

A Taxonomic Rearrangement of the Pit Vipers of the *Bothrops nigroviridis* Complex of Southern Mexico

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ABSTRACT — A review of the available specimens of *Bothrops nigroviridis* from the northern part of its range (5 from Mexico, data on 6 from Guatemala) gives clear evidence of validity and occurrence in Mexico of *B. n. aurifera* (Salvin) and *B. n. rowleyi* Bogert (as reinterpreted in modification of its original proposal as a distinct species), and less conclusive evidence of the existence of a third subspecies, *B. n. macdougalli* subsp. n., in a presumably isolated area of extreme northeastern Oaxaca.

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Arboreal pit vipers of all species are relatively rare in collections from Mexico, no doubt largely due to their secretive habits and effective green protective coloration. Only three species fall into this group, in Mexico: *Bothrops bicolor* Bocourt, *B. nigroviridis* (Peters) and *B. schlegeli* (Berthold). Of the latter species, we are aware of but two specimens, both from Las Selvas de Mercadito, near Cintalapa, Chiapas (Álvarez del Toro, 1952: 82-83). Only three specimens of *B. bicolor* are known from Mexico (Bogert, 1968: 7), and only five of *B. nigroviridis*. The latter are the subject of detailed consideration in the following account.

Bothrops nigroviridis is, at least in the northern part of its range, regarded as a species "of the Caribbean versant" (Stuart, 1963: 130). Two of the five Mexican specimens (Fig. 1) are clearly from the Caribbean versant: one from Santa Rosa, near Comitán, Chiapas (Martín del Campo, 1938: 228-229, the only recorded specimen from Mexico), and one (UIMNH = Univ. Ill. Mus. Nat. Hist. 27845) from Cerro Azul (10 miles east La Gloria), Oaxaca. Two were taken, however, on the dry Pacific versant of the Sierra Madre N Zanatepec, Oaxaca (UIMNH 53096, 56121). The final, fifth specimen is the type of *B. rowleyi* (Bogert, 1968) from 30 km NNE by N of Tapanatepec, Oaxaca. Bogert was uncertain of drainage (whether Atlantic or Pacific), but favored assumption of an Atlantic drainage, since the type was said by the collector to have been taken "on a ridge that extends northward from Rancho Vicente, Colonia Rodolfo Figueroa, approximately 5 miles west of Cerro Baul. The site is at an elevation of approximately 1520 meters, on the headwaters of the Río Grijalva. . ." Mr. Thomas MacDougall, who is intimately familiar with this area through personal exploration, assures us that the locality is indeed on Atlantic slopes: ". . . the ranch houses [of Rodolfo Figueroa] are clustered around the headwaters of what we know as Río Mono Blanco, the waters of which eventually reach the main stream of the Río Grijalva. However, the habitat conditions there are similar to those of the high, Pacific slopes of the Sierra Madre, above Zanatepec; both are connected by a continuous band of pine-oak forest."

These five specimens agree in most of the basic characteristics of northern *nigroviridis* (i.e., *B. n. aurifera* (Salvin)), all having a largely uniform green pattern above, lacking lateral light stripes, ventrals 154-162; caudals 53-67 [Martín del Campo's (1938: 229) count of 44 must reflect a truncate tail]; 9-11 supralabials; 10-11 infralabials; large median head scales; scales on snout smooth; minimum of 3-5 scales between supraoculars; latter very elongate, narrow; keels present at least on parts of outer dorsal scalerow; other scalerows strongly keeled. These and other features clearly identify the snakes as members of the species *nigroviridis*.

However, the same snakes exhibit an unusual amount of variation in certain other characters that lead us to conclude tentatively that they represent three subspecies: an eastern population, *aurifera*, to which Martín del Campo's specimen belongs; a southwestern, Pacific slope population to which the name *rowleyi* is here restricted; and a northwestern population, represented by the single

(151)

