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The systematics of *Crotaphytus wislizeni*, the leopard lizards (Sauria: Iguanidae). Part II. A review of the status of the Baja California peninsular populations and a description of a new subspecies from Cedros Island

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THE SYSTEMATICS OF *CROTAPHYTUS WISLIZENI*, THE  
LEOPARD LIZARDS (SAURIA: IGUANIDAE).  
PART II. A REVIEW OF THE STATUS OF THE BAJA  
CALIFORNIA PENINSULAR POPULATIONS AND A  
DESCRIPTION OF A NEW SUBSPECIES FROM  
CEDROS ISLAND<sup>1</sup>

Benjamin H. Banta<sup>2</sup> and Wilmer W. Tanner<sup>3</sup>

This is the second of a planned series of studies on the systematics of the leopard lizards, *Crotaphytus wislizeni*. We have previously described the populations inhabiting the Upper Colorado River Basin of southeastern Utah and adjacent states, and the population of *Crotaphytus wislizeni wislizeni* in Arizona, New Mexico, Texas, and northern Mexico (Tanner and Banta, 1963). A study of the Great Basin populations has been underway for some time, and will appear as Part III.

For the loan of, or opportunity to examine specimens under their care which were essential for use in this study, the authors wish to thank Dr. Richard Etheridge, and Mr. Allan J. Sloan, San Diego Natural History Museum (SDNHM); Dr. Robert Inger, Chicago Natural History Museum (CNHM); Dr. James Peters, United States National Museum (USNM); Drs. Alan E. Leviton and Steven C. Anderson, California Academy of Sciences (CAS); Dr. Richard B. Loomis, California State College at Long Beach (LBSC); Dr. George S. Myers, Stanford University (SU); Dr. Kenneth S. Norris, University of California at Los Angeles (UCLA); Dr. Robert C. Stebbins, University of California at Berkeley (MVZ); Dr. Ernest E. Williams, Harvard University (MCZ); Dr. Richard G. Zweifel, American Museum of Natural History (AMNH); Dr. T. Paul Maslin, University of Colorado Museum (CU); and Brigham Young University (BYU).

THE STATUS OF THE BAJA CALIFORNIA  
LEOPARD LIZARD POPULATIONS

Leopard lizards from the southern Baja California peninsula were described as *Crotaphytus copeii* by Yarrow in 1882, based upon a specimen obtained by Lyman Belding at La Paz, Lower California, in 1882. Stejneger and Barbour (1917) recognized *C. copeii* as did Dickerson (1917). However, Van Denburgh (1922) was "unable to find any differences between specimens from Cerros (=Cedros) and Magdalena Islands, Lower California (*C. copeii*), and those from the United States, either in color or proportions." Schmidt (1922) also argued against recognizing *C. copeii* stating that, "The

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specimens secured by the Albatross Expedition (1911), one each on Cedros and Tiburon Islands, are certainly insufficient to establish the validity of *C. copeii*, much less of insular races, in view of the greater variability of typical *wislizenii*." Schmidt added, however, that a "larger series from the peninsula may re-establish *C. copeii*."

Although there is still a need for additional specimens from both peninsular and insular Baja California, we believe that there are now adequate samples to provide at least a basic preview of the systematic status for such populations as do occur on Cedros Island and Peninsula Baja California. Leviton and Banta (1964) recognized the Baja California leopard lizards as *Crotaphytus wislizeni copei* Yarrow, based upon preliminary analysis of specimens in the California Academy of Sciences collections, a status which we wish to support further. In the following account all measurements are in millimeters.

*Crotaphytus wislizeni copei* Yarrow, 1882

TYPE: USNM 12663 (see figures 1 and 2).

TYPE LOCALITY: La Paz, Baja California Sur, Mexico.

