BULLETINS

OF THE

Zoological Society of San Diego

No. 26

Taxonomic Studies of the Rattlesnakes of Mainland Mexico

By LAURENCE M. KLAUBER

Consulting Curator of Reptiles, Zoological Society of San Diego

SAN DIEGO, CALIFORNIA
August 8, 1952
ency toward widely separated crossbands, sharply contrasting with a gray or light-brown background.

It is true that proportionately more southerly specimens of *lepidus* lack the characteristic split upper preoculars than is evident in those from the north; in fact, most of the deviants in this character are to be found among the few specimens available from the southerly fringe of the range. But this territorial indication of relationship is not evident in the southerly specimens of *aquilus*, the ones most distant from *lepidus*, for these have a higher incidence of split upper preoculars than those in the north. Of the *aquilus* population as a whole, 25.4 per cent of the upper preoculars are split. Specimens with a split scale on one side and an entire scale on the other are about equal in number to those split on both sides.

As to the pattern, it is true that an occasional specimen of *t. aquilus* is reminiscent of *l. klauberi* in the character of the blotches and the nature of the color contrasts between blotches and ground color. I have seen such specimens among those from Querétaro and Hidalgo. But most of the specimens from the areas where *lepidus* and *aquilus* most nearly approach each other—in western San Luis Potosí and southwestern Zacatecas—retain their quite distinctive patterns. To resemble the pattern of *l. lepidus*, *t. aquilus* would have to show a tendency toward the accentuation of every second or third dorsal blotch at the expense of those intervening. I have not noted a single specimen in which such a trend is evident. The pattern differences between *t. aquilus* and *l. klauberi* are even more extensive.

To conclude: *triseriatus* is specifically separated from both *lepidus* and *pricei*, although showing some resemblances to both.

**Crotalus pusillus** sp. nov.

**TANCSITARAN DUSKY RATTLESNAKE**

1908. *Crotalus triseriatus* Gadow, Through Southern Mexico, p. 513


1947. *Crotalus triseriatus triseriatus* (part) Schmidt and Shannon, Fieldiana-Zoölogy, vol. 31, no. 9, p. 84

**Introduction**—The largest series of rattlers now available from any single locality in central Mexico is a group of 53 specimens from Tancítar, Michoacán, collected for the Chicago Natural History Museum by Dr. F. A. Shannon and his associates. These had been tentatively classified as *Crotalus t. triseriatus*. Upon calculating the statistics of this presumably homogeneous series, I found the coefficient of variation of the ventrals to be 4.6 per cent in the males, and 2.7 in females.† As these coefficients seldom exceed 2 per cent in really hom-
geneous series, it was obvious that the group might be composite. (One specimen, showing, by its loreal-supralabial contact, that it was allied to *intermedius* rather than *triseriatus*, had already been set out.) A survey of the specimens immediately indicated that those having high ventral counts all had paired prefrontals, while the others had several irregular scales in this part of the crown. Among the males there was no overlap in the ventral counts of the two components as segregated by the prefrontal criterion; among the females there was some overlapping. Other differences were also noted, but these were neither as evident nor as consistent as the ventral-crown differences. Unless, as seems very unlikely, the ventral count and prefrontal configuration are to be attributed to a single genetic element, and this with almost perfect correlation in two component groups comprising 18 and 34 specimens respectively, two forms specifically distinct—for they occupy the same area without intergradation—are indicated. The component having paired prefrontals is obviously the new one, since before the advent of the Tancitaro series only one specimen with paired prefrontals had been available among all the *triseriatus* material at hand, this being B. M. 1906–6–1–227 from Cerro Nevado, Jalisco. There follows a description of the new species, for which the name *Crotalus pusillus* is proposed.

**Type Specimen.**—Chicago Natural History Museum no. 39112, collected in June or July, 1941, at Tancitaro, Michoacán, Mexico, altitude 5000 feet, by Dr. Frederick A. Shannon.

**Diagnosis.**—A small brown or gray rattlesnake with particularly small rattles. Like many of the smaller highland rattlers of central Mexico, the anterior suboculars contact the supralabials. However, *pusillus* differs from the other rattlesnakes having this characteristic, and particularly from *C. triseriatus triseriatus*, the form with which it might be most readily confused, in having paired prefrontals, while the others have 3 or more irregular scales in the prefrontal area. It differs from the rattlers of the *intermedius* group in its lack of contact between the loreals and the supralabials, nor does the prenasal contact the loreal, as is frequent in the *intermedius* group.

