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## THE SURINAM CORAL SNAKE

*Micrurus surinamensis*

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When I discovered, some fifteen years ago, that the collections of Dr. Harvey Bassler, Research Associate in Herpetology in the American Museum of Natural History, were, as to several species of coral snakes, about as extensive as the collections in all the museums of the world combined, I laid aside my studies on the genus *Micrurus* and its relatives to await the inclusion of this material. It was hoped that Dr. Bassler would report on these collections himself, but with his death in 1949 this hope has failed. The collections in question have now been made available to me through the courtesy of my friend Mr. Charles M. Bogert, and I am thus stimulated to renew an interest of long standing. My examination of coral snakes in European collections was made possible by my travels as Fellow of the John Simon Guggenheim Memorial Foundation in 1932. For a recent loan of coral snakes, called to my attention by Mr. James A. Peters, I am indebted to Dr. Norman Hartweg, of the Museum of Zoology of the University of Michigan. Important new Peruvian material has also reached Chicago Natural History Museum, thanks to the collecting in the southeastern part of the country by my friend and colleague, Mr. Colin Campbell Sanborn, and by our protegé, Celestino Kalinowski. We are especially indebted to Dr. Robert Mertens, Director of the Senckenberg Naturmuseum, who forwarded a specimen to be named the type of a distinct new subspecies of the Surinam coral snake, together with a second specimen retained by Chicago Natural History Museum as a paratype.

The coral snake described by Cuvier as *Elaps surinamensis* is one of the most sharply defined of the species retained in the genus *Micrurus* after elimination of *Micruroides euryxanthus* and *Leptomicrourus narducci* and *collaris*. *Micrurus surinamensis* is in fact so

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easily recognizable that not a single synonymic name has been proposed for it. This species differs from all others in the genus in having a relatively narrow frontal shield, apparently in association with depressed and wide head form, and in having the head shields light in color, uniformly outlined with black. The total number of specimens discoverable in the museums of the world amounts to only fifty-three (of which I have examined fifty-one); no less than nineteen of these are in the Bassler Collection from Amazonian Peru.

### *Micrurus surinamensis* Cuvier

*Elaps Surinamensis* Cuvier, 1817, *Regne Animal*, ed. 1, 2: 84—Surinam [by implication].

*Micrurus surinamensis* Beebe, 1919, *Zoologica*, 2: 216.

#### MATERIAL EXAMINED

**SURINAM** (Dutch Guiana): Mus. Hist. Nat. Paris no. 4629 (lectotype) and one specimen without number; Acad. Nat. Sci. Phila. no. 6809.

**CAYENNE** (French Guiana): Mus. Hist. Nat. Paris no. 4627.

**BRITISH GUIANA**: Brit. Mus. (Nat. Hist.), one specimen without number; Demerara River, one specimen without number. Dunoon, Demerara River, Univ. Mich. Mus. Zool. no. 53922.

**THE GUIANAS** ("Guyana"): Munich no. 26/1920.

**BRAZIL**: Pará, Belém, Brit. Mus. (Nat. Hist.), one specimen without number, and Munich no. 156/1911; on the Anama, near Belém, Munich no. 155/1911. Amazonas, Juma River, Amer. Mus. Nat. Hist. no. 8593; Alto Rio Negro, Fronteira de Cucus, Mus. Nac. Rio no. 420; Marabitanos, Naturh. Mus. Wien, one specimen without number. Mato Grosso (Comissão Rondon), Chicago Nat. Hist. Mus. no. 48409 (Rio 232), and Univ. Mich. Mus. Zool. no. 57706.

**BOLIVIA**: Buenavista, Brit. Mus. (Nat. Hist.) no. 27-8-1-218; Santa Cruz de la Sierra, Carnegie Mus. no. 2795.

**PERU**: Acad. Nat. Sci. Phila. no. 11301; Univ. Arequipa no. 131; Mus. Comp. Zool. no. 12422. Iquitos, Amer. Mus. Nat. Hist. nos. 52205, 52665, 53113, 53487, 53690, 53699, 53824, 54426, 54538, 54889, 56030. Payarote, Rio Amazonas, Amer. Mus. Nat. Hist. no. 52273, 52557. Achinamasa, below Chusuta, Rio Huallaga, no. 52758. Contamana, Rio Ucayali, Amer. Mus. Nat. Hist. nos. 53566, 54583. Rio Pisqui, Rio Ucayali, Amer. Mus. Nat. Hist. no. 52490. Pampa Hermosa, Rio Caxabatay, Rio Ucayali, Amer. Mus. Nat. Hist. no. 55420. Monte Carmelo Requeña, near Isla Cedro, Rio Ucayali, Amer. Mus. Nat. Hist. no. 55543. Monte Alegre, Pachitea, Amer. Mus. Nat. Hist. no. 52773. Upper Ucayali, Amer. Mus. Nat. Hist. no. 71134. Marcapata, Chicago Nat. Hist. Mus. no. 59180.

