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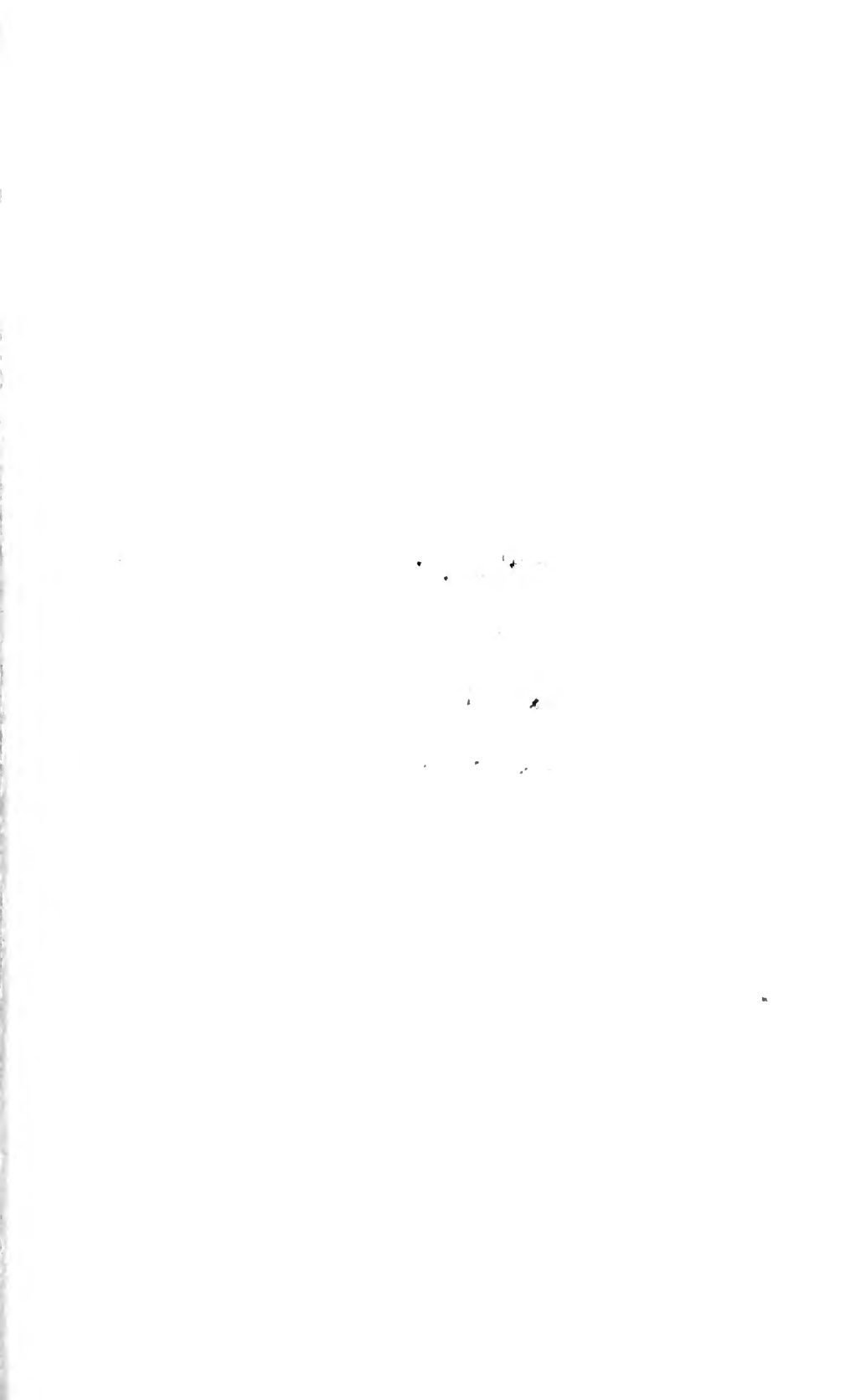
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THE VENOMOUS CORAL SNAKES OF TRINIDAD

