VARIATION, DISTRIBUTION AND SYSTEMATIC STATUS OF THE BLACK-HEADED SNAKE *TANTILLA YAQUIA* SMITH

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Introduction

In August of 1959, David B. Wake and I collected a specimen of *Tantilla* in the vicinity of Ruby, Santa Cruz County, Arizona, that exhibited several morphological characteristics unknown in species of *Tantilla* reported from the United States at that time. In 1962 I collected additional specimens of this species during the course of a herpeto-faunal survey of the lowlands in southern Sonora and Sinaloa, Mexico. Subsequent investigation revealed that these snakes are *Tantilla yaquia*. The acquisition of new material led me to initiate a project to analyze variation and distribution in the species in order to clarify its status.

Historical Review

Smith (1942) described *Tantilla yaquia* from a single specimen (MCZ 43274) collected at Guasaremos, Chihuahua by H. S. Gentry and noted the probable relationships between *T. yaquia* and *T. eiseni* Stejneger. Two years later, Hartweg (1944) described *T. bogerti* from Acaponeta, Nayarit. He mentioned the similarities between *bogerti* and *yaquia* but distinguished *bogerti* on the basis of fewer subcaudal scales. Smith and Van Gelder (1955) discussed a specimen of *T. yaquia* from Costa Rica, Sinaloa and stated that none of the features of their specimen affected the status of *T. bogerti*. In contrast, Zweifel and Norris (1955) thought that their specimen from Mirasol, Sonora showed characteristics of both *yaquia* and *bogerti* and allocated *bogerti* to the synonymy of *yaquia,* but recognized *T. y. yaquia* in Sonora and *T. y. bogerti* in northern Nayarit.

McCoy (1964) reported two specimens of *T. yaquia* from Bisbee, Arizona and confirmed the conspecificity of *yaquia* and *bogerti*. He noted the clinal variation of certain meristic characters and suggested that additional material might support subspecific designation of the Arizonan population. Fowlie (1965) listed additional locality records of *T. yaquia* from the Pajarito Mountains of southern Arizona.

Tanner (1966) suggested that *T. atriceps* (Günther), *T. yaquia,* and

T. bogerti (among others) were subspecies of *Tantilla planiceps* (Blainville) of Baja California. Stebbins (1966) followed Tanner's arrangement.

In their treatment of the herpetofauna of Sinaloa, Hardy and McDiarmid (1968) suggested that *T. yaquia, atriceps,* and *planiceps* are not conspecific. They also pointed out the clinal nature of the characteristics utilized by Tanner (1966) to distinguish between *bogerti* and *yaquia* in Sinaloa. Accordingly, they placed *T. yaquia bogerti* in synonymy with *T. yaquia.*

CHARACTER ANALYSIS

Thirty-three characteristics of all available specimens of *Tantilla yaquia* were analyzed. Most of these characters concern scalation or coloration. Because of the gaps in the range of the species (Fig. 1) and for purposes of analysis, specimens of *T. yaquia* are grouped as: A, a northern population in southern Arizona and northern Sonora, B, a central population in Chihuahua, southern Sonora and northern Sinaloa, and C, a southern population in southern Sinaloa and Nayarit.

SCALATION

Ventrals: Because of possible dimorphism in the number of ventrals and subcaudals, each sex is considered separately for each of the three populations. The sex was determined by dissection. Ventrals were counted according to the Dowling system (1951). The number of ventrals is 134-157 ($\bar{x}$ = 146.2) in males and 145-165 ($\bar{x}$ = 152.6) in females. In males from population A the ventrals are 145-157 ($\bar{x}$ = 151.4; N = 5), in population B, 139-154 (144.0; N = 7), and in population C, 134-150 (145.0; N = 5). The number of ventrals in females from population A is 155-165 (159.1; N = 8), population B, 145-153 (148.9; N = 9), and in population C, 146-154 (149.2; N = 5). Thus, females generally have more ventrals than males in the same population. On the average, the difference is greater between males and females in population A than it is between males and females of populations B or C.

Subcaudals: The subcaudal series is incomplete in many specimens due to broken tails. The subcaudal number is 46 − 75 ($\bar{x}$ = 61.9; N = 16); these extremes are found in females. Males have 50-73 subcaudals ($\bar{x}$ = 59.8; N = 13). Because of the length of the hemipenis, males of most snake species have more subcaudals than do females. The difference between male and female subcaudals in *T. yaquia* is not consistent in the three populations. In fact, in population A, females average more subcaudals than males. In population A males have 62-75 ($\bar{x}$ = 66.0; N = 4) subcaudals, and females 62-75 (68.5; N = 6). In

population B males have 62-64 (62.7; N = 4) subcaudals, and the females 57-67 (61.1; N = 7). Subcaudals in population C are 50-56 (52.4; N = 5) in males and 46-53 (49.0; N = 3) in females. More specimens are required to verify the differences in subcaudals for population A.

Males and females from population B, on the average, have more ventrals than they do in population A, and slightly less than in population C. In contrast, a comparison of the average counts of subcaudals in both males and females among the three populations indicates that there are fewer in the south. Between populations B and C, this difference in the males is more than twice that exhibited between populations A and B. In females, however, the difference between B and C is only about one-third greater than the difference between A and B.

Ventrals plus subcaudals (total): Figure 2 illustrates the difference in ventrals plus subcaudals for the three populations. The data strongly suggest that the decrease in ventrals plus subcaudals from north to south is clinal. However, small sample sizes obviate the use of meaningful statistical comparisons which will have to await the collection of additional material. In both sexes the decrease is always greater between populations A and B than it is between populations B and C.

