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New Species and Subspecies of Coral Snakes, Genus *Micrurus* (Elapidae), with Notes on Type Specimens of Several Species

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ABSTRACT

Two new species and three new subspecies of coral snakes are described. *Micrurus catamayensis*, new species, from the arid Catamayo Valley, Ecuador, is related to *M. bocourti* in having weakly developed accessory black bands, but it has more numerous ventrals and black primary bands.

Micrurus nebularis, new species, from the cloud forest around Ixtlán de Juárez, Oaxaca, Mexico, is related to the single-banded coral snakes without supraanal tubercles, such as *M. fulvius*.

Micrurus dissolucus meridensis, new subspecies, from Lagunilla in the Andes of Mérida, Venezuela, is related to *M. dissolucus*. It has a deeply bilobed hemipenis that is intermediate between the spiny bilobed organs found in South American species with triad type color pattern (*M. frontalis*, and others) and the bifurcated, partially naked organs found in the single-banded species (*M. psyches*, and others).

Micrurus dumerilii venezuelensis, new subspecies, from low to moderate elevations in Cordillera

de la Costa in north-central Venezuela is a single-banded coral snake, which is the easternmost subspecies of *M. dumerilii*.

Micrurus ephippifer zapotecus, new subspecies, from oak-madroño and oak-manzanita forests in Sierra de Juárez around Telixtlahuaca and Tejocotes, Oaxaca, Mexico, is a high-altitude subspecies (around 2000 m) related to *M. e. ephippifer*, found in Isthmus of Tehuantepec. The characteristic black saddlelike dorsal spots of the latter subspecies are not present in the new subspecies.

The following lectotypes are designated: for *Micrurus spixii princeps* (Boulenger), BMNH 1946.1.20.44; for *Micrurus laticollaris laticollaris* (Peters), ZMB 6659; for *Micrurus lemniscatus lemniscatus* (Linnaeus), NHRM L-93; for *Micrurus psyches circinalis* (Duméril, Bibron, and Duméril), MHNP 3912. As the type specimen (lectotype) of the latter subspecies comes from an unknown locality, type locality for *M. psyches circinalis* is restricted to Trinidad, West Indies.

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RESUMEN

Dos nuevas especies y tres nuevas subespecies de serpientes corales son descritas. *Micrurus catamayensis*, nueva especie, del árido valle de Catamayo, Ecuador, está relacionada con *M. bocourti* por tener bandas negras accesorias débilmente desarrolladas, pero se diferencia en tener mayor número de ventrales y más bandas negras primarias.

Micrurus nebularis, nueva especie, del bosque de niebla en los alrededores de Ixtlán de Juárez, Oaxaca, México, está relacionada con el grupo de serpientes corales de bandas sencillas y sin tubérculos supraanales como, por ejemplo, *M. fulvius*.

Micrurus dissoleucus meridensis, nueva subespecie, de Lagunilla en los Andes de Mérida, Venezuela, está relacionada con *M. dissoleucus*. *M. dissoleucus meridensis* tiene el hemipene profundamente bilobado que representa un estado intermedio entre los órganos espinosos bilobados presentes en las especies Suramericanas de patrón de coloración en tríadas (*M. frontalis*, entre otras) y los órganos bifurcados, parcialmente desnudos, que se encuentran en las especies de bandas sencillas (*M. psypes*, entre otras).

Micrurus dumerilii venezuelensis, nueva subespecie, de bajas a moderadas elevaciones en la Cor-

dillera de la Costa en la parte norte central de Venezuela, es una subespecie de serpiente coral de bandas sencillas de *M. dumerilii*. Esta es la subespecie más oriental de *M. dumerilii*.

Micrurus ephippifer zapotecus, subespecie nueva, de los bosques de roble-madroño y roble-manzanita de la Sierra de Juárez en los alrededores de Telixtlahuaca y Tejocotes, Oaxaca, México, se halla a altitudes alrededor de 2000 m, está relacionada con *M. e. ephippifer*, del Istmo de Tehuantepec. Las características manchas dorsales que asemejan una silla de montar en esta última subespecie, no están presentes en la nueva subespecie.

Los siguientes lectotipos son designados: para *Micrurus spixii princeps* (Boulenger), BMNH 1946.1.20.44; para *Micrurus laticollaris laticollaris* (Peters), ZMB 6659; para *Micrurus lemniscatus lemniscatus* (Linnaeus), NHRM L-93; para *Micrurus psypes circinalis* (Duméril, Bibron and Duméril), MNHN 3912. Como se desconoce la localidad del espécimen tipo (lectotipo), la localidad tipo para *M. psypes circinalis* es restringida a Trinidad, Indias Occidentales.

INTRODUCTION

My research on the New World coral snakes, started many years ago, has revealed several species and subspecies as yet unrecognized in the literature. This publication offers descriptions of four new taxa: *Micrurus catamayensis*, *M. nebularis*, *M. dissoleucus meridensis*, *M. dumerilii venezuelensis*, and *M. ephippifer zapotecus*; and designates types of four additional taxa.

"across the research desk" colleague. The last three, and Hobart M. Smith, reviewed the manuscript, but only I am responsible for any errors and shortcomings.

The following list of abbreviations contains the locations and persons in charge of the collections used in the present research.

ACKNOWLEDGMENTS

During my studies, I have examined coral snakes in all the major museums and universities in the United States, Latin America, and Europe and have received help, advice, and encouragement from many colleagues, all of whom will be acknowledged elsewhere. However, I would like here to acknowledge the constant help over many years of my colleagues at the American Museum of Natural History, New York: Charles J. Cole, Charles W. Myers, and Richard G. Zweifel, as well as the advice of Samuel B. McDowell, my

ABBREVIATIONS

AMNH	American Museum of Natural History, New York
BMNH	British Museum (Natural History), London (A. G. C. Grandison and E. N. Arnold)
FAUCV	Facultad de Agronomía, Universidad Central de Venezuela (A. Fernández Yopez)
FMNH	Field Museum of Natural History, Chicago (Robert Inger, Hymen Marx)
MCNC	Museo de Ciencias Naturales, Caracas (R. Abdel Lancini)
MNHN	Muséum National d'Histoire Naturelle, Paris (Jacques Guibé)

NHRM	Naturhistoriska Riksmuseet, Stockholm (Greta Westergren)
NMBA	Naturhistorisches Museum, Basel, Switzerland (U. Rahm, C. Unternährer)
NMW	Naturhistorisches Museum, Vienna (Josef Eiselt)
SCN	Museo de Historia Natural de la Sociedad de Ciencias Naturales La Salle, Caracas (Hno. Ginés, A. Paolillo)
UIMNH	University of Illinois, Museum of Natural History (Hobart M. Smith and Thomas Uzzell)
UMMZ	University of Michigan, Museum of Zoology (Arnold Kluge, Gregg Schneider)
USNM	National Museum of Natural History, Washington (Ronald Heyer, George Zug, Roy McDiarmid)
ZMB	Museum für Naturkunde, Universität Humboldt, Berlin (Günther Peters)
ZMH	Zoologisches Museum, Hamburg (Werner Ladiges)
ZMUC	Universitetes Zoologiske Museum, Copenhagen (F. W. Braestrup)

Most of my studies were carried out at the American Museum of Natural History. For support of my research, I am indebted to the authorities of the U.S. Public Health Service, National Science Foundation, Research Foundation of the City University of New York, and the Faculty Senate of the City College of New York.