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An active program of zoological and medical research in Trinidad, British West Indies, on the part of various government agencies, especially the Trinidad Regional Virus Laboratory and the Royal Victoria Institute Museum, lends interest and importance to the correct identification of the coral snakes of the genus *Micrurus* of that island. Two species, under the names *Elaps corallinus* and *Elaps marcgravi*, were recorded from Trinidad by G. A. Boulenger (1896). The same forms, under the same names, appeared in Mole's paper on the snakes of Trinidad (1924). More recent lists of South American coral snakes name *Micrurus lemniscatus* as from Trinidad, without making it clear that all of the supposed specimens of *marcgravi* were re-identified as *lemniscatus* (Schmidt, 1936, and Amaral, 1944). Thus there has remained a question as to whether there were two or three species of venomous coral snakes in Trinidad, and Mr. Arthur Greenhall, Director of the Royal Victoria Institute Museum, has asked me to examine this question. In order to further my study he has forwarded the collections of coral snakes accumulated in Trinidad institutions. For the privilege of examining this material I am much indebted to Mr. Greenhall and to Drs. Thomas H. G. Aitken and Wilbur G. Downs, to whom, with other Trinidad residents, Chicago Natural History Museum is already obliged for the cordial aid supplied to Mr. Colin Campbell Sanborn, formerly Curator, Division of Mammals, during his 1954 visit to Trinidad for a survey of the bats of the island. Some further specimens of reptiles from Trinidad were received by Chicago Natural History Museum in 1947 in collections made by Mr. Frank C. Wonder, formerly Staff Taxidermist, in the course of field work mainly focused on the collecting of mammals.

*Deceased September 26, 1957.

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Thanks to the John Simon Guggenheim Memorial Foundation, I was able to examine the coral snakes in the principal European museums in 1932, including the specimens from Trinidad identified as *marcgravi* and *corallinus* by Boulenger. It then became evident that the Trinidad specimens of the latter are to be referred to *circinalis* Duméril and Bibron, and that the Trinidad specimens thought to represent *marcgravi* are in fact quite distinct from the true *marcgravi* (= *ibiboboca*) of northeastern Brazil. The latter species, from the dry scrub savanna of northeastern Brazil, has fewer ventrals (average 225 in forty-two specimens of both sexes) and a distinctively shorter tail (19–30 caudals, with little sexual difference) than *lemniscatus* proper. I have not followed Amaral (1944) in referring *marcgravi* to subspecific status under the broad species *lemniscatus* because true *lemniscatus* appears to be represented in northeastern Brazil, within the range of true *marcgravi*.

The reason for the earlier assignment of the Trinidad *lemniscatus* to the Brazilian *marcgravi* lay in the fact that among the variable populations of *lemniscatus*, which range through the vast area of the Amazon Basin and much adjacent territory, it is the Trinidad population that approaches *marcgravi* in ventral count; Trinidad specimens, however, agree with other *lemniscatus* in the number of caudals. The Trinidad population is evidently recognizable as a subspecies of *lemniscatus*, and it is found also in certain adjacent areas of Venezuela. When Dr. Leslie Burger asked my opinion and advice regarding the identification of his Venezuelan material, after his return from collecting in that country, it became evident that he had specimens of the form known to me from European collections, and I turned over to him my notes, with the suggestion that he describe the new subspecies. This he has now done, under the name *Micrurus lemniscatus diutius* (Burger, 1955).

The smaller and more primitive coral snake of Trinidad, with simple instead of triad arrangement of the black rings, was recorded as *Micrurus corallinus*, and so listed by Mole in 1924. Amaral has long since pointed out that the Trinidad form is distinct from the southeast Brazilian *corallinus*, recording it as *M. corallinus riisei*. The name *riisei* Jan, however, is a strict synonym of the prior *circinalis* Duméril, Bibron, and Duméril (see Amaral, 1925).

In view of the fact that no less than ten species of coral snakes are recorded from Venezuela (Roze, 1955), it is remarkable that only two species of *Micrurus* should be known from Trinidad. It seems clear that this is the fact, though accidental specimens of other species might well be expected.

MATERIAL EXAMINED

Micrurus circinalis Duméril, Bibron, and Duméril

No data: Brit. Mus. (Nat. Hist.), 2 specimens, no number; Acad. Nat. Sci. Phila. 6795, 6796.

