleghany County, Virginia, May 30, 1953).

Cnemidophorus sexlineatus pauciporus HOFFMAN, 1957b, p. 423 (substitute name for *C. s. oligoporus*, preoccupied by *Cnemidophorus deppii oligoporus* Smith).

TYPE: In the Royal Museum of Uppsala, collected by Alexander Garden. Type locality restricted to Charleston, Charleston County, South Carolina, by Smith and Taylor (1950a, p. 360).

RANGE: From the Atlantic coast as far north as Maryland and the District of Columbia, westward to the Rocky Mountains (Conant, 1958, p. 324, map 72); expected in extreme northeastern Mexico, but presence there not yet verified by specimens.

DIAGNOSTIC CHARACTERS: This summary is based on 123 specimens from throughout

the range of the species. Geographic variation in most characters is extensive, and is discussed below; hence, only ranges of variation and not averages are given here.

Maximum snout-vent length, 77 mm. in our series of 123 specimens, but Fitch (1958, p. 36) records females measuring 85 mm.; 68–110 granules around midbody; PV/GAB, 0.10–0.22; 8–22 scales between paravertebral stripes; 25–35 femoral pores; postantebrachial scales not or only slightly enlarged.

Adults retaining basic juvenile pattern of six light lines and unspotted dark fields. Vertebral field pale and little darker than paravertebral stripes, in some individuals with a single line, in most with a pair of stripes or none at all. Dorsolateral lines extending onto tail, upper lateral light lines present on base of tail in most specimens. Ventral surfaces pale and immaculate in juveniles and adults of both sexes.

REMARKS: This widespread species has been considered monotypic by most authors since Taylor ("1936" [1938b]) demonstrated the specific distinctness of *sexlineatus* and *gularis*. Recently Hoffman (1957a) described *Cnemidophorus sexlineatus oligoporus* from the northeastern corner of the range of the species; shortly thereafter (1957b) he changed the subspecific name to *pauciporus* because *oligoporus* was preoccupied. The new race is "characterized by a tendency of the parietal plates to divide into a number of small scales, usually 5 or more, and by a corresponding reduction in number of femoral pores, 30 or less in 85 percent of 50 specimens referred to this subspecies on the basis of parietal count and/or geographic provenance, as opposed to 31 or more in 81 percent of 78 specimens of *sexlineatus*" (1957a, p. 153). The geographic distribution of *pauciporus* is "From the vicinity of Baltimore, Md., south to extreme southeastern Virginia, thence southwest in the Piedmont to Laurens County, S. C. Intergradation with *C. s. sexlineatus* takes place throughout most of the Coastal Plain in North Carolina and along the Fall Line in South Carolina" (1957a, pp. 153, 155).

In order to evaluate the validity of *C. s. pauciporus*, we found it necessary to examine specimens from throughout the range of the species and make appropriate scale counts on

these specimens. Hoffman gives no data on the variation in the number of dorsal granules nor are ranges or averages given for the femoral pore counts, though the number of femoral pores is given weight as a subspecific character.

That scales other than the parietals are often subdivided and that this subdivision is in most cases quite erratic and asymmetrical is not evident from the description given by Hoffman. In many individuals the fourth supraoculars and frontoparietals are split one or more times; in many, there is a small scale between one or the other frontoparietal and the frontal; in a few, the frontal or third supraocular is divided by a suture. One peculiar specimen from Cove Point, Maryland (A.M.N.H. No. 57992), has three enlarged supraoculars on each side and five symmetrical parietals.

While it appears to be true that the northeastern population of *C. sexlineatus* has, on the average, a higher frequency of subdivided head scales, such subdivision is nevertheless quite frequent in other populations. In fact, specimens with three enlarged, undivided parietal scales are in the minority. Among 97 specimens from outside the area assigned by Hoffman to *pauciporus* and intergrades with *sexlineatus*, only 38 have the "typical" head scutellation of three enlarged parietals. Sixteen additional specimens have one of the parietals split, but the remaining 43 have at least five scales in the parietal group, and some of these have other scales split as well. Thus 44 per cent of the specimens have the head scutellation of *pauciporus*. The tend-

ency to subdivision of head scales is not restricted to the East Coast, for 16 of 34 specimens from Kansas have five or more parietals.