DESCRIPTIONS OF NEW SPECIES AND SUBSPECIES

All taxa described here have the number and distribution of the cephalic shields and other characteristics typical of the genus *Micrurus*. They have one rostral, two internasals, two prefrontals, one frontal, two parietals, one nasal that is divided, no loreals, one preocular, one supraocular, two postoculars, seven supralabials (the third and fourth of which are in contact with the orbit), seven infralabials, and two pairs of genials. There are 15-15 dorsal scale rows, except immediately behind the head where they are irregular and in 17 or 16 rows. The anal plate and the subcaudals are divided unless otherwise stated.

Elevations are given in meters. The original Spanish spelling is given for all localities, except names of countries.

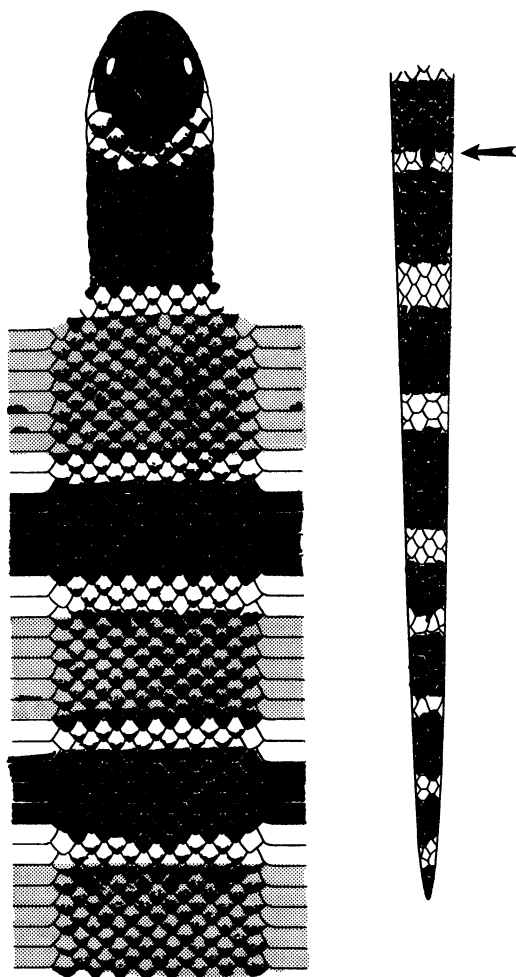


Fig. 1. Color pattern of *Micrurus catamayensis*, new species (holotype, BMNH 1935.11.3.103). In life stippled areas are red; white areas are white or yellow; and black areas are black. Arrow indicates position of anal plate.

Micrurus catamayensis, new species

Figure 1

HOLOTYPE: BMNH 1935.11.3.103, male, 2 km west of Loja, Catamayo Valley, Ecuador, 1568 m, collected by Clodoveo Carrion.

PARATYPES: BMNH 1935.11.3.100, male, BMNH 1935.11.3.101-2 and BMNH 1935.11.3.104-5, females, 2 km west of Loja, Catamayo Valley, Ecuador, 1568 m; BMNH 1935.11.3.107, female, Hacienda de Juanes, Catamayo Valley, Ecuador, 1737 m; BMNH 1935.11.3.111, female, Loja, Ecuador, 2360 m; all BMNH specimens collected

by Clodoveo Carrion; AMNH 132270, male, air base of Catamayo, Provincia Loja, southwestern Ecuador, about 1000 m, collected by Gustavo Orcés; ZMUC R.6555, female purchased in Quito, Ecuador, by Vorbeck in 1925.

DIAGNOSIS: A coral snake with weakly developed accessory black bands, forming a poorly defined triad-type color pattern, and with a black supracephalic cap. It differs from *M. bocourti* in having more ventrals and more primary black bands. It has 210, 216 ventrals in 2 males and 227–231 in 8 females as against 197–206 ventrals in 14 males and 212–220 in 10 females for *M. bocourti*. It has 22–24 black body bands in two males and 27–32 in eight females as against 14–20 black body bands in 12 males and 15–22 in 9 females for *M. bocourti*. *M. catamayensis* differs from *M. mertensi* in having weak accessory black bands, absent in the latter.

DESCRIPTION OF HOLOTYPE: Rostral is wider than high and visible from above; prefrontals are about twice as long as internasals, and only a little shorter than the frontal. Frontal is shorter than its distance from the snout, and shorter than parietals. First pair of genials is almost twice as long as second. There are 1 + 1 temporals. Holotype has 210 ventrals and 46 subcaudals.

Black supracephalic cap covers entire upper part of head including all parietals and first five supralabials. Below, mental is black and first four infralabials are partially black. Small, irregular black borders are present on the anterior and posterior part of the first pair of genials. Rest of head shields are light. Black nuchal band is separated from parietals by white band with irregular black tips or spots. First middorsal postparietal scale is black.

Primary black bands on body are outlined by white bands. Weakly developed accessory black bands are formed by large black tips concentrated around border of red bands. Black accessory triads are separated by red bands. Accessory triads become more apparent on posterior part of body but not very strong, whereas first two black bands have almost no accessory bands. Ventrally, only primary black bands are present but red bands have some irregular black spots. Black nuchal band is six dorsals and three ventrals long; black body bands are four to five dorsals and

ventrals long while accessory black bands are irregular, no longer than one or two dorsals. Red bands are five to six dorsals and ventrals long, with irregular, large black tips or almost entirely covered by black. Tail has alternating black and white bands of variable length but black band is always longer than white band that follows it. There are 24 + 9 black bands or accessory triads on body and tail.

Overall length of holotype is 495 mm, 56 mm of which comprise tail length, giving ratio of tail length/total length of 0.113.