WEST INDIES: (no other data or data erroneous), Brit. Mus. (Nat. Hist.), 1 specimen, no number; Mus. Hist. Nat. Paris 4606 (cotype of *Elaps circinalis*). St. Vincent, Brit. Mus. (Nat. Hist.), 1 specimen, no number. Martinique, Mus. Hist. Nat. Paris 4607 (cotype of *Elaps circinalis*).

TRINIDAD: (no other data), Brit. Mus. (Nat. Hist.), 7 specimens, no numbers, 1897-7-23-75, 1897-7-23-76, 1923-10-12-6, 1940-2-2-9; Mus. Hist. Nat. Paris 4601; Senck. Nat. Mus., 5 specimens, 9420; Basel Nat. Hist. Mus. 8627, 8657, 8992; Mus. Comp. Zool. 6123, 6123a; R. Victoria Inst. Mus. 113. Tucker Valley, Amer. Mus. Nat. Hist. 64544. Port of Spain, R. Victoria Inst. Mus. 101; Chicago Nat. Hist. Mus. 75952-75954, 75956, 75958-75960, 77895-77896. San Rafael, Chicago Nat. Hist. Mus. 49962-49964. San Juan, Chicago Nat. Hist. Mus. 75955. Mt. St. Benedict, St. George Co., Carnegie Mus. 6544. Maracas Valley, Chicago Nat. Hist. Mus. 75951. Diego Martin, R. Victoria Inst. Mus. 107, 115.

VENEZUELA: (no other data), Acad. Nat. Sci. Phila. 6790-6791. San Rafael, near Cumanacoa, Carnegie Mus. 7832. Cumanacoa, Mus. Comp. Zool. 9996.

Micrurus lemniscatus Linnaeus

TRINIDAD: (no other data), Brit. Mus. (Nat. Hist.) a-b; Mus. Hist. Nat. Paris 4639, 4643; Amer. Mus. Nat. Hist. 2256, 5291, 56154; R. Victoria Inst. Mus. 109; Acad. Nat. Sci. Phila. 9764; Senck. Nat. Mus. 9428d; Basel Nat. Hist. Mus. 8625, 8626, 9459; Port of Spain, Mus. Comp. Zool. 6122, 6755; R. Victoria Inst. Mus. 108, 111; Chicago Nat. Hist. Mus. 75950; Aripo Savanna, Munich Zool. Mus. 1909/194; Cedros, Chicago Nat. Hist. Mus. 77898; Guayaguayare, Basel Nat. Hist. Mus. 11361; Teteron Bay, Amer. Mus. Nat. Hist. 64487; Diego Martin, R. Victoria Inst. Mus. 103, 104, 106; Chicago Nat. Hist. Mus. 75949; Sangre Grande, Chicago Nat. Hist. Mus. 75957, 77897; R. Victoria Inst. Mus. 100; Tunapuna, Chicago Nat. Hist. Mus. 34472 (type of *Micrurus lemniscatus diutius* Burger); Centeno, R. Victoria Inst. Mus. 102; Waller Field, Agua Santa, R. Victoria Inst. Mus., 110.

VENEZUELA: Cumanacoa, Carnegie Mus. 1925.

The venomous *Micrurus* can readily be distinguished from the non-venomous snakes of Trinidad, that also have a pattern of black, red, and yellow rings, by the fact that the black rings of the harmless *Erythrolamprus* are in pairs, never in threes or single, as in *Micrurus*; and by the presence of a loreal shield on the side of the head, which does not seem to be present in any species of *Micrurus*, even as an anomaly. In dead and in preserved specimens, the well-developed anterior fangs afford ready distinction of the venomous from the non-venomous forms.

Micrurus lemniscatus ranges over northern tropical South America, without reaching northern Colombia, the trans-Andine region, or the Magdalena basin. Its partition into subspecies, following Amaral's classification of 1944, requires critical study, and this is reserved for a future report on the material that has passed through my hands. This, though relatively large, is still inadequate

in important regions. The Trinidad population is distinguished as *Micrurus lemniscatus diutius* Burger.



FIG. 7. Head pattern of *Micrurus circinalis*.



FIG. 8. Head pattern of *Micrurus lemniscatus*.