ORIGINAL DESCRIPTION: By Yarrow, 1882. Since the original description is brief and not readily available, we offer it in its entirety:

"Description: Head broader and longer than *C. wislizeni*. Superciliary ridges well developed. Anterior border of auditory aperture with one, two or three larger scales than the surrounding ones. Scales anterior to orbits, and posterior to nostrils, on upper surface of head, larger than elsewhere. Scales on gular larger than those anteriorly or posteriorly. Upper and lower labials fifteen each to angle near base of jaw. Infraorbital chain consists of four plates, the second very large. Femoral pores large and distinct. First phalanx of hind leg extended reaches angle of jaw. Color dark gray, maculated with dark brown circular spots, each having a lighter center. Anterior to the lower extremities the spots become rhomboid in shape, and on the tail are oval. The head is densely and minutely punctulated with black spots. Belly white. This species is to be compared with *C. wislizeni*, from which it differs in certain particulars, the coloration being entirely different from any of the known species of *Crotaphytus* (sic)."

As noted above, the original designation of these southern populations was based primarily on the color and color pattern. To these characters we may now add: 1. an increased number of femoral pores; 2. one or usually no small scales entering pores posteriorly (in some few specimens there are two scales which enter some, but not all pores); 3. a proportionately longer tail, especially ratio of tail to total length is greater (.68 to .71). There is also a lower average of postmentals (3.6); however, most specimens have four and are thus similar to mainland *C. wislizeni*.

RE-DESCRIPTION OF THE TYPE: A young adult female, snout vent length 83, tail regenerated with 70 comprising the non-regenerated

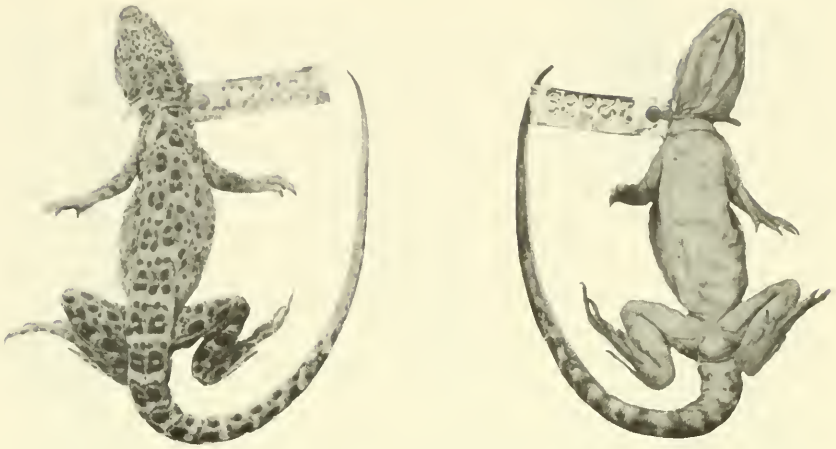


Figure 1. Dorsal view of holotype of *Crotaphytus wislizeni copeii* Yarrow [USNM 12663] from La Paz, Baja California Sur, Mexico. Photograph by Dr. Alan E. Leviton, June 1961.

Figure 2. Ventral view of holotype of *Crotaphytus wislizeni copeii* Yarrow. Photograph by Dr. Alan E. Leviton, June 1961.

portion and 67 the regenerated region. Head distinct, orbit to rostral 9.4, orbit to ear 6.5, rostral to ear opening 20.8, head width 15.4, head depth 10.7. Appendages well developed. length of right foreleg 33, length of right hindleg 72. length of longest toe, 30. Dorsal scales (occiput to base of tail) 219, dorsomedial head scales (occiput to and including rostral) 24, ventromedial body scales 100. ventromedial head scales (including mental) 67, nuchals approximately 9 in number and cream in color. Supralabials 23/24, infralabials 16/17, femoral pores 24/24. Postmentals 2/1 (3). internasals 7, postrostrals 3-1-3. scales between rostral and nasals 2-2. Dorsal pattern distinct. dorsal transverse bars wide, light tan. 8 in number, and do not extend laterally. Dorsal spots brown and bounded by white. Dorsum color light tan, dorsal blotching consists of olive brown spots with two, three and sometimes four components bordered by small white spots. On the anterior portion of the body these brown spots have a small white circle center, a somewhat comparable pattern also occurring on the anterior portion of the tail. Numerous brown spots on head dorsum. Only five faint gray gular stripes (3-6 scales wide) are present with two transverse connections anteriorly. Venter cream with small dark specks present in the pectoral region.