DESCRIPTION OF PARATYPES: Paratypes are similar to holotype; BMNH 1935.11.3.104 has only one postocular on each side. Accessory black bands vary from nearly nonexistent (BMNH 1935.11.3.111) to clearly marked but always irregular. Intensity of black tips on red scales also varies from clearly defined tips to almost entirely black scales.

Single male paratype has 216 ventrals and eight females have 227–237 ventrals. Male paratype has 43 subcaudals, females 31–36. Male has 22, females 27–32 primary black body bands or accessory triads. In several females 1–16 black bands are incomplete ventrally. On the tail, the male has 6 and the females have 5–7 single black bands.

Largest paratype (BMNH 1935.11.3.111) is 915 mm long, including 73 mm of tail length. Ratio of tail length to total length is 0.113 and 0.121 (2 males, including the holotype) and 0.0724–0.0909 (6 females).

NOTES: Additional difference between *M. catamayensis* and *M. bocourti* in number of ventrals and primary black body bands can be obtained by comparing mean, range, and standard deviation (table 1).

The relationships of this species are uncertain. It seems related to the assemblage of South American coral snakes (*M. corallinus* (Merrem), *dumerilii* (Jan), *psyches* (Daudin), *bocourti* (Jan), *mertensi* Schmidt, and several more) characterized by single black body bands, a long hemipenis, and a long tail. Its head coloration and scale counts are similar to those of *M. mertensi*, known from the dry Pacific side of northern Peru, but the new species has accessory black triads and a shorter tail in males. *M. mertensi* males have a tail length/total length ratio of 0.120–0.134. *M. bocourti*, a species with accessory black triads, is also present in Catamayo Valley,

TABLE 1
Variation in Number of Ventrals and Number of Primary Black Bands of *M. bocourti* and *M. catamayensis*
(Figures in parentheses indicate the number of specimens examined)

	<i>M. bocourti</i>	<i>M. catamayensis</i>
A. Number of ventral scales		
Range observed		
Males	196–206 (14)	210–216 (2)
Females	212–220 (10)	227–236 (8)
Mean		
Males	200.6	213.2
Females	216.2	232.0
Standard deviation		
Males	3.15	4.23
Females	2.74	3.77
B. Number of black body bands		
Range observed		
Males	14–20 (14)	22–24 (2)
Females	15–22 (10)	27–32 (8)
Mean		
Males	16.7	23.0
Females	17.9	28.9
Standard deviation		
Males	2.13	1.46
Females	2.57	1.51

perhaps in the semihumid valleys, as represented by BMNH 1935.11.3.106. This female has only 15 accessory triads, more precisely, 2/3 15 2/3 + 5, and 218 ventrals, well within the range of *M. bocourti*, known otherwise from the more humid lowlands of Provincia Guayas, Ecuador. It is possible that a mimicry system is maintained between *M. bocourti*, with strong accessory black triads, and *M. catamayensis*, with weak accessory black triads. A mimicry system in which a species of single-banded coral snakes displays a form (subspecies) with accessory black triads in sympatric conditions with a triad pattern species, is found in the Sierra Nevada de Santa Marta region of Colombia. *M. d. dumerilii*, a subspecies of an otherwise single-banded species, has accessory black triads where it overlaps in distribution with *M. dissoleucus nigrirostris* Schmidt, a triad species, in lower Valle de Magdalena; and *M. dumerilii colombianus* (Griffin) with *M. dissoleucus*



Fig. 2. Hemipenis of *Micrurus dissoleucus meridensis* (right organ of USNM 217256).

melanogenys (Cope) in the Santa Marta region (see also the description of a new subspecies of *M. dumerilii*, described in this paper). Greene and McDiarmid (1981) and Roze (1983) reported concordances of intricate diversity of Batesian and Mullerian mimicry systems in coral snakes.

Parker (1938), as well as Schmidt and Walker (1943), commented on the herpetofauna of the dry Catamayo Valley and its altitudinal distribution, including the coral snakes, described here. From the biogeographical and evolutionary perspective the arid and relatively high region of the Catamayo Valley in southern Ecuador with its steep gorges and a mixture of desertic–dry–semihumid environments is one of the most fascinating areas in South America and has not been fully appreciated and studied.

ETYMOLOGY: The name *catamayensis*, inhabitant of Catamayo in Latin, or Valle de Catamayo, Ecuador, indicates its presence in that part of the world.

Micrurus dissoleucus meridensis,
new subspecies
Figures 2 and 3

HOLOTYPE: USNM 217256, a male from 1 km NE of Lagunilla, Mérida, Venezuela, 915 m, obtained on 27 March 1966.

DIAGNOSIS: Differs from all the other subspecies of *M. dissoleucus* in having higher number of complete black triads (18 in the only available specimen), as compared to 6 to 11 for all other subspecies.

DESCRIPTION OF HOLOTYPE: Rostral is wider than high, visible from above. Internasals

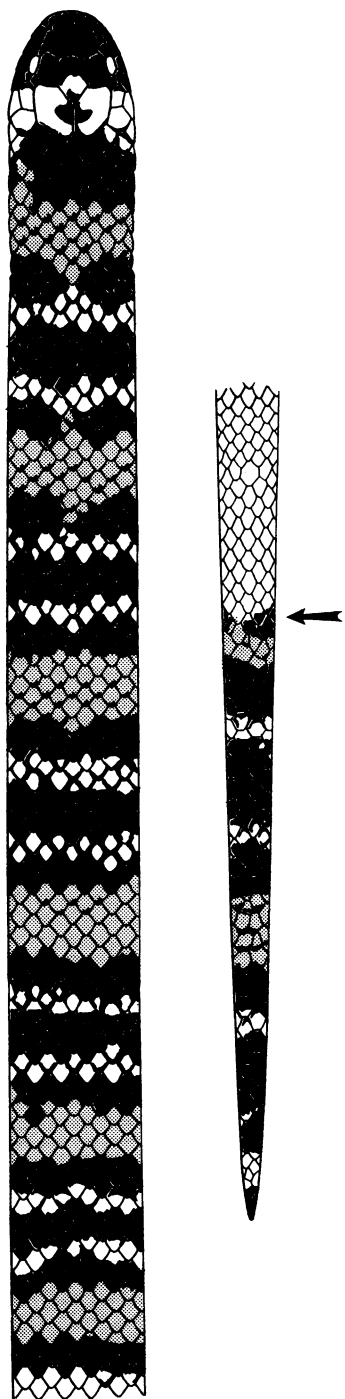


Fig. 3. Color pattern of *Micrurus dissoleucus meridensis*, new subspecies (holotype, USNM 217256).

are wider than long. Prefrontals are almost twice as long as internasals. Frontal is a little longer than prefrontals but shorter than parietals and shorter than its distance from snout. There are 1 + 1 temporals; posterior is longer than anterior. First pair of genials is shorter than second pair. Holotype has 176 ventrals and 27 subcaudals. Six prefrontals are between genials and first ventral.