The two species of *Micrurus* in Trinidad may be distinguished as follows:

1. Black rings single, all bordered by a narrow yellow ring, these separated by a broad red ring; top of head black (fig. 7).....*Micrurus circinalis*
Trinidad and adjacent Venezuela.
2. Black rings in groups of three (i.e. in "triads"); the middle ring of each triad wider than the outer ones and separated from them by wide yellow rings; the triads separated by still wider red rings; top of head with a narrow light band across the snout, a broad black band over the eyes, and a broad yellow band behind it (fig. 8).....*Micrurus lemniscatus*
Trinidad and northern South America.

Micrurus circinalis Duméril, Bibron, and Duméril

Elaps circinalis Duméril, Bibron, and Duméril, 1854, *Erpét. Gén.*, 7: 1210
—Martinique (in error).

Micrurus circinalis Schmidt, 1936, *Field Mus. Nat. Hist., Zool. Ser.*, 20: 192.

Elaps riisei Jan, 1858, Rev. Mag. Zool., 1858: 525, pl. B—St. Thomas, Lesser Antilles (in error); Mole and Ulrich, 1894, Proc. Zool. Soc. London, 1894: 513.

Micrurus corallinus riisei Amaral, 1925, Rev. Mus. Paulista, 15: 24; 1925, Proc. U. S. Nat. Mus., 67, art. 24, p. 24; 1929, Mem. Inst. Butantan, 4: 229.

Micrurus psyches riesii Amaral, 1931, Bull. Antiv. Inst. Amer., 4: 89.

Elaps bocourti Jan and Sordelli, 1872, Icon. Gén. Ophidiens, 42: pl. 6, fig. 2—type locality unknown.

Elaps corallinus Günther, 1858, Cat. Col. Snakes Brit. Mus., p. 233 (part); Boulenger, 1896, Cat. Snakes Brit. Mus., 3: 420 (part).

Diagnosis.—A coral snake with simple (non-triad) black annuli; with top of head black, without crossbands; with low ventral count, 180–193 in males and 194–209 in females; a high number of caudals, 43–50 in males and 31–35 in females; no supra-anal tubercles or keels in adult males; a high number of black annuli on body, 22–30 in males and 24–31 in females; head shields uniformly of the normal coral snake arrangement, with seven upper and seven lower labials on each side; oculars without exception one anterior and two posterior; temporals with a strong tendency to fusion of the anterior temporal with the sixth upper labial on one or both sides; temporals 1–1 in 26, 1/0–1 in five, 0–1 in 13, and 1–0/1 in one, 1–1/2 in one.

The tail length in males, in fifteen specimens, varies from 0.13 to 0.17 of the total, average 0.15; in eleven females the ratio is 0.08 to 0.10, average 0.09.

Annuli on tail 8–12 in males, 5–8 in females; black annuli narrow, on 2 to 2½ dorsal scales and about 2 ventrals; red annuli about six ventrals wide; yellow annuli mostly ½ dorsal scale in width, not distinguishable ventrally in preserved specimens; dorsal scales and ventrals of red annuli heavily and uniformly black spotted; caudal annuli apparently separated by yellow annuli (white in preserved material) 2 to 3 scales wide, each with an irregular narrow black annulus at its middle dorsally, less developed beneath; black of head extending back on the parietals to meet the first (nuchal) black ring; a light band extending downward from the border of the parietal on each side, crossing the second temporal and the post-temporal, the sixth and seventh upper labials, and the fifth, sixth, and seventh lower labials on each side, and meeting beneath in mottling of the posterior chin-shields and the first ventral.

Maximum length of males 504 mm., of females 537 mm. Smallest specimen examined in each sex 180 mm.

The scale counts and number of black rings in the six specimens examined from Venezuela (three males and three females) coincide

almost exactly with the means of the Trinidad series. They agree in details of coloration and clearly do not represent a population that is likely to prove to be subspecifically definable.

In no. 75955, measuring 455 mm., there are five eggs measuring 20 to 23 mm. in length, 6 mm. in diameter. One specimen (no. 77895, collected in Port of Spain by A. M. Greenhall) is strongly melanistic.

The British Museum specimen labeled St. Vincent has the rostral, internasals, and prefrontals fused into a single shield, with the suture between the prefrontals remaining. In a Trinidad specimen in the British Museum the third and fourth upper labials are partly fused on the left side and united with the preocular. Twenty-four specimens out of forty-three have from 1 to 13 caudals undivided.