Head scales: The preocular, postocular and temporal scales are generally consistent in number. All specimens examined have one preocular and two postoculars. In most specimens, the nasal and preocular scales are in contact; the contact may be broad or narrow. In a few cases the prefrontal is in contact with the second supralabial and separates the nasal from the preocular. Nearly all specimens exhibit one elongate primary and one elongate secondary temporal. The secondary temporal is fused with the primary temporal on the left side in one specimen from Sinaloa (JFC 62-53). The loreal scale is absent from all specimens.

The mental scale is separated from the chin shields by the first pair of infralabials in most specimens. Only two individuals from Arizona possess a contact between the mental and the chin shields. Seven specimens from population B, including the type of *T. yaquia,* have this contact. In one specimen (ASU 5836) the contact is present on one side only. In the other 10 specimens from population B, there is no contact. Few individuals have the mental and chin shields widely separated. None of the snakes from Sinaloa or Nayarit exhibits a mental-chin shield contact.

The labial scales generally are consistent throughout the range of *Tantilla yaquia.* There are seven supralabial scales and six infralabial scales in most of the specimens examined. It can be argued that the

seventh supralabial, the largest, is not a labial scale because it borders the lip only for a short distance along its margin. However, because of its free overlapping lower edge, large size, and position in the labial series, it is considered a supralabial in this study. There is no geographic consistency to deviation from the normal supralabial count of seven. One specimen from Arizona (MVZ 43701) has six supralabials on both sides; another specimen from Arizona (ASDM 2255) has six supralabials on the left side only. Both low counts apparently are the result of a fusion of the fifth and sixth supralabials. A specimen from Teacapán, Sinaloa (LACM 7001) has eight supralabials on the right side, the result of the splitting of supralabial one.

Normally, the third and fourth supralabial scales border the orbit. Smith (1942:41) stated that the fourth and fifth supralabials enter the orbit on the type of *T. yaquia*. Reexamination of the holotype indicates that the third and fourth supralabials enter the eye. If, however, there is a split of one of the anterior labial scales, then the fourth and fifth supralabial scales enter the orbit, as in the specimen (LACM 7001) mentioned above. Occasionally part of the second supralabial enters the orbit together with the third and fourth (MVZ 43701). No variation in the number of infralabials was observed.

Body scales: All specimens examined have 15 scale rows one head length behind the head, at mid- body, and one head length in front of the anus.

COLORATION

Body color: In preservative, the dorsal surface of the body is light brown to brownish-tan, fading slightly on the lateral surfaces. In some specimens, especially those from southern Sonora, the dorsal scales have a speckled appearance to give the impression of a faint stripe on each scale row. Microscopic examination shows that this coloration is due to the posterior superimposition of each dorsal scale resulting in twice the concentration of pigment at each area of overlap.

The ventral coloration of three live specimens was pinkish-orange. The color, brightest on the posterior third of the ventrals beneath the tail, gradually fades on the anterior half of the body. The anterior quarter of the ventral surface, the throat, and the chin are creamy white. After storage in preservative, the pinkish coloration is lost completely, and the ventral surface appears light tan. Some of the specimens from the vicinity of Alamos, Sonora, and the type specimen have traces of brownish pigment on the lateral edges of some ventral scales. These specks of pigment are not present in specimens from other localities.
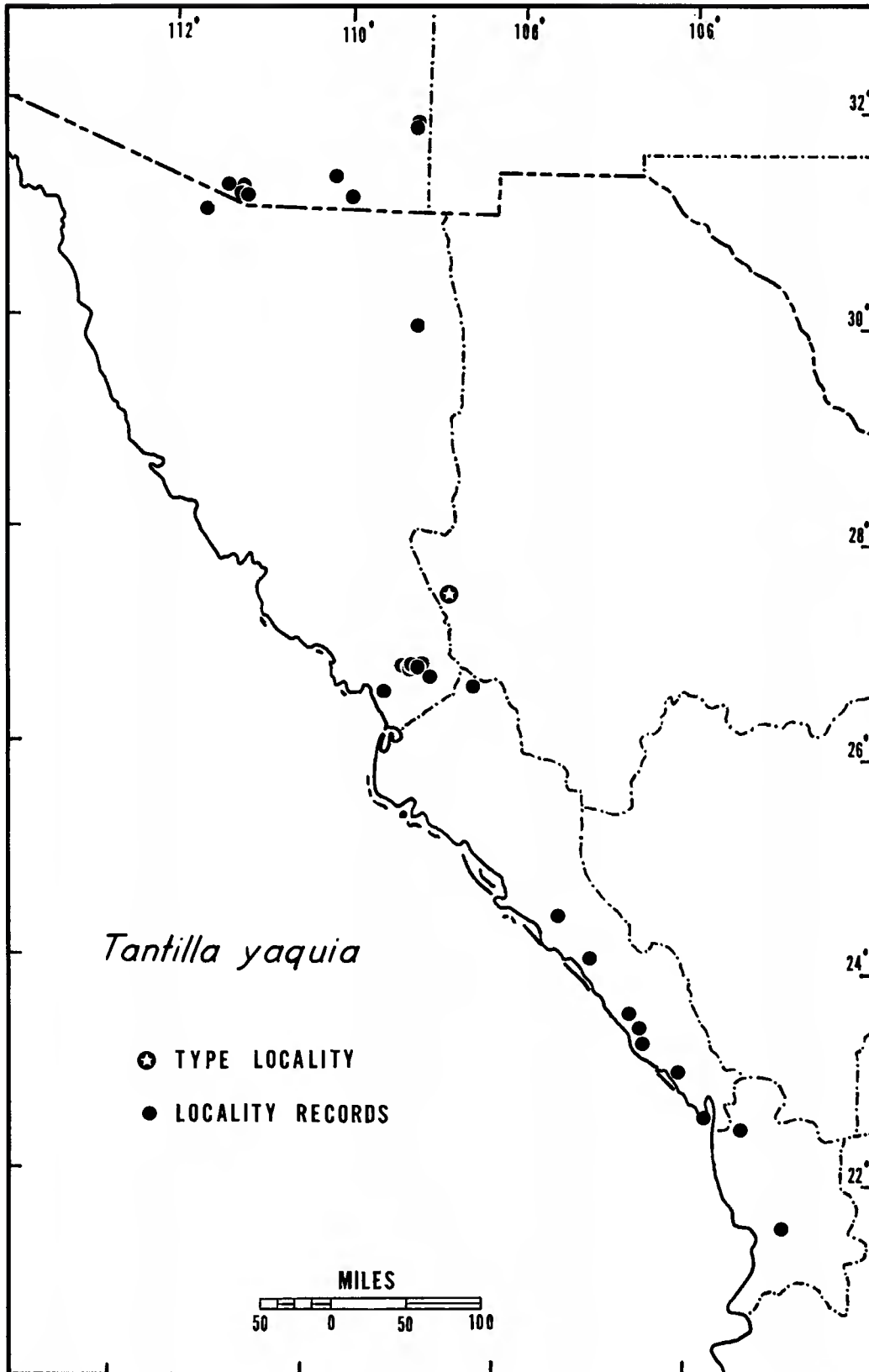
Figure 1. Map of southeastern Arizona and northwestern Mexico showing locality records for *Tantilla yaquia*.