Snout is black (fig. 3), including the supraoculars, anterior part of frontal, postoculars, and first five supralabials. Snout is followed by white parietal crossband with an irregular black spot in center, between parietals. Below, mental and several infralabials are black. Black nuchal band, the only band of first triad, covers tips of parietals but is irregular ventrally. Rest of body is covered by irregular triads separated by red bands. On venter, triads are quite irregular, with black bands broken or displaced. On posterior part of body it is impossible to identify triads. Black central band of a triad is two to three dorsals long, and black outer bands are one to two dorsals long, all very irregular. Red bands are three to four dorsals and ventrals long, with small back tips. White bands are immaculate but have a feeble dark outline, characteristic of *dissoleucus*. Triads are much longer on tail than on body but also irregular. Holotype has $1\frac{1}{3}$ 18 + 2 $\frac{1}{3}$ black triads.

Right hemipenis of holotype (fig. 2) is everted. It is deeply bilobed, with slightly rounded apices. Partially conical lobes are one-third length of total organ. Sulcus spermaticus is bifurcated. Base of organ is naked, with few very small spinules or spines covering about one-fourth of undivided part of organ. This is followed by a clearly marked zone of larger, nearly uniform-size spines extending to apex of each lobe. Sulcus has an almost indistinct ridge or lip. Sulcus runs to apex of organ, bifurcating shortly before division of hemipenis. Short, naked fold (protuberance in a fully everted condition) at base of organ, left of sulcus, reaches level where large spines begin. Large spines are fleshy, ending in sharp, hard points. Everted organ measures about four to five subcaudals. Overall the hemipenis is entirely covered with mostly uniform-size spines.

Holotype is 390 mm long, 40 mm of which comprise tail length. Ratio of tail length to total length is 0.102.

NOTES: The type specimen displays several unusual features and it is only with some hesitation that I describe it as a subspecies of *M. dissoleucus* (Cope). In some ways, its coloration is different from that of any other species of coral snake except for the reduction of the first triad to a single band, as in *M. dissoleucus*. The number and shape of the triads are quite different and only the dark outline of the white scales is a *dissoleucus*-like feature. The hemipenis of *M. d. meridensis* is somewhat similar to the triad-type hemipenes of South American species of coral snakes, such as *M. lemniscatus* (Linnaeus), *M. frontalis* (Duméril et al.), *M. spixii* Wagler, *M. surinamensis* (Cuvier), *M. isozonus* (Cope), and others, characterized by having a short tail and a short, bilobed all-spiny hemipenis. Yet, the new subspecies has it more deeply divided. The well-divided condition with somewhat pointed forks is a feature found in the single-banded, long-tailed coral snakes (*M. dumerilii*, *M. corallinus*, *M. psyches*, *M. nigrocinctus* (Girard), and others) of South and Central America. The characteristics of the hemipenis make this subspecies somewhat intermediate between the short-tailed and long-tailed coral snakes.

The condition of the hemipenis in this new subspecies might even merit a species status when more specimens are known and studied. This raises the question of rates of evolutionary differentiation of coral snakes in general. The differences found in the hemipenis, the head muscles, and the dentition of American elapids suggest that the evolutionary process among the species and species groups has been going on for a long time (McDowell, 1986). The "age" of such species of *M. tschudii*, *M. surinamensis*, or species of *Leptomicrurus* (Roze and Bernal-Carlo, 1987) might be closer to the age of genera in some colubrid groups or Asiatic elapids. McDowell (in litt.) noted that "the differences between Australian proteroglyphs and among sea snakes seem at least as great as among coral snakes and these differences are also estimated (by proteins) to be no older than Miocene." Coral snakes perhaps originated in the Miocene (Cadle and Sarich, 1981), but possibly even a bit farther back.

ETYMOLOGY: The name *meridensis*, inhabitant of Mérida in Latin, alludes to its distribution in the Estado Mérida, Venezuela.

Micrurus dumerilii venezuelensis,
new subspecies
Figure 4

HOLOTYPE: AMNH 59392, female, El Valle, Distrito Federal, Venezuela, collected by Edgardo Mondolfi, 20 July 1938.

PARATYPES: All from Venezuela: AMNH 3936, male without specific locality (paratype of *M. carinicauda*); FAUCV unnumbered, male from Las Trincheras, Carabobo, collected by Hernandez; SCN unnumbered, a male from Hacienda Fria, Miranda, collected by Contreras; MCNC 609, male, Maracay, Aragua, collected by Lancini; ZMH unnumbered, female, Caracas, Distrito Federal, collected by Sievers; UIMNH (ex "MCNC 317"), male, Ocumare de la Costa, Aragua, collected by Ciferi; UIMNH (ex MCNC 322), female, San Esteban, Carabobo, collected by Anduze; NMW unnumbered, female, San Esteban, Carabobo, collected by Staundinger, 1868.

DIAGNOSIS: A single-banded *M. dumerilii* with supraanal tubercles. It differs from *M. d. carinicauda*, its closest geographical ally, in having a lower number of ventrals: 177–191 (183.4) in five males and 194–199 (197.0) in four females, as compared to 192–197 (193.6) and 204–212 (208.2) in six males and nine females, respectively, of *M. d. carinicauda*.

DESCRIPTION OF HOLOTYPE: Rostral is wider than high, easily visible from above; internasals are wider than long, their contact approximately as long as visible part of rostral. Prefrontals are longer than their distance from snout. Frontal is almost twice as long as prefrontals, longer than its distance from snout but somewhat shorter than parietals. There are 1 + 1 temporals, anterior a little longer than posterior. First pair of genials is shorter than second.

Holotype has 198 ventrals and 33 subcaudals. There are three preventrals.