Study of the ecological distribution in Trinidad requires the attention of local naturalists.

The question as to the relation between *circinalis* and *corallinus* is an open one. *Micrurus corallinus* is one of the most abundant of coral snakes in numbers of individuals; I am unable to discern any distinct geographic variation in its wide latitudinal range from Espiritu Santo to Rio Grande do Sul. From the interior of Brazil only a few scattered records are available and nothing can be said as yet as to the western populations. It is very clear, however, that *corallinus* does not occur at all in the Amazonian forest, and somewhat surprisingly, it is not known from northeastern Brazil or from the savanna corridor. Thus the disjunction between the ranges of *circinalis* and *corallinus* is of the order of three thousand kilometers, and of two major ecological habitats. It is not likely that the derivation of one from the other, or their divergence from a common ancestor, could have been recent. The pattern of coral snake differentiation and distribution as a whole seems to be definitely pre-Tertiary for the earliest types, Tertiary for the existing species, and post-Tertiary only for the very latest subspecific differentiations.

Micrurus lemniscatus Linnaeus¹

Coluber lemniscatus Linnaeus, 1758, Syst. Nat., 1: 224—"Habitat in Asia" (in error; restricted to Santarem, Pará, Brazil).

Elaps lemniscatus Schneider, 1801, Hist. Amphib., 2: 291.

Micrurus lemniscatus Beebe, 1919, Zoologica, 2: 216.

¹Synonymy limited to references to Trinidad specimens.