MATERIAL EXAMINED: (N=50) MEXICO: Baja California: 6 mi. W Alaska (MVZ 31839), 3 mi W Canon de Llanos,  $\pm$  10 mi SW Alaska (MVZ 31794-5), Punta San Felipe (MVZ 50017), El Cajon Canon (MVZ 9589), El Medano (MVZ 1350-1), Medano Blanco (MVZ 37260-1), Turtle Bay (MVZ 45584), 30 mi SE Mesquital (MVZ 50018), 3 mi SSE El Arco (MVZ 50020), 20 mi SSE El Arco (MVZ 50019), 0.5 mi SE San Jose de Gracia (MVZ 73569), near

Bahia Asuncion (CNHM 130299-300), sand dunes, 12 mi SE Venancio (MVZ 37362), 4 mi E Punta Santa Rosalia (AMNH 75762), Vizcaino Desert, 8 mi SE Rancho La Cantina (CAS 90297), Rancho San Jose (CAS 65857-60), 15 mi W El Rosario (BYU 21781), Cadeje (BYU 21783), Mountains N Baja California (USNM 16856), Ensenada (USNM 37629), Yubay (USNM 37630), San Quintin (CNHM 1124), San Jorge (SU 18823), San Tomas (SU 1087), 5 mi W El Marmol (SU 11547), San Telmo River at San Jose (SDNHM 4071), 3 mi E Socorro (SDNHM 4143), San Jose (SDNHM 5078-80, 26752-3), 12 mi E El Arco (SDNHM 17470), Rancho Buena Vista, 7 mi NW San Jose (SMNHM 36454), 2 mi N San Simon (SDNHM 42622), Valle de Trinidad (SDNHM 18945-6), 8 mi E El Rosario (SDNHM 43007), 40 mi W Bahia de Los Angeles (SDNHM 19787), Bahia de San Francisquito (SDNHM 18118), no specific localities (MCZ 14302-3), La Paz (USNM 12663), 6 mi W Rancho Catavina (LBSC 1470).

DIAGNOSIS: A peninsular population of *Crotaphytus wislizeni* differing from mainland Mexico and United States populations in a conspicuous dorsal pattern, not variable brown spots surrounded by small white spots, but with brown spots broken up into smaller components of two to four parts, each bordered by small white spots. Available samples provide some extent of the parameters of variation of the following meristic characters: 1) number of body ventrals: 44(96.0454)86-108<sup>1</sup>, 2) number of mediiodorsal scales (occiput to base of tail): 43(199.0465)174-277, 3) ventrals into head: 42(63.3571)55-73, 4) number of femoral pores: 44(45.75) 38-53. The morphometric variation of the peninsula population is as follows: 1) snout-vent length: 46(94.4565)48-121, 2) tail length: 41(218.6341)104-253, 3) head length: 46(24.1531)13-33, 4) head width: 45(17.7826)10-23, 5) snout length: 46(10.8043)6-14.

That the dorsal blotches begin as single units and diverge into 2-4 subunits may be discerned by an examination of a juvenile specimen (Fig. 3).

RANGE: Most of the Baja California peninsula except the coastal northwestern portion and the northeastern (San Felipe Desert area) portion where it is replaced by *C. w. wislizeni* (Figure 6).

*Crotaphytus wislizeni neseotes*, n. subsp.<sup>2</sup>

Figures 4 and 5

TYPE: California Academy of Sciences Number 79872. Adult male collected by Mr. Joseph Richard Slevin on Cedros Island, west coast of Baja California Norte, Mexico, between April 25, and May 30, 1940.

PARATYPES: (N = 37) MEXICO: Baja California, Cedros Island; no specific area of island cited (MCZ 45722-3, CAS 8843-4, 56182, 56184-6, 59587, 79866-74, AMNH 5544, SDNHM 7249, 15969, 17411, 24340-2, CNHM 130291-8), Canyon of Middle Canyon (SDNHM 27693-5), S end (SDNHM 5264).