**Description of the Type.**—An adult male, length over-all 652 mm., tail length 67 mm., head length 33 mm., width of proximal rattle 3.8 mm., fang length (to upper lumen) 6.9 mm.

The scale rows are 27–23–17, all keeled except the two lowest lateral rows, which are also the largest of the series. Eight scales fringe the rattle. The ventrals number 154, the anal is entire; there are 32 subcaudals of which only the first is divided. There are 12 supralabials on each side, and 10 infralabials. The rostral is wider than high. There is one loreal on each side and 3 prefoveals. There are 2 preoculars, neither divided; the upper curves over the canthus to a slight degree. On each side, the anterior subocular contacts the fourth and fifth supralabials. The second subocular does not meet the supralabials. The posterior edge of the orbit is even with the posterior edge of the sixth supralabial. Nine scales border each eye. The prenasals are larger than the
postnasals. The prenasal contacts only the first supralabial; it curves slightly under the postnasal. Neither the postnasal nor the loreal touches any labial.

The scales on the crown comprise a pair of internasals wider than high, and a pair of prefrontals, thus making a total of only 4 scales anterior to the supraocular-frontal area. The supraoculurs are much the largest of the head scales. The anterior intersupraoculars are 2+3. The posterior head scales are keeled. The first infralabials meet on the median line; they are undivided, and there are neither submentals nor intergenials.

The head is brown above, with some black stippling, especially posteriorly. The most conspicuous head marks are wide postocular dark-brown bands, which pass above the angle of the mouth and then turn downward behind it. The anterior supralabials are gray; the posterior, below the dark stripe, are buff. There is a dark spot on the labials immediately below the eye. The infralabials are punctated and irregularly spotted with brown. The gulars are buff, punctated outwardly toward the infralabials.

The body pattern comprises a series of 40 irregular subhexagonal blotches about 8 scale rows wide, and 2½ scales long, end-to-end. The interspaces cover about 1 scale. The blotches are deep brown, lighter middorsally. A series of smaller auxiliary blotches is somewhat evident on either side. The entire dorsum is much stippled and punctated, especially within the blotches. The belly is buff anteriorly, with increased dark-gray stippling and mottling rearward, until, at the tail, it becomes almost uniformly black. The anterior lobe of the rattle matrix is black.

Description of the Topotypic Series.—The totopytic series (including the type) is made up of the following specimens, all in the collection of the Chicago Natural History Museum: numbers 37039, 37042, 37046, 37048, 39095, 39097, 39103, 39109, 39112–3, 39117, 39120–1, 39127, 40818–9, 40824–5. This comes to 18 specimens, of which, unfortunately, only 3 are females. This series of paratypes I shall describe as a group; I prefer to deal separately with the few other specimens of pusillus that are available.

The longest specimen is a male measuring 674 mm.; the longest female is 522 mm. The shortest specimen is 247 mm., but one of the non-topotypes is 200 mm. The tail-length equation for the males is approximately $T = 1.11L - 4$, where $T$ is the length of the tail and $L$ the body length over-all, including the tail. Thus an adult 550 mm. long would have a tail length of 57 mm., or 10.4 per cent of the length over-all, which puts pusillus in the category of the longer-tailed rattlesnakes (Klauber, 1943, table 19). There are not enough females available to determine a trend line for that sex. The head-length equation is $H = 0.0442L + 3.84$. Thus a 550 mm. adult, on the average, would have a head length of 28.1 mm. The head length is contained in the body length 19.6 times, showing pusillus to be a relatively large-headed rattler (Klauber, 1938a, table 19). The rattle width (proximal rattle) is closely represented by $W = .00583L + 0.3$. This indicates a very small rattle, about 3.5 mm. in
width in a 550 mm. adult snake; *pusillus* has, proportionately, a smaller rattle than almost any other species of the two rattlesnake genera. The fang length is contained in the head length 5.1 times, and in the body length over-all 100 times.

The scale rows at mid-body number 23 in every specimen. The ventrals in the males range from 152 to 161, mean 155.8, and in the females (only 3 specimens) from 150 to 154, mean 153.0. The subcaudals in the males vary from 28 to 33, mean 30.9; the corresponding female figures are 25 to 27, mean 25.7. The supralabials range from 11 to 13, mean 12.0; and the infralabials from 10 to 13, mean 11.3. There are 8 scales fringing the rattles in all but one specimen, which has 7.