Hoffman (1957a, p. 153) observes that "The character of the parietals . . . is difficult to treat with precision . . . and probably no two persons would make the counts in exactly the same way." We agree that such is the case, but the high percentage of divided scales seen throughout the range of *sexlineatus* would be evident in any method of counting and casts some doubt on the validity, as a subspecific character, of the admittedly slightly higher percentage of subdivision in the northeastern part of the range.

A lower average number of femoral pores is given as a diagnostic character of *C. s. pauciporus*, 30 or fewer pores being typical of this race. Among 104 specimens from outside the range of *pauciporus*, and excluding possible intergrades, 39 lizards (37.5%) have 30 or fewer femoral pores. There is, however, geographic variation in this character, as is shown in table 6.

Our specimens from intermediate regions are too few to confirm one inference that might be made from these data, namely, that femoral pore counts average about the same from the Southeast to the edge of the plains. However, a reduction from east to west coincident with the shift from forest to prairie seems indicated. *Cnemidophorus s. pauciporus* apparently has a lower average number of femoral pores than other populations, but western populations approach *pauciporus* in this respect. The reduction of femoral pores in the prairie lizards seem to invalidate Hoff-

TABLE 6
VARIATION IN SCUTELLATION OF SEVERAL POPULATIONS OF *Cnemidophorus sexlineatus*

	Femoral Pores		Granules at Midbody		PV- Separation		PV/GAB	
	Range (Mean)	N	Range (Mean)	N	Range (Mean)	N	Range (Mean)	N
Maryland	25-31 (27.4)	15	91-101 (96.9)	15	15-18 (16.7)	16	0.15-0.19 (0.173)	15
Florida	28-35 (31.9)	20	89-110 (96.8)	19	10-20 (16.0)	19	0.11-0.21 (0.165)	19
Eastern Kansas ^a	29-34 (32.0)	13	79-91 (85.5)	13	9-14 (11.6)	13	0.11-0.16 (0.136)	13
Central Kansas ^b	27-35 (30.9)	21	72-83 (77.2)	18	8-13 (10.7)	17	0.10-0.17 (0.139)	17
Western Kansas ^c and Colorado ^d	27-35 (30.6)	18	68-82 (76.8)	18	8-11 (9.3)	18	0.12-0.15 (0.130)	18

^a Wilson, Douglas, and Greenwood counties.

^b Cowley, Riley, Washington, McPherson, Ottawa, Ellsworth, Lincoln, and Phillips counties.

^c Cheyenne, Hamilton, and Morton counties.

^d Yuma County.

man's (1957a, p. 156) speculation "that the reduction of the femoral pore series reflects slightly shorter legs, perhaps influenced by residence in semi-wooded areas where open ground was quite limited and the necessity for long sprints to shelter less frequent or imperative."

The size of the dorsal granules has proved to be a most useful character in the working out of taxonomic snarls in *Cnemidophorus*, and, though *pauciporus* cannot be distinguished from adjacent populations on this character, another significant geographic trend has been uncovered, as is shown in table 6.

Again our specimens from the intermediate region are too few to prove that the high counts characteristic of the eastern lizards persist throughout the southern states, though counts of 95, 98, and 101 on three specimens from southwestern Arkansas suggest that they do. The marked reduction in number of granules from east to west in Kansas is, however, well established.

No geographic trends in maximum body size are seen, but it is noteworthy that the largest specimens are females. In several other species of the *sexlineatus* group, males attain a conspicuously larger size than females, but Fitch (1958, p. 42) notes that in *sexlineatus* males and females average approximately the same size.

There is geographic variation in color and pattern. This is evident in our sample and has been the subject of comment by previous authors. Lowe (1955a) mentions that two specimens from New Mexico "were a conspicuous green when alive," whereas in the eastern part of its range *sexlineatus* has a brown ground color. Living lizards from Weld County, Colorado (received through the courtesy of Dr. T. Paul Maslin), and Harvey County, Kansas (kindly furnished by Dr. Henry S. Fitch), were bright green on the lateral and anterior dorsal surfaces. Evidently this color characterizes lizards throughout a broad area in the Great Plains.