1. Number (mean) Range.

2. The term *neseotes* refers to the fact that this is an insular race.



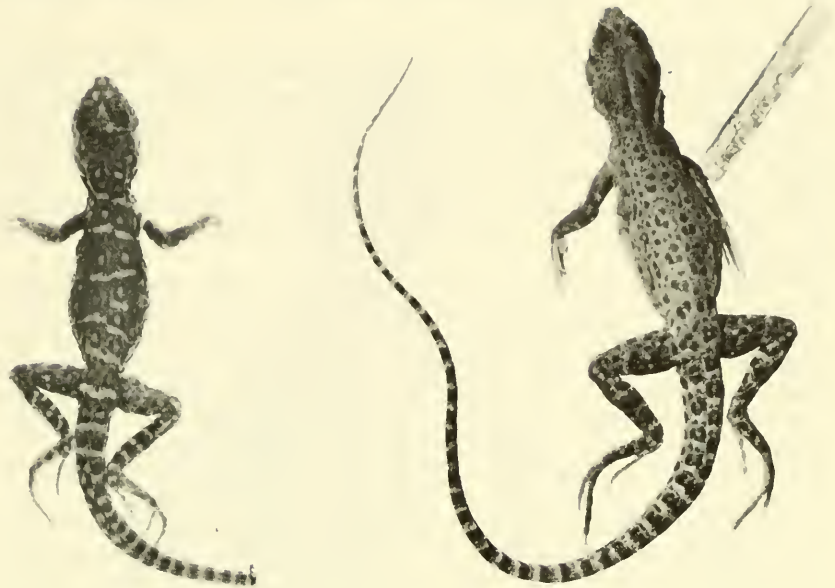


Figure 3. Dorsal view of juvenile from Cadeje, Baja California, showing dorsal pattern on single blotches which later diverge into subunits of 2-4. Photograph by Charles A. Torbit, Jr.

Figure 4. Dorsal view of holotype [CAS 79872] of *Crotaphytus wislizeni neseotes*. Photograph by Maurice Giles.

**DIAGNOSIS:** An insular population of *Crotaphytus wislizeni* closely related to adjacent peninsula Baja California (*C. w. copei*), but differing from the latter in, 1) number of body ventrals (Cedros Island: 37(91.2162)83-105; Baja California: 44(96.0454)86-108; 2) number of mediadorsal scales: 73(190.7837)169-202; 3) fewer ventrals into head: 37(58.0270)44-68; 4) longer snout-vent length 37(96.6216)87-124; 5) shorter tail length 35(214.7428)106-270; 6) longer head: 37(25.054)16-33; 7) wider head: 37(19.2702)11-24; 8) longer snout: 37(11.7027)7-15; 9) slightly greater number of femoral pores: 37(45.9729)37-59. For a comparison of these statistics compared with the Baja California population, see Tables 1, 2.

**DESCRIPTION OF TYPE:** An adult male, snout-vent length 93, tail length 228, total length 321, ratio of tail/total length .71. Eye orbit to rostral distance 11.2; eye orbit to ear distance 7.5; rostral to ear distance 23. Head distinct, head width 18; head depth 13.4. Appendages well developed, right foreleg length 37.5; right hindleg length 82; longest toe 33.5. Number of dorsal scales (occiput to base of tail) 196; dorsomedial head scales (occiput to and including rostral) 24; ventromedial body scales 97; ventromedial head scales 70 (including mental), nuchals approximately 6 and gray in color, supralabials 22/22; infralabials 23/21. Femoral pores 25/27, small scales contacting pores posteriorly. Internasals 6; postmentals 2-2;

interorbitals 4; postrostrals 4-4; scales between rostral and nasals 2-2. Dorsal tail bands 46. Dorsum light olive brown; round darker olive brown blotches conspicuous; large spot pattern conspicuously broken into smaller oval spots consisting of two to four components, each separated by small white spots. Gulars less than 50 percent dark gray. Gray gular stripes 7 in number and wide (3-5 scales) with interconnecting transverse fusions especially noticeable anteriorly and posteriorly. Venter cream with gray scales anteriorly and laterally.

**SEXUAL DIMORPHISM:** A most unique characteristic of the Cedros Island population is the extent of its sexual dimorphism. Cedros Island females are larger than the males, femoral pore counts are slightly greater than the males, dorsal body scales are significantly greater in females, tail lengths of females are greater than males, head lengths of females are also greater than males, head width and snout length are likewise greater in females. See Tables 1 and 2.