Head cap and collar: In preservative the dorsal surface of the head is usually brown, brownish-black, or black (Fig. 3). The frontal, prefrontal, supraocular, and parietal scales are usually lighter, often mottled tan and brown; the latter is more prevalant in the northern population. Laterally and posteriorly the head color darkens strikingly in sharp contrast to the creamy white labials and collar. Anteriorly the head coloration may become much lighter. In some specimens the internasal scales are grayish and intermediate in coloration between the head color and the rostral color. A few specimens exhibit a well defined dark-light border on the internasal scales. The rostral is sometimes lighter than the head cap; in a few specimens the rostral is white. Specimens with a light snout compose about 75 per cent of population A, about 40 per cent of population B, and about 30 per cent of population C. There is no correlation of rostral color with size or sex of the snake. With the exception of the higher frequency of light snouted snakes in southern Arizona, there is no correlation of rostral color with geographic distribution.

A dark head cap continues onto the neck a distance of from two to slightly more than four scales (counted at midline) posterior to the parietals. The head cap extension is usually black and always darker than the dorsal surface of the head. The posterior border usually forms a straight edge when viewed from above. The head cap extends posteriorly from the parietals on the midline an average of 2.8 scales in population A, (N = 13) 2.9 scales in population B (N = 17), and 3.3 scales in population C (N = 10). Although the mode is three scales in all populations, there appears to be a more extensive head cap in specimens from the south. All of the individuals that have the head cap extending only two scales posteriorly on the midline are from population A. All specimens from population C have three to four scales in the head cap. The only exception to this trend in the posterior extension of the head cap is found in the northern population. A specimen from near Sasabe, Sonora (UAZ 23571) has an extensive black head cap that covers four and one-eighth scales posterior to the parietals. The northern population includes individuals whose head caps extend over the fewest and greatest number of body scales.

Posteriorly, the head cap always is bordered by a light nuchal collar. Dorsally this collar is complete in all specimens except one (ASU 5836) in which a single middorsal scale of the black head cap extends posteriorly interrupting the white collar. The nuchal collar varies on the midline from one-half to one and one-half scales in width and extends laterally as a continuum to join the light coloration of the throat.

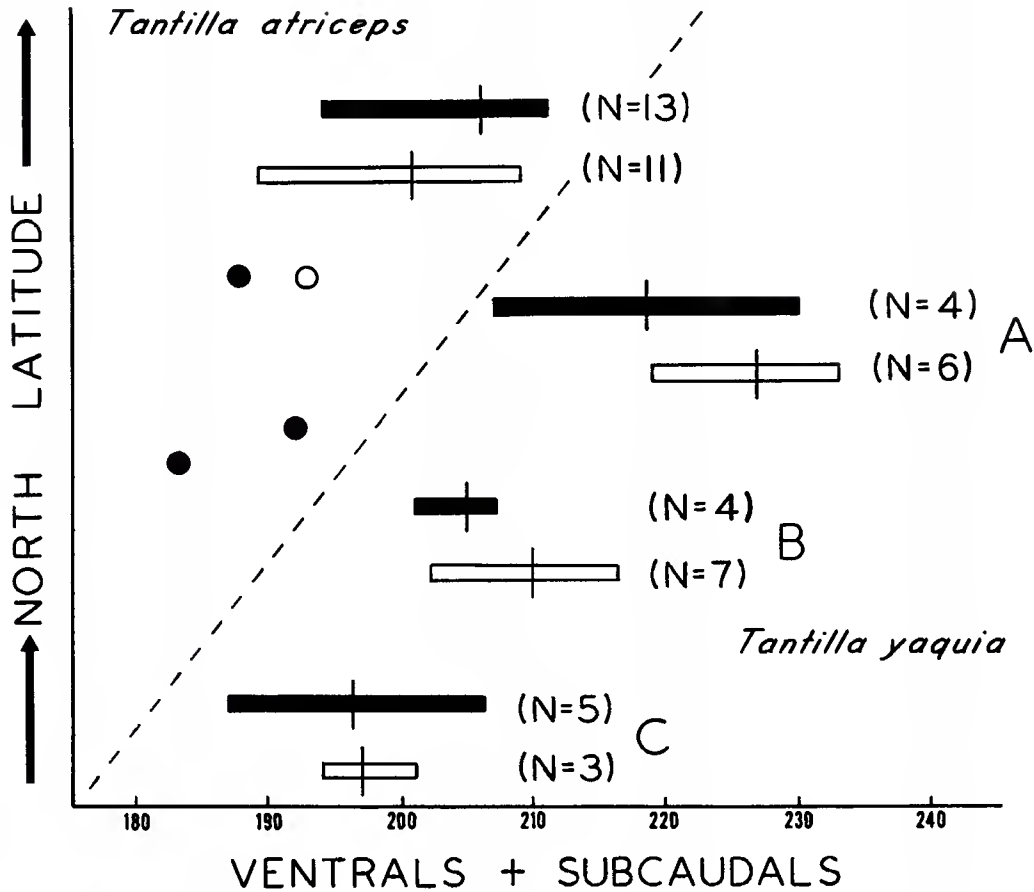In some specimens there are dark spots posterior to the light collar.