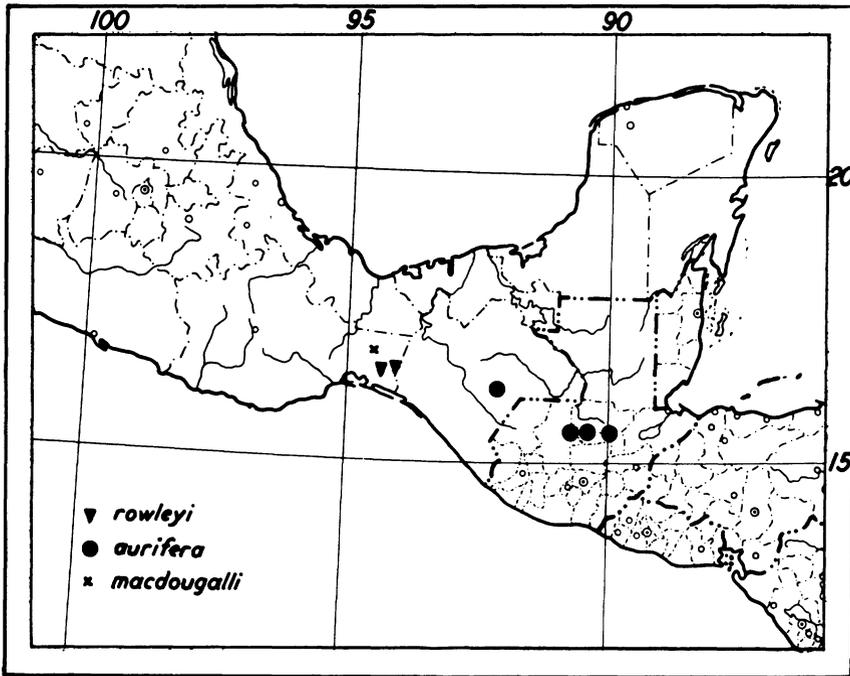


FIGURE 1. Map showing known distribution of the subspecies of *Bothrops nigroviridis* in Mexico and Guatemala. Each symbol indicates a locality of collection.

specimen from Cerro Azul, here named *Bothrops nigroviridis macdougalli*, subsp. n. The three geographic races can be distinguished by the following key.

Key to Mexican Subspecies of *B. nigroviridis*

1. Lacunar fused with second labial; one canthal; irregular yellow spots scattered over back and sides; a postocular dark stripe; 19 scalerows; inhabits cloud forests ----- *aurifera*
 Lacunar separate from supralabials; two canthals; no yellow spotting on back or sides; no postocular dark stripe; scalerows 19 or 21; inhabits cloud forests or dry pine-oak forests ----- 2
2. Scalerows 19; inhabits dry, pine-oak forests ----- *rowleyi*
 Scalerows 21; inhabits cloud forests ----- *macdougalli*

The distinction of *aurifera* from the more western populations is wholly satisfactory except for the possession by the type of *rowleyi* of but one canthal, as is characteristic of *aurifera*. The close geographic and habitat association of the type of *rowleyi* and the two from N Zanatepec, Oaxaca, strongly indicates that the type of *rowleyi* is an intergrade between *aurifera* and the Pacific slope population exemplified by the Zanatepec specimens. As thus conceived, *rowleyi* is a Pacific slope subspecies; unfortunately the type specimen is of Atlantic slope derivation, and allocation of the name to the Pacific slope population is justified primarily on the basis of habitat continuity and geographic proximity. *B. n. rowleyi* is the only Pacific slope population known of *nigroviridis* north of Costa Rica and this geographic isolation, or semi-isolation, lends credence to its validity as a distinct subspecies.

B. n. macdougalli is, of course, inadequately known, being based upon a single specimen. That specimen does, however, have 21 scalerows, whereas no other example of the species has been so recorded. In only this respect, and in its occurrence in a cloud forest habitat separated by the canyons

of the Rio Ostuta from the dry pine-oak habitat where *rowleyi* occurs, does it differ from *rowleyi*, with which we are very reluctant to allocate it, since to do so would deny significance of the marked physiographic barriers between the two populations. *B. n. macdougalli* is widely different from *aurifera*, and cannot be allocated taxonomically with it. *B. n. rowleyi* is similarly different from *aurifera*. We assume that *rowleyi* and *macdougalli* have evolved in their independent areas from some ancestral stock sharing the characters by which they differ from *aurifera*; it seems unlikely that they would independently have evolved their shared differentiae from *aurifera*. Whether the single apparent morphological difference now known between *rowleyi* and *macdougalli* is valid or is supported by other differences remains to be established with more material, especially concerning males. The analysis here accepted is justified by its conformance with physiographic indicators and by at least the minimum requirement of morphological correlation, as deduced from the material now available. Although future collections may show that but one subspecies ranges over the entire central and western upland of Chiapas and adjacent Oaxaca, on both Atlantic and Pacific slopes, such an assumption on the basis of material now available seems unwise to us, obscuring the high degree of probability of populational isolation, and significance thereof, that presumably exists between the two taxa as we conceive them.

In recognition of the important contributions made by the collector, Mr. Thomas MacDougall, to knowledge of both the flora and fauna of Chiapas and Oaxaca over the past forty years, and for his unparalleled explorations afoot of hitherto biologically unknown and most remote regions of this area, we are pleased to name the new form for him. He also collected the two UIMNH specimens of *rowleyi*, without which an evaluation of the taxonomy of this species would have been even more puzzling.

Bothrops nigroviridis macdougalli subsp. nov.

Holotype: — Univ. Illinois Mus. Nat. Hist. 27845, taken near the higher slopes of Cerro Azul of the Sierra Madre, 5000 ft., roughly 10 miles east (straight line) La Gloria, Oaxaca, 25 March 1950, by Mr. Thomas MacDougall. No other specimens known.

Diagnosis: — An essentially uniform green, stripeless, prehensiletailed *Bothrops* with entire caudals, 21 scalerows at midbody, 2 canthals, very narrow, elongate supraoculars separated from each other by a minimum of 4 scales, lacunar scale separate from supralabials, dorsal scales of head from orbits forward essentially smooth, outer scalerows with weak keels at least on anterior part of body.