**RANGE:** Restricted to Cedros Island, Eastern Pacific Ocean, off the west coast of central Baja California, Mexico (Figure 6).

**REMARKS:** The Cedros Island population of *Crotaphytus wislizeni* is readily distinguished from mainland peninsula populations primarily by the larger size attained by the individuals composing it. In contrast to the dwarfing of the Cedros Island rattlesnake, *Crotalus exsul* Garman (cf. Klauber 1931, 1949), the leopard lizards have developed in the opposite direction, toward larger size. This phenomenon of relative gigantism is also characteristic of several other reptiles inhabiting islands surrounding Baja California (e.g., *Uta palmeri* from Isla San Pedro Martir, *Crotalus mitchelli angelensis* Klauber (1963) from Isla Angel de la Guarda and *Sauromalus varius* from San Esteban Island in the Gulf of California).

Most of the reptiles found on Cedros Island are relatively distinct from their closest counterparts on the adjacent Baja California peninsula and have received nomenclatural status (cf. Yarrow, 1882; Garman, 1883; Stejneger, 1889, 1893; Fitch, 1934; Klauber, 1946; Zweifel, 1958). One of the two specimens of the colubrid genus *Chilomeniscus* was very distinct from peninsula samples available and has been reported upon by Banta and Leviton (1963). According to Durham and Allison (1960) Cedros Island has been separated from the Vizcaino Peninsula of Baja California since the Miocene. This is seemingly enough time to have allowed for the degree of differentiation exhibited by the reptile fauna, if indeed the animals have been extant on the island for that period of time.

One of the specimens (LMK 24340) is a gravid female containing two eggs with lengths ranging from 22 to 24 mm. and widths of 15 to 16 mm. However, the main interest of this specimen is in the length of the tail (snout-vent 106, tail length 38) most of which was obviously removed in some way or other, but rather than being regenerated as is the case with most iguanid and many other lizard groups, only a very healed-over stub remains. Also in the stomach of another adult female (CAS 8843), a grasshopper and an adult lizard (*Uta concinna*) was found.