Figure 2. Ranges and means of ventral plus subcaudal scales for populations (A, B, C) of *Tantilla yaquia* and selected specimens of *Tantilla atriceps*. Solid symbols indicate males; open symbols indicate females. Dots represent single specimens. Populations are arranged in approximate geographic position by north latitude.

These spots are the same dark color as the scales anterior to the collar and usually are restricted to the scale row immediately posterior to it. The spots are lacking in all specimens from population A, present in all specimens from population B (except KU 93500), and found in half of the specimens in population C. When present, the spots may vary in number from one to nine. Invariably, if spots are present, one will be on the middorsal scale row. In specimens from population C, coloration posterior to the white collar is restricted to a single middorsal scale. Only a single specimen, the same individual that exhibited the mid-dorsal interruption of the light collar, has dark spots on the anterior tip of two middorsal scales posterior to the collar.

The black head cap extends laterally below the angle of the mouth in all known specimens of *T. yaquia*. The amount of lateral extension below the angle of the mouth is measured by counting the rows of partially or fully dark pigmented scales below the zigzag boundary

between adjacent scale rows, that intersects the posterior ventral margin of the seventh supralabial. In most instances this line is simply an extension of the lip edge formed by the supralabial scales. The black head cap extends from one-half to three scales below the angle of the mouth. As with certain other characteristics, there appears to be a greater lateral extent of the head cap in the southern population. Individuals from poulation A exhibit a lateral extension ranging from 0.5-2.5 ($\bar{x} = 0.96$; N = 13) scales. For population B the range is 0.5-2.25 (1.40; N = 17) scales, and for population C the range is 1.0-3.0 (1.90; N = 10).

Lateral head coloration: The ventral extent of black posterior to the eye was measured by recording the portion of the anterior temporal scale that is white. In all specimens the lower one-fourth to three-fourths of the anterior temporal is white. More than 80 per cent of those examined have the lower one-third to one-half of the anterior temporal white. There is no apparent geographic variation in this character. A single specimen (JFC 62-53) from Sinaloa has white extending through parts of the temporal onto the parietal scale. This specimen is abnormal in having the temporals fused on one side. Even though the white reaches the parietals, the presence of a dark central spot on the temporal suggests that this condition corresponds to not having the white reaching beyond the lower three-fourths of the temporal scale.

The amount of white on each supralabial scale was recorded. There is no correlation between sex and supralabial color or rostral color and supralabial color. The first supralabial scale in most specimens is white or gray-white. When there is black on the first labial, the rostral color is usually dark. However, specimens with an entirely white first supralabial may have either a black or a white snout.

There is some black on the second supralabial in all specimens examined. Two specimens have all black second supralabials. There is slightly more white on the second supralabial in specimens from population A than in those from B or C.

There is definitely less white on the third supralabial in specimens from the southern parts of the range. In individuals from population A, the third supralabial is always white over 50 per cent or more of its surface. No individuals from population B have supralabial three more than 50 per cent white, and in approximately 40 per cent of the individuals, less than one-half of each supralabial is white. In population C seven specimens have no white on the third supralabial, one has white on about one-eighth of the scale, and another has white on about half the scale.

Nearly all specimens have white on most of supralabial four. In

population A white on most of supralabial four. In population A white covers more than 80 per cent of the scale; the black of the head cap is restricted to a small line beneath the eye. In population B white covers about 75 per cent of the scale, and in a few specimens, the white is restricted to the lower posterior third of the scale. In population C there is more encroachment of the black beneath the eye. The white rarely covers more than half and usually is restricted to the lower posterior portion of the scale. In one specimen (LACM 7001) almost the entire fourth supralabial is black.

There is no dark pigment on any part of supralabials five and six in typical specimens of *T. yaquia*. Those specimens from Arizona (MVZ 43701, ASDM 2255) that have only six supralabials, apparently due to fusion of the fifth and sixth, lack dark pigment on the fifth and most of the sixth.

In specimens from southern Arizona the seventh supralabial usually is white on its lower anterior quarter or more. In general, specimens from population B have about the same amount of white on the seventh supralabial as do specimens from population A; a few individuals have much more. Snakes from southern Sinaloa and Nayarit have more than half the seventh supralabial scale white. Some from population C have an entirely white seventh supralabial. The posterior shift of black color on the seventh supralabial correlates with the posterior extension of the black head cap along the midline. Both tend to extend more posteriorly in specimens from the southern limits of the range.

The mental and infralabials are nearly always white in specimens from population A; there is a slight trace of pigmentation in only two specimens examined. Less than half of the specimens from population B possess a white mental. Most but not all of those with a white mental also have white infralabials. Other specimens from this region have some pigment on the mental and infralabials. When present, the dark pigmentation is more intense on the anterior infralabials. About half of the known individuals from population C have some degree of pigmentation on the mental, and only two have no pigmentation on the infralabials. In some specimens pigmentation is found only on the anterior infralabials.