Burt (1931a, p. 81) records that "the upper sides are often decidedly lighter than the back in western specimens, in which case the two lateral fields are in sharp contrast on

each side, the lower lateral remaining darker." The contrast between the dark dorsolateral field and pale upper lateral field is quite striking in well-preserved western specimens and stands in marked contrast to the nearly uniform brown of the two fields in eastern lizards. The contrast between upper and lower lateral fields mentioned by Burt is much less evident in our specimens. The bicolored pattern is best developed in specimens from Colorado and is evident to a lesser degree in eastern Kansas. Apparently juveniles of the western form have both upper and lower lateral fields dark, so resemble adult lizards from the east. There is some sexual dimorphism in pattern, with the lower stripes becoming obscured in adult males.

Apparently eastern and western populations of *Cnemidophorus sexlineatus* differ in relative tail length, lizards from Kansas having shorter tails than lizards from farther east (Fitch, 1958, pp. 43-44). The utility of this character for taxonomic purposes is hampered, however, because of sexual dimorphism (tail longer in male), ontogenetic variation (shorter in juveniles), and autotomy.

The spacing of the paravertebral stripes is quite variable in *sexlineatus*, as it is in other species, but average differences are clearly seen between western and eastern populations (table 6). The difference in P-V separation between eastern and western lizards is in part attributable to the relatively larger granules of the western lizards, but the difference persists in the P-V/GAB ratio, which shows that the stripes truly are farther apart in the eastern lizards.

The subject of variation in *Cnemidophorus sexlineatus* is worthy of far more detailed attention than we have been able to give, but we feel that enough data have been presented to cast serious doubt on the validity of *C. s. pauciporus*. It should be evident, however, that the separation of eastern and western subspecies deserves consideration, for there appear to be differences in color, pattern, proportions, and scutellation that correlate well with the change from deciduous forest to prairie. We refrain from formally proposing the subspecific separation here because of our relatively limited data.

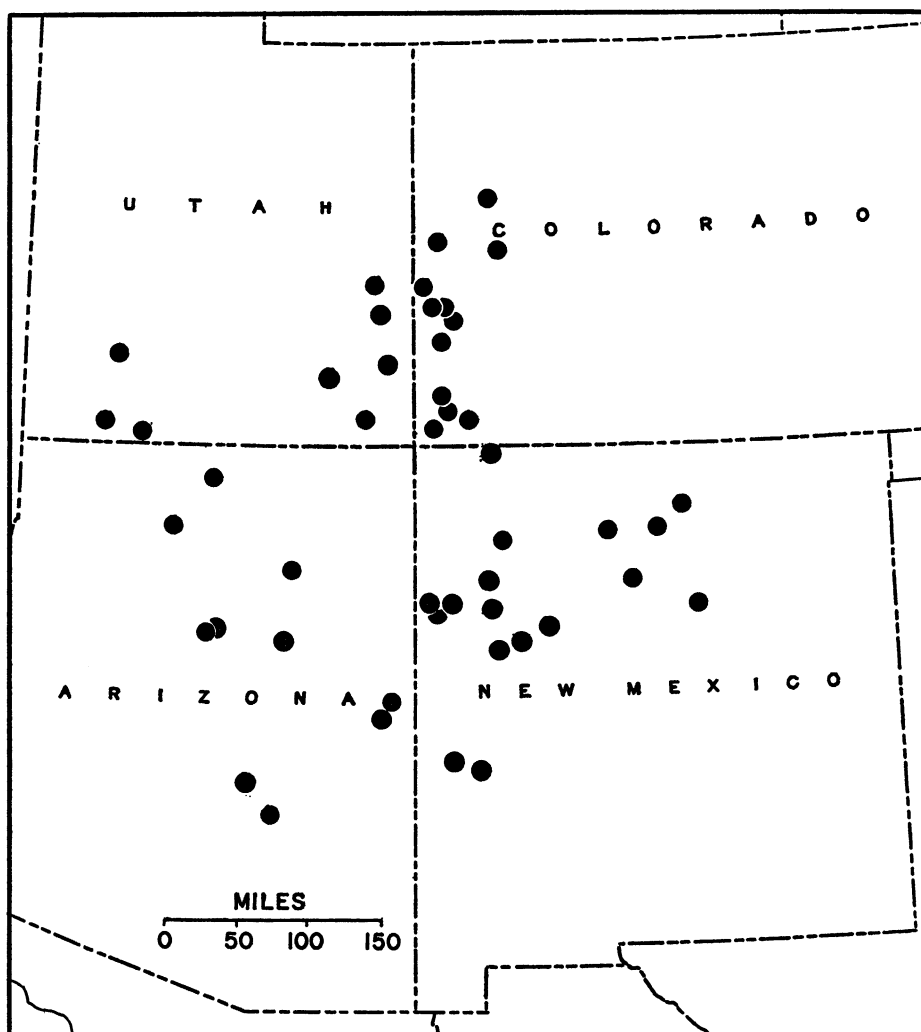
FIG. 10. Distribution of *Cnemidophorus velox*.***Cnemidophorus velox* Springer**