Description: — An adult female 647 mm total length, tail 111 mm. Four internasals, 2 median ones faintly keeled and preceded by 2 tiny scales bordering rostral and nasals; 2 canthals between lateral internasal and anterolateral edge of supraoculars upturned, forming with anterodorsal edge of nasal and upper edge of upper preocular a low broken ridge about snout; 2 large prefrontals bordering canthals and internasals, with a tiny scale in the anterior part of their median suture, contacting median internasals; a large frontal, as broad as long (5 mm), contacting prefrontals; one large scale between frontal and supraocular on each side, with a small slender scale wedged beside frontal on one side, making a total of 4 scales (minimum) between supraoculars; 5 scales between rear edges of supraoculars; supraoculars over three times as long (6 mm) as wide (1.8 mm maximum); 4 large scales in parietal area, lateral two only somewhat smaller than frontal and separated from supraocular by one, elongate keeled scale; temporal and postparietal scales keeled, other head scales smooth except as otherwise indicated.

Nasal divided above naris, not below; 3-4 loreals, upper as large as first supralabial, contacting 2 preoculars above pit; 2 small lower loreals between nasal and lacunar; on one side an additional small loreal wedged between nasal and anterior two supralabials; lacunar separate from labials; 2 large, elongate preoculars, lower forming upper border of pit; 2 small scales bordering lower edge of pit, the posterior one separated from fourth labial by two small scales, from orbit by one small lower preocular; 2 suboculars, the anterior one bordering small lower preocular and touching fourth labial; 3 postoculars, each keeled; one row of scales between labials and suboculars; 5-6 rows of temporals, all keeled although lower row very feebly; 9-10 supralabials.

Infralabials 12-12, the first in contact with its mate; anterior chinshields large, contacting anterior 4 infralabials; posterior chinshields not distinguishable from other throat scales.

Dorsal scales in 19-21-15 rows, all prominently keeled except those in first row; latter distinctly keeled posteriorly, faintly keeled on middle and anterior parts of body, smooth only on neck. Ventrals 158, excluding only one unpaired, median scute, and beginning at level of rictus oris; all other scales between mental and ventrals paired; caudals 59, all except first unpaired.

Color of preserved animal at present a dark bluish black above, somewhat lighter below, a black posterior margin on each ventral and caudal; no light flecks or other light markings anywhere on body; no postocular dark stripe.

Remarks: — In life, according to Mr. MacDougall, the snake was green above, with some black markings, and yellow below from the neck posteriorly. It was found about shoulder high on a palm leaf in a wet cloud forest with tree ferns.

The two specimens (UIMNH 53096, 56121) from the Pacific slopes, 5000 ft., of the Sierra Madre north of Zanatepec, Oaxaca, here referred to *B. n. rowleyi*, were taken in a pine-oak habitat below the cloud forest level; Mr. MacDougall describes even the cloud forest there as less mesic than the cloud forest at Cerro Azul. On the basis of his report for these two specimens, we have assumed that the preferred habitat of the subspecies is the pine-oak belt. However, Bogert (1968: 10) clearly states that the type of *rowleyi* was taken in cloud forest. If there is a populational continuity of *rowleyi* and *aurifera*, the intergrade populations, to which the type of *rowleyi* presumably belongs, can be expected to overlap both habitats. The Zanatepec specimens are both females, and have, respectively: 56, 57 caudals; 158, 158 ventrals; 10-10, 9-11 supralabials; 10-10, 11-11 infralabials, 19-19-15, 19-19-14 scale rows; 2-2, 2-2 canthals; body length, 457 mm, 561 mm; tail length 99 mm, 120 mm. One specimen is discolored and nearly uniform black all over, as most formalin-preserved specimens of all green *Bothrops* become (on this basis the black *B. bicolor* noted by Bogert, 1968: 9 is probably discolored and not melanistic). The other has retained somewhat lifelike colors and is blue-green above, greenish yellow below, with no light markings anywhere on body or tail, and only a few, very small, scattered dark flecks on neck and on sides in the anal and basal caudal regions; there is no postocular dark stripe.

Few data on Guatemalan *aurifera* have been published. We have examined only two specimens but have utilized data given in the accounts by Boulenger (1896: 568-569), Mocquard (1909: 950-951), Müller (1878: 401), Salvin (1860: 459-460, pl. 32), Slevin (1939: 413), and Stuart (1948: 88). Data on the single known Mexican specimen are derived from Martín del Campo (1938: 228-229, Fig. 1). The two Guatemalan *aurifera* examined are Univ. Michigan Mus. Zool. 91081 from Finca Volcán, Alta Verapaz, reported by Stuart (1948: 88); and Calif. Acad. Sci. 67049, Finca El Soche, Quiché, 25 miles west Cobán, Alta Vera Paz, reported by Slevin (1939: 413). Both specimens have single canthals, the second supralabial fused with the lacunar, and a black postocular stripe; other data are given in the cited publications. The CAS specimen is a mature adult (806 mm total length, tail 129 mm.) with conspicuous, irregular vertebral light spots, roughly black-outlined, whereas the UMMZ specimen is a juvenile (385 mm. total length, tail 67 mm.), with only the faintest evidence at midtrunk of dorsal light blotches. It seems likely that the pattern characteristic of *aurifera* develops only with maturity and is not evident in early ontogeny.

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