SIZE

The two largest specimens of *Tantilla yaquia* are both males, measuring 325 mm. total length, from southern Arizona, one taken in the Pajarito Mountains (UAZ 23573), and another from near Bisbee (AMNH 4194). The smallest specimen, a male, measured 104 mm. total length and was taken in January beneath a rock 7.1 mi. NE of the
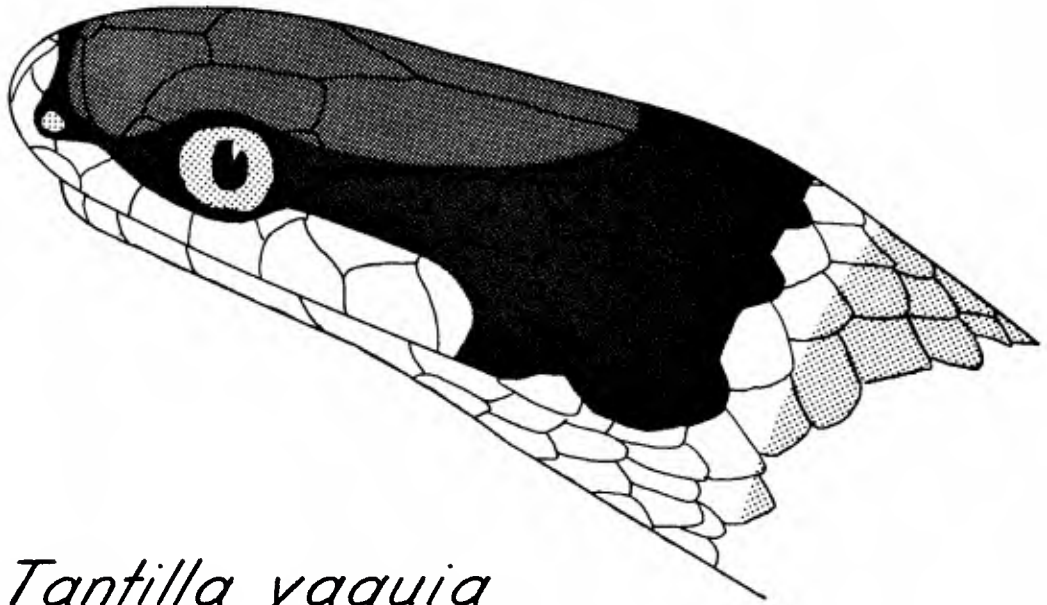
Tantilla yaquia
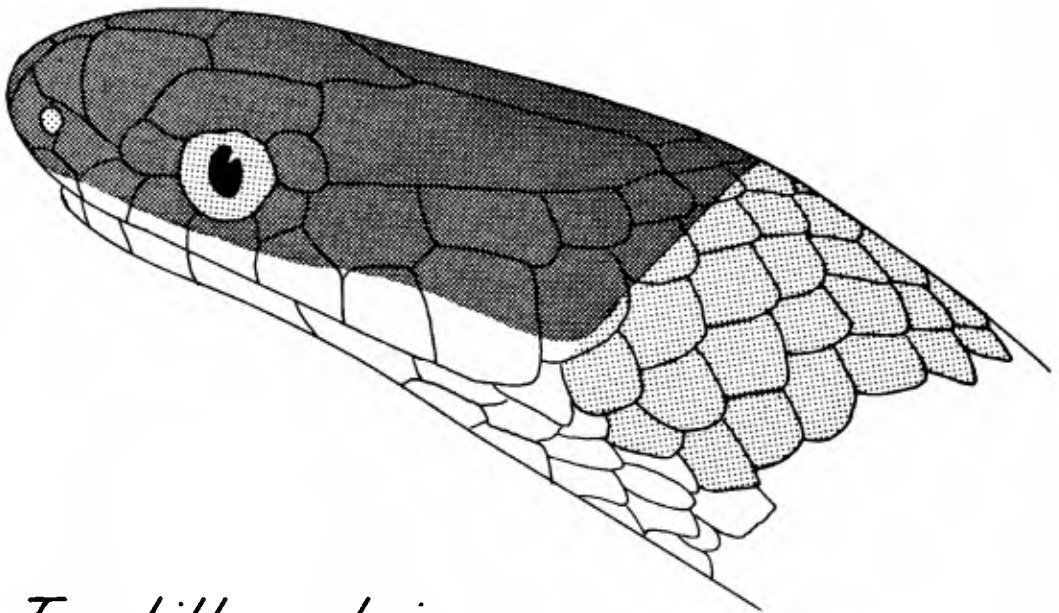
Tantilla atriceps

Figure 3. Diagrammatic representation of head patterns of typical *Tantilla yaquia* and *Tantilla atriceps* from southeastern Arizona.

Alamos airport, Sonora, Mexico. The presence of a conspicuous umbilical scar on ventrals 125 and 126 indicates that this specimen was recently hatched. Another small specimen, a female measuring 140 mm. total length has an umbilical scar on ventrals 132 and 133.

A ratio of tail length/total length was calculated for males and females in each of the three populations. Specimens from the south have shorter tails than those from the north. In the males the ratios expressed as percents are 24.4-27.4 ($\bar{x}$ = 26.1; N = 4) in population A, 24. 3-27.5 (25.4; N = 4) in population B, and 21.2-23.2 (22.1; N = 5) in population C. For females the percentages are 21.4-28.5 (25.1; N = 6) in population A, 20.9-27.3 (23.7; N = 7) in population B, and 17.2-22.7 (20.1; N = 3) in population C. males and females exhibit a more drastic change from population B to C than from populations A to B. The difference in the magnitude of change for tail length/total length ratios from population to population in males and females parallels the changes characteristic of each sex in the number of sub-caudal scales.

DISTRIBUTION AND ECOLOGY

Tantilla yaquia ranges south from southern Cochise and Santa Cruz Counties, Arizona, through eastern Sonora, western Chihuahua, and Sinaloa into Nayarit (Fig. 1). In the northern part of its range *T. yaquia* is characteristically found above 1000 m in evergreen and raparian woodland (Lowe, 1964) in Chiricahua, Mule, and Pajarito Mountains of southern Arizona.