Plate 30, figure 5

Cnemidophorus gularis velox SPRINGER, 1928, p. 102.*Cnemidophorus sexlineatus perplexus*, BURT, 1931a, p. 124.*Cnemidophorus sackii innotatus* BURGER, 1950, p. 4 (type specimen, U.M.M.Z. No. 73323C, from the vicinity of Kanab, Kane County, Utah).*Cnemidophorus velox*, LOWE, 1955b, p. 4.

TYPE: M.C.Z. No. 37208, collected in August, 1927, by Stewart H. Springer, type locality restricted to Oraibi, Navajo County, Arizona, by Lowe (1955b, p. 4).

RANGE (FIG. 10): "On the so-called Colorado Plateau of northern Arizona and New Mexico, southern Utah and southwestern Colorado. The range extends southward on outlying mountain ranges to at least central Arizona and to central or southern New Mexico" (Lowe, 1955b, p. 5).

DIAGNOSTIC CHARACTERS: Maximum snout-vent length, approximately 85 mm.; 63–85 (73.1 ± 0.63 , $N=55$) granules around midbody; 5–10 (7.7 ± 0.16 , $N=55$) scales separating paravertebral stripes; 31–37 (33.8 , $N=18$) femoral pores; postantibrachial scales not greatly enlarged.

"A moderately-sized species of *Cnemidophorus* characterized by . . . 6 or 7 longitudinal light body stripes, with the seventh (vertebral) stripe, when occurring, less distinct than the remaining stripes; (3) total absence of light spots in the dark fields on the body; (4) ground color of the upper surfaces of the body black to blackish-brown; (5) ventrum immaculate whitish very faintly tinged with bluish; (6) distal portion of tail light bluish in adults and bright blue in juveniles" (Lowe, 1955b, p. 4).

REMARKS: The range of this species has not been determined with precision. Maslin

(1959b, pp. 44-45) gives locality records for Colorado, and Maslin, Beidleman, and Lowe (1958, p. 342) mention localities in New Mexico, but little specific information is available for other parts of the range. Information is particularly needed on instances of contact between *velox* and the very similar species *C. inornatus*. The range map (fig. 10) compiles published records, localities for specimens in the American Museum of Natural History, and records furnished by Frederick R. Gehlbach.

Cnemidophorus velox is one of the species in which males appear to be lacking.

SUMMARY

THE LIZARDS of the *sexlineatus* species group constitute the largest group within the genus *Cnemidophorus* and occupy the greatest geographic area, from Honduras to Maryland and westward to Arizona and northern Baja California. The taxonomic arrangement of the lizards of this group that has been developing over the 30 years since Burt (1931a) placed all forms described in two species (one with three subspecies) reveals a far more complicated situation than earlier authors appreciated. Within approximately the last decade, the application of more refined methods of study, together with a knowledge of the appearance of the animals in life and of their ecology, has greatly increased the understanding of variation and distribution. In the present report we recognize 17 species and 31 forms.

The impetus for the preparation of the present report was provided by the discovery that one of the oldest, hence taxo-

nomically most important, names in the genus, *sackii* Wiegmann, 1834, was misapplied. A simple shift of names or an application to the International Commission for conservation of names would scarcely remedy the situation satisfactorily, for a number of distinct species and subspecies would still remain buried in synonymy. This report, then, establishes the true identity of *Cnemidophorus sacki* as the form previously called *C. sacki australis* and redistributes the forms recently assigned to *C. sacki* among seven species. The arrangement given is assuredly not final, but it provides a working basis for future studies. With future workers in mind, we draw attention throughout this paper to the outstanding problems and point out where, particularly in the field, effort most profitably can be expended. We realize, however, that our colleagues may come, with Shakespeare, to feel that "'Tis the times' plague, when madmen lead the blind" (King Lear).

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