The rostral is wider than high. It curves over the snout slightly at the top, and is indented on each side by the prenasals. The fore part of the crown is occupied by a pair of internasals, wider than high, followed by a pair of much larger prefrontals, each of which has a convex, rather than straight, posterior edge. Each prefrontal has a lateral depression, bordered outwardly by a ridge that comprises a part of the canthus rostralis. The supraoculars are rather long and narrow, and are somewhat pointed at both ends. They are much the largest of the head scales. The anterior intersupraoculars are usually 2+3, 3+3, or 3+4; the first row is enlarged.

The prenasal is larger than the postnasal. Above, it extends only slightly behind the nostril; it extends somewhat farther below, cutting off the postnasal from contact with the labials. The prenasal contacts only one supralabial, the first. The postnasal contacts both the internasal and prefrontal. The prefoveals vary from 1 to 5; the average is 3. There is a single loreal on each side; it is slightly higher than wide, and is narrower above. It is always well separated from the supralabials. The upper preocular is undivided; it slants upward anteriorly and may curve over the canthus slightly, where it contacts the prefrontal. The lower preocular is, as usual, slim and crescentic; it forms a part of the upper border of the pit and always reaches the loreal. The total scales in the orbit are usually 8 or 9. The anterior subocular always contacts the fourth and fifth supralabials; an interocularial is interposed so that the next posterior subocular does not contact any supralabial. The posterior edge of the orbit is even with the sixth or seventh supralabial. The first infralabials are undivided and meet on the median line. There are no submentals or intergenials.

The body pattern comprises from 33 to 46 subrectangular dorsal blotches (mean 39.8). The tail spots in the males number from 8 to 12, mean 9.9; and 5 to 8 in the females. The body blotches are considerably longer than the interspaces, being about 2½ to 3 scales long (end-to-end), while the interspaces measure 1 to 2 scales. The blotches are 7 to 9 scale rows wide. The blotches are highly irregular, varying from rectangles, through squares, to ovals and circles. They are frequently diagonal, as if the two sides failed to match. There is an auxiliary row of smaller spots on each side, these spots usually being even with the main series.
The general color is brown (or gray if the epidermis is abraded). The main blotches are somewhat darker than the ground color and have black edges. The auxiliary blotches are usually darker than the main series. The dorsal interspaces between blotches are lighter, tending toward buff, than the lateral ground color. Dark punctations are evident over the dorsum, particularly within the main blotches. The punctations increase posteriorly.

The ventrum is buff anteriorly, gradually darkening posteriorly by reason of an increasing concentration of dark-gray stippling until, at the tail, the color may be almost solid black. The stippling is applied evenly so that there is no evidence of a ventral pattern.

The head is without pattern above, being brown or dark-gray, heavily punctated with dark spots. On each side there is a dark-brown postocular band about 2 scales wide, that turns downward just behind the angle of the mouth. The edges of the band are accentuated by internal darkening, by a thin light border above, and a wider light border, which engages the posterior supralabials, below. The supralabials are heavily punctated with gray anteriorly. Sometimes there are several brown spots on the supralabials, the largest of which is just below the eye, but often these are masked by punctations. The lower surface of the head varies from clear to heavily punctated buff; the sutures between infralabials are often accentuated by clumps of dark dots.

Other Material.—In addition to the topotypic series, the following specimens of *pusillus* are available:

British Museum 1906-6-1-227 from Cerro Nevado, Jalisco, is a young male with 23 scale rows at mid-body, 156 ventrals, and 30 subcaudals. It differs from the other specimens in that the suboculars do not touch the labials. It is the only specimen known to me that has been available for more than 10 years or so. Cerro Nevado is about 75 miles from the type locality of *pusillus*.

UI 22809, from the Uruapan road (probably near Carapán), Michoacán, is a juvenile female with 23 scale rows, 162 ventrals, and 29 subcaudals. It clearly belongs to the new species. The place of collection is probably about 25 miles (straight line) from the type locality.

These two are the only other specimens known to me that are unquestionably *pusillus*. There is another, MVZ 45254 from near Chilpancingo, Guerrero, which may be *pusillus*. Strange as it may seem, I cannot be sure whether this rattler is *Crotalus* or *Sistrurus*, for the anterior head scales are pressed so flat that creases cannot be distinguished from sutures. It shows certain differences from both *C. pusillus* and *S. rarius*, but as no other specimens of either species are available from Guerrero, these differences might be due to territorial clines that cannot be evaluated. For the present this specimen must be left in a doubtful status.