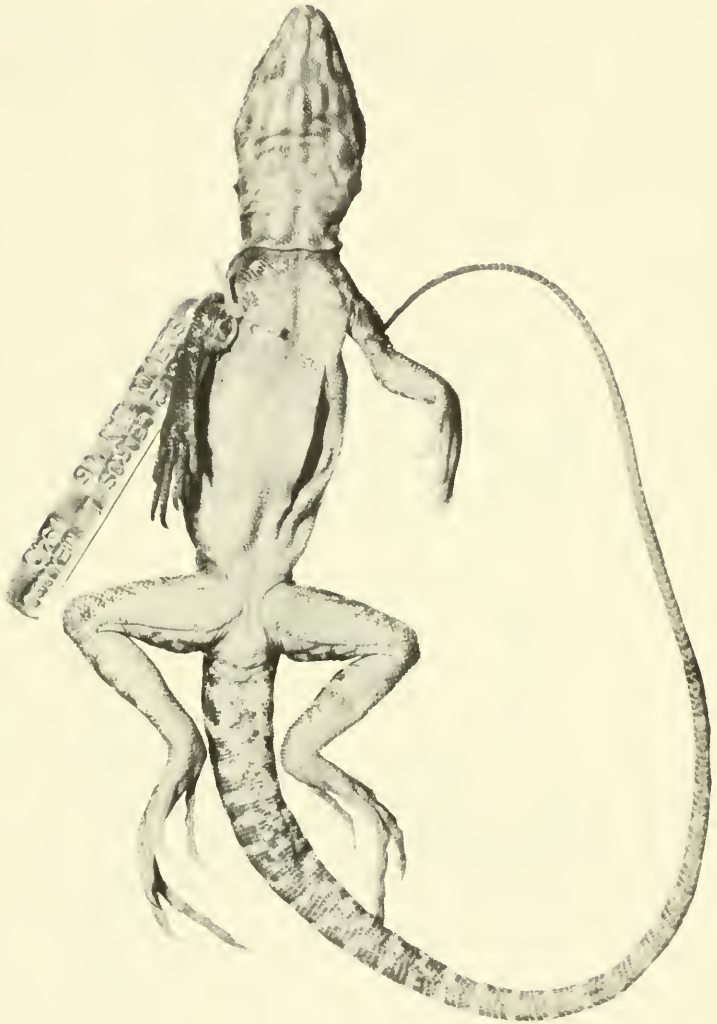


Figure 5. Ventral views of holotype of *Crotaphytus wislizeni nescotes*. Photograph by Maurice Giles.

We have not seen the coloration of living gravid females of the Cedros Island population. The extent of the usually brilliant orange or vermilion color in the females of mainland leopard lizard populations suggests that this character might be useful in population segregation. However, the description of this character in the Cedros Island population and the pattern in juveniles will have to wait until suitable color and pattern data become available.



TABLE 1. COMPARISONS OF MEANS OF SELECTED MERISTIC CHARACTERS BETWEEN SAMPLES OF *CROTAPHYTUS WISLIZENI* FROM CEDROS ISLAND (A) AND FROM BAJA CALIFORNIA (B)

Character	A	$\delta \delta$ (N=16)	$\delta / \delta$ (N=21)	$\delta / \delta$ Mean Ratio
	B	$\delta \delta$ (N=23)	$\delta / \delta$ (N=21)	$\delta / \delta$ Mean Ratio
Femoral pores (total of right and left thighs)	A	(43-50)44.88	(37.59)46.81	.958
	B	(38-53)46.09	(40.53)45.38	1.015
Postmentals	A	(3-5)3.75	(2.5)3.57	1.05
	B	(2.6)4.04	(3.5)3.81	1.06
Dorsal body scales	A	(180-201)187	(169-202)193.66	.9656
	B	(175-227)200.73 <sup>1</sup>	(183-212)197.29	1.01743
Ventral body scales	A	(83-100)91	(83-105)91.42	.99540
	B	(86-110)95.63	(89-108)96.29	.99522
Dorsomedial head scales	A	(22-26)23.63	(20-28)23.24	1.01678
	B	(21-27)23.14 <sup>2</sup>	(20-25)22.81 <sup>1</sup>	1.01446
Ventrals into head	A	(44-68)57-19	(55-69)58	.98603
	B	(55-73)63.5	(56-72)63.2 <sup>2</sup>	1.00474
Internasals	A	(5-7)6.44	(5-7)6.29	1.02384
	B	(6-8)6.65 <sup>3</sup>	(5-8)6.47 <sup>4</sup>	1.02782

1. N = 22  
 2. N = 21  
 3. N = 20  
 4. N = 19

Overall  $\delta / \delta$  A .99937  
 Mean Ratios B 1.01923  
 $\delta / \delta$  Mean A .958 - 1.02384  
 Ratio Range B .99522 - 1.02782

TABLE 2. COMPARISONS OF MORPHOMETRIC DATA BETWEEN SAMPLES FROM CEDROS ISLAND (A) AND FROM PENINSULA BAJA CALIFORNIA (B)

Character	Males		Females	$\delta/\text{♀}$ Mean Ratios
Snout-Vent Length	A	16(52-115)89.375	21(52-120)102.1428	.8750
	B	24(52-112)91.333	22(58-121)97.8636	.93326
Tail Length	A	16(106-232)198.375	19(129-267)228.5263	.8680
	B	20(104-258)212.2	21(135-253)224.7619	.9441
Head Length	A	16(15-27)23	21(16-33)26.619	.864
	B	24(13-28)23.4166	22(15-28)24.9545	.93837
Head Width	A	16(11-22)17.875	21(13-24)20.33	.87924
	B	24(10-22)17.4166	22(15-23)18.18	.958
Snout Length	A	16(7-13)10.9375	21(7-12)12.2857	.89026
	B	24(6-14)10.625	22(6-14)11	.9659
Length of Hindleg	A	17(45-90)74.1764	21(49-97)81.5714	.90934
	B	24(40-89)76.166	23(46-102)80.3913	.94744
Length of Foreleg	A	17(22-44)34.4117	21(31-47)39.8095	.8644
	B	24(21-45)36.4166	24(24-48)38.5416	.94486
Overall $\delta/\text{♀}$ Mean Ratios	A	.8786		
	B	.94741		
	$\delta/\text{♀}$ Ratio Range	A .864 - .90934 B .93837 - .9659		