Black cap projects as a triangular extension to end of posterior suture of parietals, but lateroposterior part of parietals is light. Black cap includes postoculars, first four and anterior part of fifth supralabial. White postparietal band covers lateroposterior part of parietals, temporals, several supralabials, and anterior part of first row of dorsals. Black nuchal band is 3½ dorsals long, extending and covering five ventrals. Below, snout is

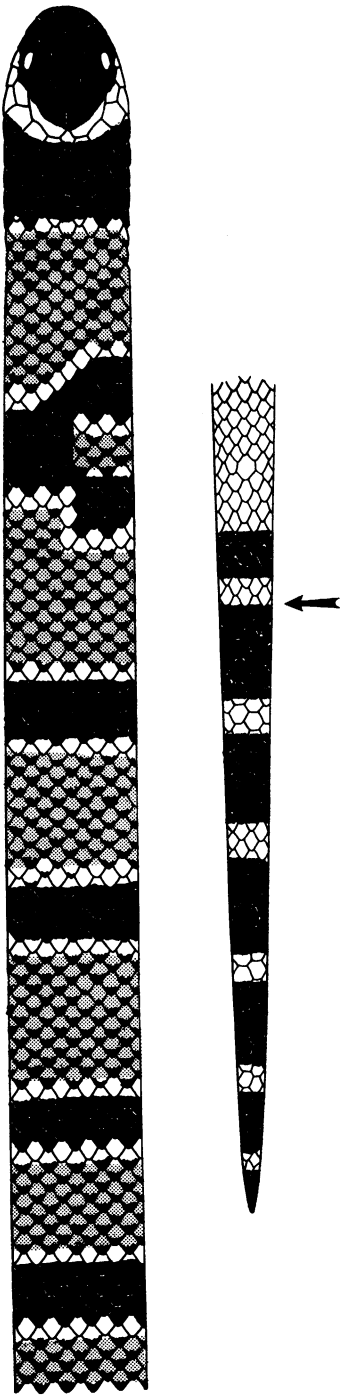


Fig. 4. Color pattern of *Micrurus dumerilii venezuelensis*, new subspecies (holotype, AMNH 59392).

black, including first three infralabials and first pair of genials, but mottled with light. Black body bands are two to three dorsals and ventrals long, bordered by a white (yellow) short band, one or fewer dorsals long. First black dorsal band behind nuchal band is split in two on right side of dorsum. Red bands are five to seven dorsals and ventrals long, strongly marked with black tips; ventrally, red bands have only a few small dark or black spots. Only black and white bands are on tail, black bands about three times longer than white ones. Holotype has $24 + 6$ black body and tail bands.

Holotype is 253 mm long, 22 mm of which comprise tail length, giving ratio of tail length to total length of 0.087.

DESCRIPTION OF PARATYPES: Paratypes are similar to holotype. In several specimens black cap is reduced and covers about half of parietals.

Black nuchal band is three to six dorsals long; in UIMNH (MCN 332) black nuchal band touches tips of parietals. Length of black body bands varies from two to four dorsals and two to three ventrals, while white (yellow) bands are one-half to one dorsal long. Red bands are 5 to 10 dorsals and ventrals long, usually immaculate ventrally. Black tail bands are two to three times longer than light bands.

Five males have 177–191 (183.4) and four females, including holotype, have 194–199 (197.0) ventrals. Subcaudals vary 47–51 (48.6) in males, and 33–35 (34.3) in females, including holotype. Males have 17–24 (20.1), and females 24–26 (25.0) black body bands, including holotype. Males have 6–10 black tail bands, females 6–7.

Longest measured specimen, a female from San Esteban (NMW) is 701 mm long, 70 mm of which comprise tail length. Ratio of tail length to total length varies from 0.148 to 0.173 in males and from 0.087 to 0.105 in females, including holotype.

NOTES: This is the easternmost subspecies of *M. dumerilii*, with the lowest number of ventrals and subcaudals for the species. It is found in tropical lowland and humid montane forest altered by humans in the Cordillera de la Costa in north-central Venezuela, from sea level to about 1100 m.

M. d. venezuelensis intergrades in Estado

Falcón, Venezuela with its eastern ally, *M. dumerilii carinicauda* Schmidt. This is shown by specimens from Falcón, as UMMZ 55887 from La Fría, NMBA 11357 from Cerro Riecito, and NMBA 9238 and 9974 from El Mene, all of which come from the Acosta District and were collected by H. G. Kugler (Shreve, 1947). Two specimens from Puerto Cabello, Estado Carabobo, Venezuela (NMW 18288:1–2) may also represent intergrades. *M. d. carinicauda*, described from Orope, Estado Táchira, Venezuela (Orope is in Táchira and not in Zulia, as given in the original description of the species by Schmidt, 1936, and clarified by Hoge and Lancini, 1962), is found in Norte de Santander and Santander, Colombia, and adjacent Venezuela: Zulia, Táchira, and Mérida.

Micrurus dumerilii is unique among coral snakes in having subspecies with single-banded color patterns (*antioquiensis* Schmidt, *carinicauda*, *transandinus* Schmidt, and *venezuelensis*) and subspecies with accessory black bands that form poorly developed triads (*dumerilii* and *colombianus*). The presence of subspecies with single-banded and accessory-band color pattern in one species suggests that triads are derived from a single-banded color pattern. In this case, the triads are an apomorphic character in coral snakes derived from the single-banded pattern. This is supported by the long and bifurcated hemipenis of *M. dumerilii*, similar to that of the single-banded coral snakes of Central and South America.

Roze (1955) and Lancini (1979) published color photos of this subspecies under the name of *M. carinicauda* and *M. dumerilii carinicaudus*, respectively, and discussed its distribution.

ETYMOLOGY: The name *venezuelensis*, inhabitant of Venezuela in Latin, denotes its distribution in Venezuela.

***Micrurus nebularis*, new species**

Figure 5, Map 1

HOLOTYPE: AMNH 103118, male from Vivero Rancho Teja, 3 km east of Ixtlán de Juárez, Oaxaca, Mexico, 2370 m, collected by Boone Hallberg on 13 July 1968.

PARATYPES: AMNH 107013, male, 2 km east of Ixtlán de Juárez, 2370 m, collected in

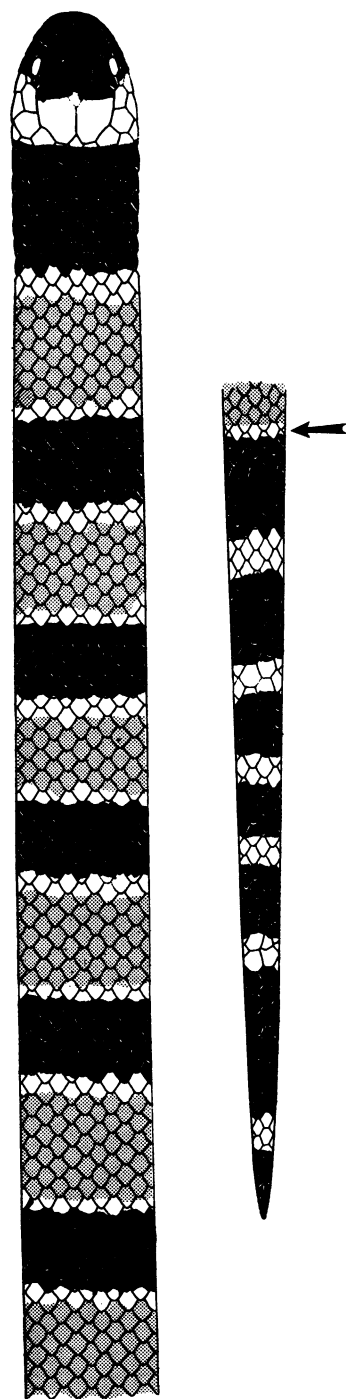


Fig. 5. Color pattern of *Micrurus nebularis*, new species (holotype, AMNH 103118).