In southern Sonora, Chihuahua, and northern Sinaloa, the snake is distributed along the dissected foothills and western slopes of the Sierra Madre Occidental at lower elevations. In this region *T. yaquia* commonly occurs in the deciduous short tree forest (Gentry, 1942) and occasionally ranges into the drier thorn woodland.

All localities recorded from southern Sinaloa and Nayarit are at low elevations (below 200 m) on the coastal plain. The vegetation in this area is tropical semiarid and dry forests (Hardy and McDiarmid, 1968). There are no records of *T. yaquia* from localities south of the Río Santiago valley in Nayarit.

The distributional pattern of *T. yaquia* is typical of many species of amphibians and reptiles in northwestern Mexico. Other species that exhibit this pattern and range from the coastal plains of Nayarit and Sinaloa northward along the foothills of Sonora into southern Arizona include: *Hylactophryne augusti, Eumeces callicephalus, Elaphe triaspis,* and *Oxybelis aeneus.*

Very little is known concerning the habits of *T. yaquia.* Apparently

it is a nocturnal, secretive form, that spends much of its time beneath rocks and in crevices. Most specimens in the north have been found beneath rocks and surface litter, especially in March, April, August, and September, when the soil is damp after winter and summer rains. In Arizona individuals have been collected in or near streams. One specimen (MVZ 59778) was found in the stomach of a *Rana tarahumarae,* a frog that is rarely taken away from water. Another snake (UAZ 23574), collected by R. L. Bezy, was found just before dark as it was swimming in a swift portion of the stream in Sycamore Canyon. Near Alamos, specimens have been collected in December, January and February, although a few have been taken in July and August. A specimen was dug from the interstices between the roots and surrounding soil of a large mesquite *(Prosopis)* south of Navojoa in December. Another specimen was taken at 1945 hours on July 6 on the road north of Mázatlan, Sinaloa. The ambient temperature was 26.4°C.

SUBSPECIES

The southern specimens of *T. yaquia* have been considered by some authors to be subspecifically distinct from the remainder of the population. The characters that were used to diagnose this race, reduced number of subcaudals, short tail, and more extensive white area posterior to the eye, have been shown to vary clinally throughout the species. Accordingly, I recognize no subspecies of *T. yaquia,* and I place *T. yaquia bogerti* in the synonymy of *T. yaquia.*

RELATIONSHIPS

When Smith described *Tantilla yaquia* in 1942, he suggested that it was most closely related to *T. planiceps* of Baja California and *T. eiseni* of northern Baja California and California. Since that time, the acquisition of additional material of the three species has reinforced his suggestions. The high number of ventral plus subcaudal scales, the posterior and lateral extent of the head cap, the presence of a light collar, the occurrence in some specimens of dark specks posterior to the collar, and other characters confirm the close relationships between *yaquia* and the *planiceps-eiseni* group. However, several other characters clearly separate the eastern *yaquia* from the western *planiceps* and *eiseni.* Of primary importance are ventral plus subcaudal counts and details of head coloration, especially the extensive white postocular spot of *yaquia.* In addition, these species are widely separated geographically by the Gulf of California and the Sonoran Desert.

Two other species of black-headed snakes, *T. atriceps* and *T. utahensis,* that have been regarded as allies of *yaquia* (Smith, 1942), also occur in the southwestern United States and Mexico. *Tantilla utahensis* ranges in a narrow band from eastern California through southern Nevada, northern Arizona, Utah and into Colorado. *Tantilla atriceps* is distributed from northeastern Mexico westward into central Arizona and Sonora where it approaches the range of *T. yaquia.* These two forms are similar to each other in coloration but differ from the previously mentioned species by possessing a more restricted head cap and usually lacking a distinct light nuchal collar. In addition they have a lower number of ventrals plus subcaudals than the closest geographic populations of the other three species. Apparently they differ from each other only in the number of ventral plus subcaudal scales. *T. atriceps* averages 206.3 in males and 207.9 in females, and *T. utahensis* averages 223.8 in males and 226.0 in females (Tanner, 1966: Table 3).

Tanner (1966) concluded that *Tantilla planiceps, T. eiseni, T. utahensis, T. atriceps,* and *T. yaquia* represent subspecies of one wide-ranging species, *T. planiceps.* In addition he considered the type and only known specimen of *T. hobartsmithi* from near La Posa, 10 mi. N Guaymas, Sonora an aberrant *atriceps* and placed it in synonymy with *T. planiceps atriceps.* My analysis of variation in *T. yaquia* provides the opportunity for evaluation of Tanner's proposals, especially with reference to the status of this species.

Several character states are compared below for *T. yaquia* and *T. atriceps.* All data for *atriceps* are in parentheses after those for *yaquia;* the source of the data is listed by page number from Tanner's paper unless otherwise indicated. Important characters are extensive light collar present in *yaquia* (rarely present: key, 148); dark nape spots in some specimens of *yaquia* from populations B and C (always absent: 139); head cap extending posterior to parietals two to four scales (zero to two scales : 139); lateral extension of head cap below angle of mouth from one-half to three scales (never present: 140); white labial-temporal spot present and set off posteriorly by the lateral extension of the head cap (present but not delimited posteriorly: 140); average number of ventrals plus subcaudals for males in population A, 218.5 (206.3: Table 3) and for females in population A, 226.7 (207.9: Table 3). It appears that there are several differences between populations of *Tantilla* referred to *yaquia* and those referred to *atriceps.*

Tanner (1966:146) mentioned the differences in color patterns between specimens of *atriceps* and *yaquia* but attempted to show their "conspecificity" with the following statement: "If, however, a few specimens of *eiseni* with a well-developed light nape band and perhaps an

eiseni or *utahensis* with a reduced head and nape pattern and a narrow light nape band are placed between *atriceps* and *yaquia,* the differences tend to blend into a color pattern gradient." Apparently Tanner is suggesting that certain specimens of *eiseni* or *utahensis* are intermediate between *atriceps* and *yaquia.* This means that even though typical *atriceps* and *yaquia* occur in close geographic proximity in several places in southeastern Arizona without a suggestion of intergradation, one must go to an area several hundred miles north or west of the nearest records for the two species to find *Tantilla* that may be intermediate in head coloration.