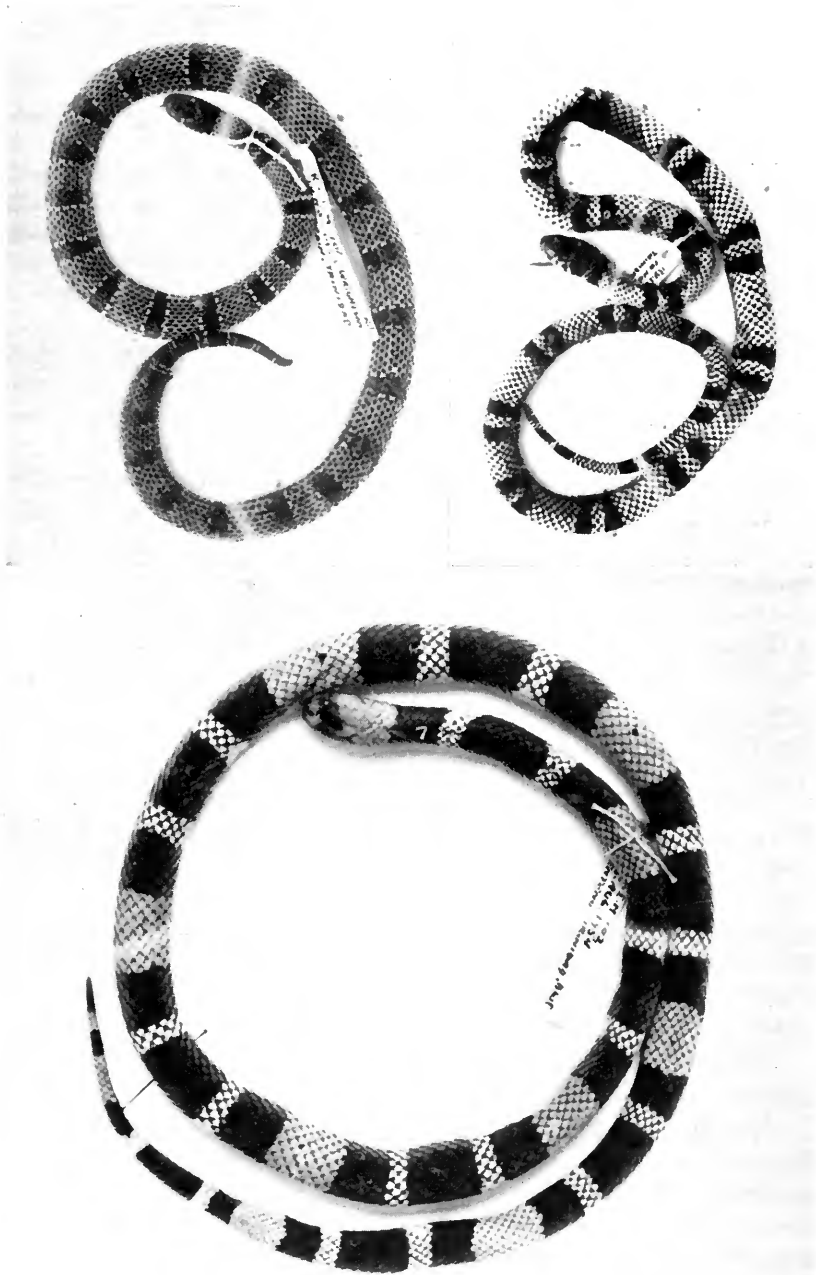


FIG. 9. Upper left, *Micrurus circinalis*; upper right, *Erythrolamprus aesculapi* (harmless, rear-fanged false coral snake); lower, *Micrurus lemniscatus diutius*.

Micrurus lemniscatus diutius Burger

Micrurus lemniscatus diutius Burger, 1955, Bol. Mus. Cienc. Nat. Venezuela, 1, no. 2, p. 40—Tunapuna, Trinidad.

Elaps lemniscatus Günther, 1858, Cat. Col. Snakes Brit. Mus., p. 234 (part); Mole and Urich, 1894, Proc. Zool. Soc. London, 1894: 514.

Elaps marcgravi Boulenger, 1896, Cat. Snakes Brit. Mus., 3: 428 (part); Boettger, 1898, Kat. Rept. Samml. Mus. Senck., 2: 126; Werner, 1900, Verh. Zool. Bot. Ges. Wien, 50: 271; Mole, 1924, Proc. Zool. Soc. London, 1924: 258; Roux, 1926, Rev. Suisse Zool., 33: 292.

Diagnosis.—A coral snake of the genus *Micrurus* with the black annuli in triads, the first of which is complete, the nuchal black ring being the first ring of a triad, with a red band separating the nuchal ring from a black band across the eyes, anterior to which there is a narrow yellow band crossing the prefrontals; ventrals in males 219–226, average 223, in females 226–242, average 235; caudals in males 34–38, average 36, in females 32–39, average 34; triads of black rings, in both sexes, 8–11 on the body, 1 to 2 (usually $1\frac{2}{3}$) on the tail. The composition of a triad, counting the ventrals in each annulus, is as follows in two typical specimens (the fifth triad):

	Red	Black	Yellow	Black	Yellow	Black	Red
CNHM 75957.....	4	4	2	8	3	4	5
Basel 8626.....	8	3	2	5	2	3	8

The three largest male specimens measure 1056, 1060, and 1067 mm., the three largest females only 990, 682, and 736 mm. The tail length in males varies from 0.08 to 0.10 of the total, and in females from 0.07 to 0.09.

Scale anomalies are relatively few. In CNHM no. 75957 the upper labials are six on each side, by fusion of the fourth and fifth. Basel no. 9459 has the anterior temporal on each side almost completely fused with the sixth labial.

The stomachs of Basel no. 11361 and CNHM no. 75957 each contained an eel-like fish of the genus *Symbranchus*.

It will be difficult to maintain any definite arrangement of *Micrurus lemniscatus* (as treated here) into subspecies on the basis of geographic variation in ventral counts. The specimens that agree most closely in low ventral count with *diutius* appear, in small minority, in the Guiana region, Bolivia, and the Amazon Basin. Specimens from the interior of the Guianas and from the Venezuelan-Brazilian border tend to have low scale counts. The highest averages of scale counts appear in Colombia and Mato Grosso. If all of the available material could be examined together, it is to be expected

that other characteristics would be found to reinforce the differences in ventral counts. In general, from the study of the series of 152 specimens thus far examined, it is reasonable to distinguish the Trinidad and Cumanacoa populations as *diutius*. The satisfactory allocation of the specimens with anomalously low ventral counts from the Guianas and the Amazon Basin will require much further study, and, I fear, much more material. The study of the collections available does not as yet indicate that *marcgravi* and *frontalis*, though they are clearly related forms, should be regarded as subspecies of *lemniscatus*.

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