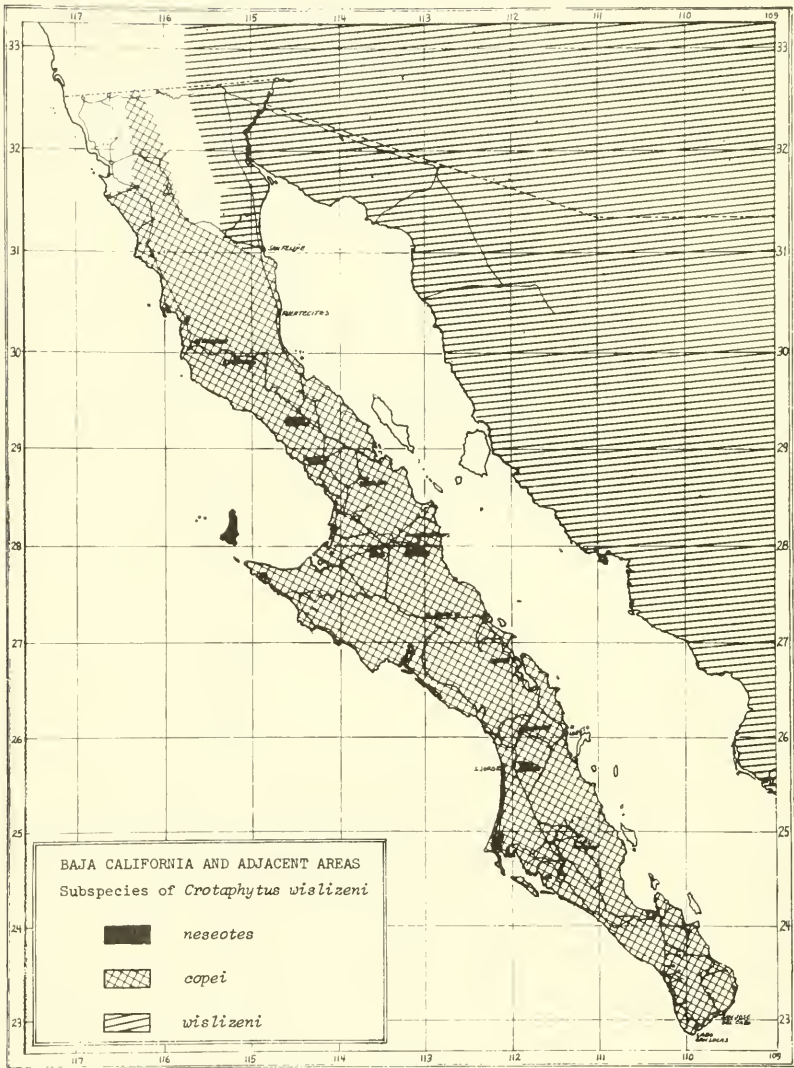


Figure 6. Map indicating occurrences of samples of *Crotophytus wislizeni copei*, *C. w. neseotes*, and *C. w. wislizeni* in the Baja California region.

*Crotophytus wislizeni wislizeni* Baird and Girard, 1852

MATERIAL EXAMINED: (N=2) Baja California Norte: 2 mi S San Felipe (UCLA 10735)\*; 6 mi SE mouth of Tajo Canyon, Laguna Salada (UCLA 5544).\*

\*Now deposited in the herpetological collections of the Los Angeles County Museum of Natural History

RANGE: Northeastern section of Baja California Norte, Mexico (Figure 6).

REMARKS: The San Felipe Desert area of northeastern Baja California is inhabited by populations readily designated as *C. w. wislizeni* with the characteristic dorsal spots encircled by small white dots. The extent of the intergradation with *C. w. copei* remains to be determined when more adequate samples become available.

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