The second characteristic Tanner utilized to show the subspecific relationship between *atriceps* and *yaquia* is the presence of a fine middorsal dark stripe. As previously mentioned in the character analysis, there is no indication of either a middorsal or lateral stripe in *T. yaquia.* The fine hair line that Tanner mentioned (1966:138, 147) is a dorsal blood vessel which in some specimens shows through the skin to resemble a dark median stripe. The variations in presence, width, and length are easily explained. Following the death of the snake, the blood in this vessel hardens and contracts. If the shrinkage is great enought to separate the blood into clots in the vessel, the apparent dorsal stripe appears to be intermittent or markedly shortened. Also, this vessel is very obvious in slightly desiccated specimens in which the dorsal scales are rather transparent. The type of *T. hobartsmithi* has been dried, and the median dorsal vessel is obvious.

The dorsal extent of the creamy white spot behind the eye is characteristic of all *T. yaquia.* This pattern is accentuated by the dark head cap which bounds it posteriorly and dorsally (Fig. 3). The relatively invariable arrangement and striking contrast between the white and black laterally on the head appear to be important characteristics. Tanner (1966:140, 148) argued that this light area in most *atriceps* is no longer obvious because of the posterio-lateral contraction of the head cap. The fact is that it does not contrast posteriorly with an area of black, nor is it as extensive as in *yaquia.*

Tanner maintained that in some specimens of *T. atriceps* from southern Arizona, the postocular spot is faintly apparent. Information on 20 specimens of *T. atriceps* from five localities in southern Arizona was provided by C. J. Cole and L. M. Hardy. In all 20 specimens the fifth supralabial has some brown on its upper margin; 18 of the 20 also have brown on the sixth, while in two the sixth supralabial is all white. As previously mentioned, the fifth and sixth supralabials in *T. yaquia* are entirely white. It appears that in nearly all cases the extent of development of the postocular white spot will distinguish specimens

of *T. yaquia* from *T. atriceps* (Fig. 3). The lateral extent of the head cap also will distinguish *atriceps* from *yaquia*, as in the case of the specimen of "*T. atriceps*" pictured by Wright and Wright (1957: fig. 212), which is a *T. yaquia*. Although I did not examine this specimen, the typical *yaquia* head pattern and the locality leave no doubt as to its identity.

Tanner concluded that because the scale characters overlap in all instances, except the subcaudals of females, there is little justification for recognizing *yaquia* as a distinct species. Unfortunately most of Tanner's data for *yaquia* were taken from material from southern Sonora. This biased his ventral plus subcaudal totals towards those of population B. In addition, most of the *atriceps* data (63 of 101 specimens examined) were taken from specimens from Maricopa County, Arizona. Of the remaining 38, only 18 are from localities in Cochise, Pima, and Santa Cruz counties in areas of potential sympatry with *yaquia*.

Data supplied by C. J. Cole and L. M. Hardy, who also follow the Dowling method of counting, show that ventral plus subcaudal counts for 13 male *atriceps* from the vicinity of Tucson are 194-211 ($\bar{x}$ = 201.8); for 11 females from the same area 189-209 (201.1). These averages are slightly lower than those provided by Tanner (males 206.3, females 207.9). The same counts for *yaquia* from population A, that population geographically adjacent to *atriceps,* are males 207-230 (218.5) and females 219-233 (226.7). These counts are quite different for the two species. There is only a five scale overlap between the ranges of scales in males and an average difference of nearly 17. The differences between *atriceps* and *yaquia* are more striking when the females are compared. There is no overlap in the range of ventral plus subcaudals and an average difference of about 25 scales.

It has been shown above that the ventral plus subcaudal totals apparently decrease clinally from north to south in *T. yaquia*. Although details of the geographic variation of this character in *T. atriceps* are not available, a decrease in the same direction is suggested (Fig. 2). Scattered specimens of *atriceps* from Cochise county have approximately the same total ventral plus subcaudal scales as those from near Tucson in Pima county. Two specimens of *atriceps* from Santa Cruz county, nearer the range of *yaquia,* have 188 scales (a male) and 193 scales (a female). Both of these counts are well below the average for Tucson specimens. If we include the counts for two males from Sonora, the reduction in scales becomes more obvious. A male *atriceps* from near Hermosillo has 192; the male type of *T. hobartsmithi,* apparently a *T. atriceps,* has 183. These data indicate a clinal decrease in ventral

plus subcaudal scales in *T. atriceps* from southeastern Arizona into Sonora, paralleling but not converging with the decrease in *yaquia*. Thus, similarities and overlap in this scale character between *atriceps* and *yaquia* occur only if specimens of *yaquia* from southern Sonora are compared with specimens of *atriceps* from central Arizona. Such a comparison reveals that the two species are distinctly different in those areas where their ranges are contiguous.

Undoubtedly, *T. yaquia* and *T. atriceps* are distinct species. Clarification of relationships between *T. atriceps* and *T. utahensis* awaits completion of a study of these nominal species as is being carried on by C. J. Cole and L. M. Hardy. Because of the lack of intermediates between *atriceps* and *utahensis* and because of the distinctness of *atriceps* and *yaquia*, the latter of which is more similar to *planiceps*, it seems likely that *atriceps* is distinct from *planiceps*.