June 1970; AMNH 91110, female, 3.6 km east of Ixtlán de Juárez, Dto. de Ixtlán, Oaxaca, 2300 m, collected in June 1963; AMNH 100857, female, 2.5 km east of Ixtlán de Juárez, 2300 m, collected in March 1967; AMNH 113600, female, Vivero Rancho Teja, 3 km east of Ixtlán de Juárez, 2270 m, collected in 1968; FMNH 228251 (ex AMNH 103117), female, Vivero Rancho Teja, 3.5 km east of Ixtlán de Juárez, 2310 m, collected 20 June 1968. All paratypes come from Distrito de Ixtlán, Oaxaca, Mexico, collected by Boone Hallberg.

DIAGNOSIS: A single-banded coral snake without supraanal tubercles in males; related to *M. fulvius* from which it differs in lacking or nearly lacking black tips on red scales, and in having more numerous black bands: 23–24 in two males and 26–28 in four females, as compared to 10–22 and 12–26 of the combined number of black body bands for males and females, respectively, of all the subspecies of *M. fulvius*. It differs from *M. ephippifer* in not having the saddlelike black spots or heavy black tips on the red scales.

DESCRIPTION OF HOLOTYPE: Rostral is wider than high; prefrontals are $2\frac{1}{2}$ times longer than internasals. Frontal is longer than prefrontals and longer than its distance to snout, but shorter than parietals. There are 1 + 2 temporals followed by a large posttemporal. Holotype has 208 ventrals and 49 subcaudals.

Black snout coloration extends to and covers anterior part of parietals, almost entire frontal and postoculars, including most of fourth supralabial. First three infralabials and anterior part of first pair of genials are black. However, yellow on genials reaches the posterior tip of mental covering also part of the first infralabial. Yellow parietal band is followed by black nuchal band that reaches but does not cover tips of parietals and is five dorsals long. Below, black nuchal band is four ventrals long and covers also tips of second pair of genials. Black body bands are four dorsals and three to four ventrals long. Black bands on tail are about two times longer than yellow ones that separate them. Yellow bands are about one dorsal and one or less ventrals long; many of them end on first dorsal or on lateral tips of ventrals. Yellow bands are

practically without black tips. Red bands, three to four dorsals and ventrals long, are somewhat obscured dorsally by brownish overtones, particularly on tips of the scales, while ventrally they are bright red and immaculate. Holotype has 23 + 7 black body and tail bands.

Hemipenis in situ is 15 subcaudals long. It and the sulcus spermaticus bifurcate at level of 10th subcaudal. Base of hemipenis is naked, except for minute spinules, starting around fourth subcaudal along sulcus. Small spines begin between subcaudals 7 and 8, increasing in size toward bifurcation. Between subcaudals 9 and 12, spines are large, but diminish again toward apex, where they are more or less uniformly small. A naked fold runs from base of organ parallel to sulcus and ends shortly before bifurcation; a few scattered spines appear on fold shortly before bifurcation.

Overall length of holotype is 557 mm; tail length is 76 mm, giving a ratio of tail length to total length of 0.136.

DESCRIPTION OF PARATYPES: Cephalic scutellation of paratypes is similar to that of holotypes. Two specimens have 1 + 1 temporals and three have 1 + 2 temporals, at least on one side. Umbilical scar is visible in FMNH 228251 and AMNH 100875, with overall length of 370 mm and 228 mm, respectively. In all paratypes black nuchal band covers tips of parietals and in all except one (AMNH 113600), nuchal black band ventrally covers tips of second pair of genials. All red bands are somewhat dulled by brownish overtones. A few small irregular black tips on red scales are present in AMNH 113600, and AMNH 91110 has very few small dotlike black tips.

Male paratype has 203 and females have 218–225 (222.3) ventrals; subcaudals: 45 for only male, and 35–37 (35.8) in females. Male has 24 + 7, and females have 26–28 (27.0) black body bands, while tail bands number 5 or 6.

NOTES: Probably this species is endemic to the high altitudes of the Sierra de Juárez in central Oaxaca, Mexico, in cloud forest and in pine-oak woodlands, above 2000 m, where the holotype and several paratypes were collected.



Fig. 6. General aspect of *Micrurus ephippifer zapotecus*, new subspecies (paratype, AMNH 103120). (Photo by Charles M. Bogert)

The holotype had in its stomach a practically undigested *Geophis dubius*, that had been swallowed head first.

ETYMOLOGY: The name *nebularis*, Latin for pertaining to or related to clouds, denotes its distribution in the high mountain cloudy environment of Sierra de Juárez.

***Micrurus ephippifer zapotecus*,**
new subspecies
Figure 6, map 1

HOLOTYPE: AMNH 103119, male from Tejocotes, Distrito de Etlá, Oaxaca, Mexico, 2400 m, collected by Charles M. Bogert, 10 September 1968.

PARATYPES: AMNH 103120, female, Tejocotes, 2530 m, collected on 10 September 1968; AMNH 89634, male, 1 km west of El Aguila, 2030 m, collected 17 September 1962; AMNH 119232, female, 2 km west of Telixtlahuaca, 1980 m, collected on 11 October 1969. All paratypes come from Distrito de Etlá, Oaxaca, Mexico, collected by Charles M. Bogert.

DIAGNOSIS: A single-banded coral snake without supraanal tubercles, related to *M. ephippifer* from which it differs in having more black body bands: 22–26 in two males and 27–29 in two females, as compared to 15–21 and 17–23, in 15 males and 14 females, respectively, of *M. ephippifer ephippifer*. Moreover, it has irregular black tips and spots on

red scales that occasionally may fuse to form a larger black spot or pseudoband on the dorsal part of the red bands. In the nominotypical subspecies the red bands are completely obliterated dorsally by a black saddle-shaped spot (fig. 7), so that in many cases the red band cannot be seen dorsally.

DESCRIPTION OF HOLOTYPE: Rostral is wider than high; prefrontals are almost twice as long as internasals; frontal is slightly shorter than its distance from the snout and a little shorter than parietals. There are 1 + 1 temporals; on left side a large posttemporal reaches beyond tips of parietals, while on right side posttemporal region is covered by two scales. Holotype has 218 ventrals and 49 subcaudals, five of which are undivided.