Species Comparisons.—*C. pusillus* is much more like *C. t. triseriatus* than any other form. In addition to the paired prefrontals, it can be segregated from members of the *intermedius* group by the nature of the loreal contacts, and from *pricei, lepidus*, and their subspecies by pattern. It has smaller rattles than
C. t. aquilus. There remains, then, C. t. triseriatus, of whose large range, pu-
sillus, as far as is now known, occupies only a small part. I have had available
for study somewhat over 100 specimens of t. triseriatus, and of these, only
one, MZUM 75866 from near Tres Marias, Morelos, has paired prefrontals.
In this specimen these scales are not regular, as in pusillus; it is questionable
whether the next 2 posterior scales are to be considered as being in the pre-
frontal or intersupraocular area. This lack of a definite line between these
areas is characteristic of triseriatus as compared to pusillus, in which the
boundary is clear. MZUM 75866 is a male with 146 ventrals, while the lowest
pusillus has 150. In fact, in all the triseriatus available, the highest ventral
count is 152 (except for the type, which has 159); 9 out of 96 have 150 or
more, while 2 pusillus out of 20 have 152 or fewer. Thus the overlap in ven-
trals is seen to be about 10 per cent.

Besides the prefrontals and ventrals there are other average differences
between pusillus and t. triseriatus, but I have discovered none that is suffi-
ciently evident or consistent to be of diagnostic value in a key. C. pusillus has a
slightly longer head, and a slightly smaller rattle. There seems to be no dif-
ference in tail length. The pusillus fang is slightly longer, proportionate to
either head or body, than that of triseriatus.

Comparing the series of 34 triseriatus from the type locality of pusillus,
with the topotypes of the latter—thus avoiding the effects of territorial vari-
ations in the more widespread form—the following average differences are ob-
served:

C. pusillus

1. Longitudinal crease near outer edge
of each prefrontal
2. Prefoveals fewer and nearly equal
in size
3. Less color contrast between dorsal
blotches and ground color
4. Crown unicolor, except for many
scattered punctations
5. Paired parietal blotches faint, if at
all evident
6. Lower (second) series of lateral
blotches represented only by in-
creased punctations
7. Ventrum marked with evenly dis-
tributed punctations, although with
increased density posteriorly
8. Underside of tail often black be-
cause of dense punctations
9. Proximal rattle matrix black in
adults

C. t. triseriatus

Prefrontals (canthals) dished but not
creased
More prefoveals, and more uneven in
size
More color contrast between dorsal
blotches and ground color
Crown with light and dark marks;
often with lighter internasals and
light supraocular crossbars
Paired parietal blotches evident

Intermediate (second) series of la-
teral blotches clearly evident

Ventral punctations grouped into
blotches. Posterior edges of ventrals
often unmarked
Underside of tail often pink, with
fewer scattered punctations
Proximal rattle matrix buff or brown
in adults
I have never seen a live pusillus. Judging from experience with other rattlers, I believe that a comparison of live specimens of triseriatus and pusillus would accentuate some of the pattern differences I have pointed out, and would bring to light others that I have missed.

Range.—At present pusillus is known only from the highlands of southern Jalisco and western Michoacán.

Crotalus Pricei

With the discussion of this species and its subspecies, I shall discontinue, except in the case of durissus, any attempt to divide the subsequent subjects into groups, as was done with intermedius, triseriatus, and their relatives. This is mentioned only so that the reader will not assume that the following species are to be considered as a continuation of the triseriatus group.

Crotalus pricei pricei Van Denburgh
Arizona Twin-Spotted Rattlesnake

Figure 3.


Of this subspecies, I have had available for study about 140 specimens, 88 of which are from Arizona, the rest from northwestern Mexico. About 40 per cent are females.

Crotalus pricei pricei is a small, quite distinctive rattlesnake, having in its most typical form, a highly individualistic pattern comprising paravertebral rows of small brown blotches on a blue-gray, gray, or light-brown background. On the average, the number of these blotches (counting only one of the two rows) exceeds the dorsal count of any other rattlesnake. Although it is true that, in some specimens, many of the spots of the two rows are joined together across the middorsal line, it is seldom difficult to recognize pricei by pattern alone, if the specimen be well preserved. No other rattlesnake except its sister subspecies pricei miquihuamensis, and polystictus, has the dorsal spots divided into two separate rows; and the high number of spots, in itself, is often conclusive.

Description of Subspecies.—The essential statistical data on p. pricei are as follows: Scale rows 21 (123), 22 (1), 23 (8); ventrals, males 149 to 162, mean 157.9, females 157 to 171, mean 162.6; subcaudals, males 21 to 30,