Tantilla yaquia and the western species *T. planiceps* and *T. eiseni* probably are derived from a common ancestral form which was split and subsequently isolated on each side of the Gulf of California, by the Colorado and Sonoran deserts formed in the late Tertiary. I suspect that the three forms evolved in conjunction with the woodland element derived from the Madro-Tertiary Geoflora (Axelrod, 1958). *Tantilla yaquia* became associated with the Sierra Madrean woodland and arid tropical scrub of eastern Sonora and Sinaloa. In the west *T. planiceps* was restricted to the Lagunan woodland in the cape region of Baja California and *T. eiseni* became associated with the Californian woodland and chaparral. Savage (1960): postulated interglacial fragmentation of continuous ranges of *Tantilla eiseni* and *planiceps* during the Pleistocene. Peninsular connections between these two forms during glacial maxima could account for their similarities. *Tantilla atriceps* probably differentiated much earlier than the western species and evolved in association with the desert grassland of the Chihuahuan desert area. *T. atriceps* probably was isolated east of the Rocky Mountains and Sierra Madre Occidental during much of late Cenozoic and has only recently moved westward into Arizona and Sonora where it is found in the eastern parts of the Sonran desert. The evolutionary history of *T. utahensis* is a matter for speculation. The apparent intermediates suggest that it was derived from an *eiseni* stock. However, its similarities to *T. atriceps* and present day distribution do not preclude its possible derivation from an *atriceps* stock and subsequent isolation in the Great Basin north of the Grand Canyon and Mogollon Rim.

Recent records of *T. atriceps* and *T. yaquia* in southeastern Arizona suggest that it is only a matter of time until the two species will be found under the same rock. Even though *T. yaquia* is primarily a woodland

form and *T. atriceps* is frequently found in desert grassland, sympatry is expected where these two habitats interdigitate, particularly since both species commonly occur in riparian woodland. There are specimens of *T. atriceps* from Tubac and south of Tumacacori along the Santa Cruz River in Santa Cruz County, Arizona. *Tantilla yaquia* occurs in this drainage system only about 15 miles away, in the Pajarito Mountains (UAZ 23573). Similar situations of near sympatry are encountered in Cochise County between Benson and Tombstone and between Bisbee and Douglas.

SUMMARY

Examination of more than thirty characteristics of 40 specimens of *T. yaquia* indicates that some characters apparently show clinal variation. *Tantilla yaquia* differs from other species of *Tantilla* in several characteristics, including the number of ventrals plus subcaudals, the posterior and lateral extent of the black head cap, the presence of a light collar, and the distinct white supralabial-temporal spot. The current systematic treatment of this population as a subspecies of *T. planiceps* is untenable.

New evidence indicates that *Tantilla yaquia* and *T. atriceps* are specifically distinct in characteristics of scalation, coloration, and general habitat. The so-called "intermediates" between these two species are discussed and their status refuted. In addition it is shown that characteristics utilized to distinguish the southern population of *T. yaquia bogerti* from *T. y. yaquia* exhibit clinal variation. Since there and insufficient data to warrant its recognition, *T. y. bogerti* is placed in synonymy with *T. yaquia*.

The distribution and ecology of *T. yaquia* are discussed; the probable evolutionary history is briefly considered.

Specimens Examined

Arizona:

Cochise Co.: Cave Creek (AMNH 72991); 0.25 mi. E Portal, 4700′ (AMNH 99357); Bisbee (UCM 875); near Bisbee (AMNH 4194); Tombstone (MVZ 43701).

Santa Cruz Co.: 12 mi. W Nogales (CM 25210); 300 yds. S Peña Blanca Rd., about 7 mi. W Junction with Nogales Hwy. (UAZ 23573); Alamo Canyon, 2.5 mi. SW Peña Blanca Camp (MVZ 59778); Sycamore Canyon, Bear Valley (UAZ 23574); Pajarito Mts., Sycamore Canyon (ASDM 2255); Pajarito Mts., first canyon E Sycamore Canyon, 50 yds. N road (ASDM 2237); 3 mi. SE Ruby, 4500′ (LACM 7002).

Mexico:

Sonora: El Zapeta Ranch, about 15 mi. SE Sasabe (UAZ 23571); 1.7 mi. SW Aribabi (UAZ 23569); Alamos (UAZ 23570, MVZ 78758); 7.1 mi. NE Alamos airport (ASU 5834, 5835, 5836); 6.1 mi. WSW Alamos (ASU 5837, 5838); 5.5 mi. W Alamos (ASU 5833); Canyon Aqua Marin, 6.5 mi. W Alamos (ASU 6743); 15 mi. W Alamos (JFC 63-129); 15.7 mi. W Alamos (JFC 63-162); Rio Alamos, 8 mi. SE Alamos (UAZ 23572); Arroyo Cuchujaqui, 8 mi. SE Alamos (LACM 8475); Mirasol, 16 mi. SE Alamos (SDSNH 18190); 25 mi. S Navojoa (LACM 6997).

Chihuahua: Guasaremos, Río Mayo (MCZ 43274, type of *Tantilla yaquia*).

Sinaloa: 0.75 mi. ENE El Cajón, 3200′ (KU 93500); Costa Rica, 16 km. S Cúliacán (UIMNH 34921); 43.8 mi. S Cúliacán (UAZ 16310); 22.4 mi. SE Río Piaxtla, Hwy. 15 (SU 23778); 16 mi. N Mazatlán, Hwy. 15 (JFC 62-53); 5.8 mi. N Mazatlán, Hwy. 15 (LACM 6998); Labrados (CAS 64976); Teacapán (LACM 7001).

Nayarit: Acaponeta (AMNH 62259, 62260, type and paratype of *Tantilla bogerti*); Jesús María (AMNH 74949).

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