Black head coloration extends from snout to supraoculars and includes most of frontal, anterior part of parietals, postoculars, and most of fourth supralabial. Most of mental and first three infralabials are black. Yellow parietal band is followed by black nuchal band that is six dorsals long and covers tips of parietals as well as seventh supra- and infralabial. Ventrally, black nuchal band is five ventrals long and projects forward, covering part of second pair of genials and tips of first pair. Black body bands are mostly four dorsals and three ventrals long. Yellow bands that border black bands are 1½ to 2 dorsals long; anteriors are a little longer and more brilliant than posteriors. Some posteriors have

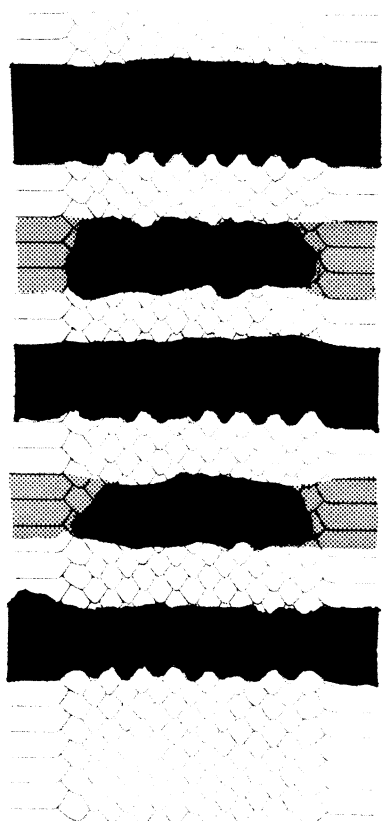


Fig. 7. Midbody color pattern of *Micrurus ephippifer ephippifer* (AMNH 65890). In life stippled areas are red; white areas, white; and black areas, black.

slightly brownish tips. Red bands are three to four dorsals and four to five ventrals long. Red scales have large black tips that sometimes extend over entire scale. Some red scales are immaculate; ventrally, red bands have only a few black spots. Only black and yellow bands are on tail; black bands are less than two times longer than yellow bands. Holotype has 22 + 7 black body and tail bands.

Holotype has a completely everted right hemipenis. It is about 10–11 subcaudals long (in situ about 14 or 15 subcaudals), bifurcated, and with sulcus spermaticus divided, both at about sixth subcaudal. At level of bifurcation, hemipenis is slightly wider than at base but tapers off toward apex. As both forks gradually become more slender, they transform into a whiplike terminal portion that ends in a soft, fleshy papilla—a terminal, spinelike projection. Base of hemipenis is

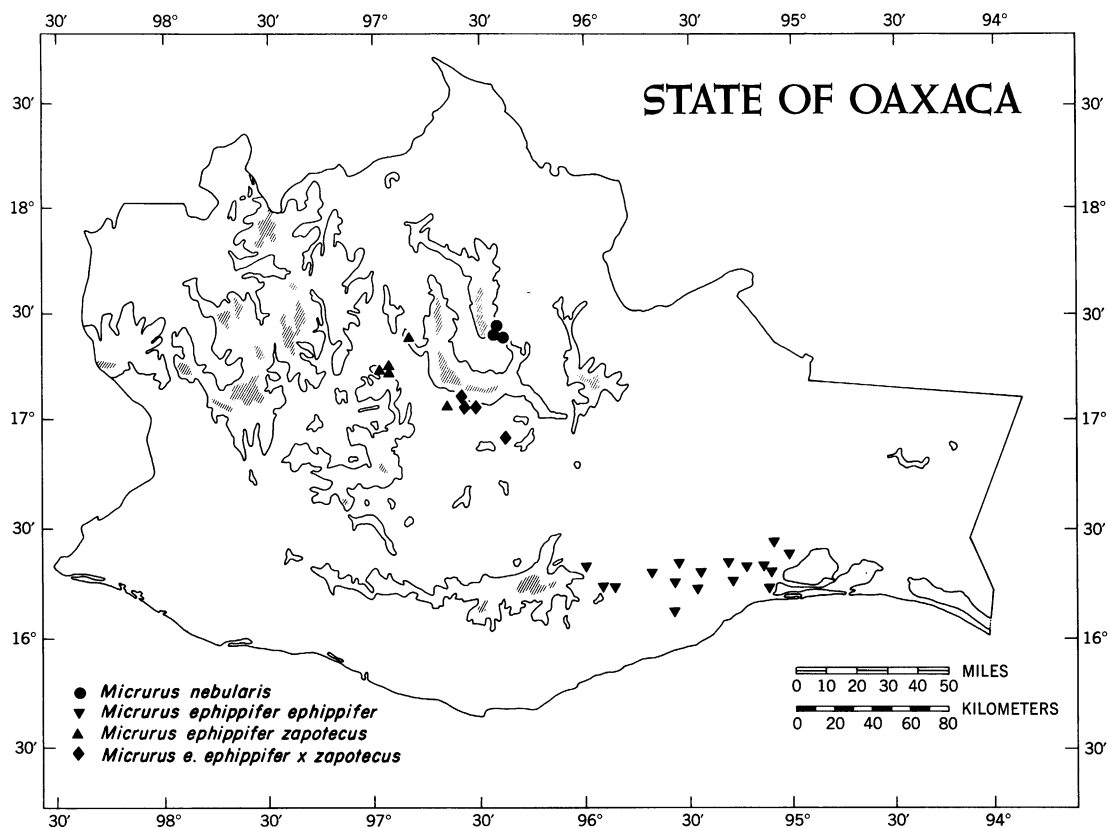
completely naked up to about third subcaudal. Small spines begin at third subcaudal, gradually increase in size, and are largest about 1 to 1½ subcaudals above bifurcation. Spines gradually diminish again toward apex where they are barely distinguishable. Naked fold runs almost opposite sulcus, ending shortly before bifurcation. A fold on each side of sulcus has small spines from about second subcaudal on. They also gradually increase in size, joining region where rest of organ is covered by spines. From level of bifurcation folds of sulcus are naked again. Sulcus ends at terminal papillate projection.

Overall length of holotype is 675 mm; tail length is 98 mm, which gives the ratio of tail length to total length, 0.145.

DESCRIPTION OF PARATYPES: Cephalic scutellation of paratypes is much the same as in holotype. All paratypes have 1 + 1 temporals. Single male paratype has three undivided subcaudals, while females have all subcaudals divided. Head coloration is also similar to that of holotype. Ventrally, black nuchal band projects forward in all but one (AMNH 103120), but it has a black spot between genials. Black bands are three to four dorsals and mostly three ventrals long. Red bands vary from having only a few black tips and larger spots to a black middorsal spot on red bands, but black never occupies entire red band as is the case with *M. e. ephippifer*. Ventrally, two paratypes are immaculate; the rest have some black spots on red ventrals. Male paratype has 216 ventrals, and two females have 226, 231 (228.5) ventrals. Male has 47 and females 35, 38 (36.5) subcaudals. Male paratype has 26 + 6 black bands on body and tail, females 27, 29 (28.0) black body bands and 5 to 6 black tail bands.

Longest specimen (AMNH 119232) has overall length of 758 mm, and 75 mm of tail length. Ratio of tail length to total length in males is 0.136–0.145, including holotype, and in females, 0.099–0.104.

NOTES: This subspecies is distributed in humid pine-oak, oak-manzanita, and oak-madroño woodlands in the Sierra Madre del Sur of Oaxaca, at altitudes between 1900 and 2600 m, where several specimens were collected. The nominotypical subspecies is found in lowland and low-altitude arid and semi-arid scrub forest and medium-altitude semi-



Map 1. Distribution of *Micrurus nebularis*, *Micrurus ephippifer ephippifer*, *Micrurus ephippifer zapotecus*, and intergrades between *M. e. ephippifer* and *M. e. zapotecus*. Solid line represents the 7000-ft contour in the Sierra Madre del Sur. Hatching delineates areas above the 9000-ft contour.

humid forest west of the Isthmus of Tehuantepec, up to 1500 m.

A specimen from Monte Albán, Oaxaca (UMMZ 106709) seems also to belong to the new subspecies. It has no head, but the red bands have dark tips and are only partially fused. One specimen, AMNH 89633 from Mitla, east of Oaxaca, can be considered an intergrade between the two subspecies. It has a perfect saddlelike pattern but the black nuchal projects forward and the number of black bands (22) is between the numbers in the two subspecies. Around Mitla the environment is dry, with semixerophytic scrub and other vegetation. It is possible that a broader zone of intergradation between the two subspecies will be found along the Valley of Oaxaca going toward the Isthmus of Tehuantepec. Five specimens from around the Cerro San Felipe del Agua, Oaxaca (AMNH

100859, 100860, 102219, and UIMNH 40078 and 53122) between 1900 and 2300 m (map 1) could also be tentatively considered as intergrades. They have a low number of black bands (18–22, except AMNH 102219, which has 26) as in *M. e. ephippifer* (Cope) but no black saddlelike dorsal spot. If a larger black spot is present, it does not occupy the entire red band.

The holotype was collected at 11 A.M. while it was devouring a snake (*Rhadinaea taeniata aemula*). This clearly suggests diurnal activity. Coral snakes in higher altitudes and in shady forests of tropical lowlands are known to be active during the day and, probably, at night as well.

ETYMOLOGY: The name *zapotecus* honors the zapotecs, the ancient people who lived in Oaxaca but mysteriously disappeared before the arrival of Spanish conquerors, leaving be-

hind some of the most remarkable cultural monuments.

NOTES ON TYPE SPECIMENS

In order to clarify the taxonomy and designate the best preserved specimens as lectotypes from existing series of syntypes of earlier described species, I propose the following designations.

1. *Micrurus spixii princeps*. Four syntypes were mentioned in the original description of *Elaps princeps* Boulenger, 1905. They are in the British Museum (Natural History), all from Santa Cruz, Province Sara, Bolivia, collected by José Steinbach in 1904. I designate herewith BMNH 1946.1.20.44 (earlier BMNH 1946.10.29.63) as lectotype. It is the largest specimen of the syntypes, a well-preserved male, 1220 mm in total length, 65 mm in tail length; 223 ventrals, 21 subcaudals. BMNH 1946.1.20.45, a female, 1946.1.20.46, a female, and 1946.1.20.47, a male become paralectotypes.

2. *Micrurus laticollaris laticollaris*. Three syntypes were mentioned in the original description of *Elaps marcgravii laticollaris* Peters, 1869. Of these, I designate herewith ZMB 6659 as lectotype, which is the only male, said to come from "warmer environments of southern Mexico, Matamoros, Puebla," collected by Berkenbusch. It has 211 ventrals, 43 subcaudals, and $2\frac{2}{3}$ $5\frac{2}{3}$ black triads on the body and 3 single black bands on the tail. The type locality was restricted to Izúcar de Matamoros, Puebla, Mexico, by Smith and Taylor, 1950. ZMB 6659a, a female, and FMNH 95836 (ex ZMB 6659b), also a female, both collected by Berkenbusch, become paralectotypes.

3. *Micrurus psyches circinalis*. Of the original four syntypes of *Elaps circinalis* Duméril et al., 1854, in the Paris Museum (see also Roux-Estève, 1983), three still exist. MNHN 3912, a female from an unknown locality, obtained by Geoffrey, is selected herewith as lectotype, and the type locality is restricted to Trinidad, West Indies, where it is known to be present and relatively abundant, at least in the past. The lectotype has 201 ventrals, 32 subcaudals, 0 + 1 temporals, and 27 + 6 black body and tail bands; total length, 280 mm and tail length, 25 mm. These charac-

teristics fall well within the variation of the Trinidad population of *Micrurus psyches circinalis*. Of the three syntypes, the lectotype is the only specimen that represents this form. One of the two paralectotypes, MNHN 869, a male from an unknown locality, obtained by Lieutaud, is not conspecific with *Elaps circinalis*. Jan (1872) used this as type specimen for his new species, *Elaps bocourti* (= *Micrurus bocourti*). The other paralectotype, originally MNHN 3913, a male with supraanal tubercles, from "Martinique," collected by Plee, was exchanged with Instituto Butantan, São Paulo, Brazil, where it is registered as IB 17749. This specimen represents a *Micrurus dumerilii* ssp.

4. *Micrurus lemniscatus lemniscatus*. Both syntypes that served Linnaeus (1758) to describe *Coluber lemniscatus* are still present in the Naturhistoriska Riksmuseet, Stockholm, (NRS L-93 and L-94) from Asia (locality error). I designate herewith NRS L-93, the largest and better preserved male, as lectotype. It is 675 mm in total length, 57 mm in tail length, and it has 239 ventrals, 36 pairs of subcaudals, and 12 + 1 $\frac{2}{3}$ black triads on body and tail. NRS L-94, a male, with a total length of 500 mm, and 41 mm of tail length, becomes paralectotype. It has 242 ventrals, 37 subcaudals, and 15 + 1 $\frac{2}{3}$ black triads on body and tail.

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