**ECUADOR**: Rio Pastaza, 500 meters alt., Univ. Mich. Mus. Zool. nos. 84105, 88919-20. Anga Cocha, Rio Bobonaza, Amer. Mus. Nat. Hist. no. 49055.

**COLOMBIA**: Puerto Boy, Rio Caquetá, Inst. LaSalle, one specimen without number; Villeta, Brit. Mus. (Nat. Hist.), one specimen without number.

**VENEZUELA**: Between Guaramoca and San Fernando, upper Orinoco, Senck. Nat. Mus. no. 20708, and Chicago Nat. Hist. Mus. no. 65163.

I have taken two records from the literature, for Villavicencio, Colombia (Amaral, 1932) and for Mato Grosso (Amaral, 1925).

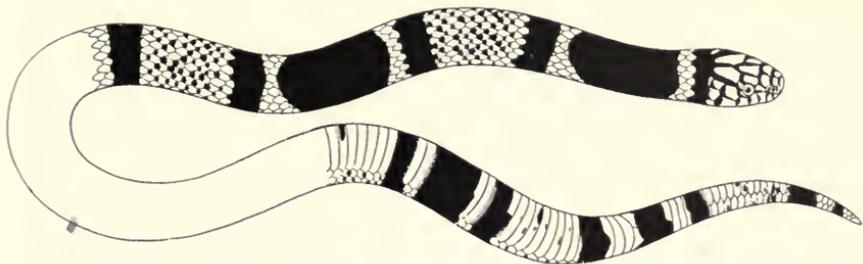


FIG. 4. Color pattern of *Micrurus surinamensis*. From Jan, Icon. Gén. Ophid., Livr. 42, pl. 3, fig. 1.

The four specimens from the upper Rio Negro and upper Orinoco regions, where there is otherwise a wide gap in the distribution of the species, fall so completely outside the range of variation of the remaining series that they clearly represent a distinct undescribed form, which may be named:

***Micrurus surinamensis nattereri* subsp. nov.**

*Type*.—Senckenberg Museum no. 20708, a female, from between Guaramoca and San Fernando, Venezuela, collected by G. Hübner, 1895.

*Diagnosis*.—A coral snake of the genus *Micrurus* with the black rings in triads, the first triad complete and beginning just behind the parietals; head red, the shields with black borders on their posterior margins; frontal shield narrow, no wider posteriorly than the supraoculars; ventrals 186–193 in males, 197–206 in females.

*Description of type*.—A coral snake with somewhat depressed head; rostral visible from above; two internasals, two prefrontals, two supraoculars, a single relatively narrow frontal, and two parietals; two nasals, no loreal, one preocular, two postoculars, and temporals 1–2 on each side; seven upper and seven lower labials on each side; scale rows at the first widened ventral (the fifth scale from the chin shields) 19, dropping to 17 at the sixth widened ventral by fusion of the third and fourth scale rows, and dropping by fusion of the same (renumbered) scale rows at the twelfth ventral to the normal coral snake dorsal scale count of 15; a median nuchal scale behind the parietals apparently formed by the fusion of three dorsals; ventrals 206, anal divided; caudals 38, all divided.

Head red, the head shields almost all with a narrow black border posteriorly; black rings in triads, consisting of a central wide black ring separated from the narrow one on each side by narrow yellow

zones and the triads separated by broad red rings; the first triad complete, the first narrow black ring one scale row behind the parietals; composition of a triad at midbody ventrally:

Red	Black	Yellow	Black	Yellow	Black	Red
10	2	3	5	3	2	8

Eight and one-third triads on the body, two-thirds plus one on the tail; red zones with black spots mostly at the tips of the scales, occasionally covering an entire scale; red zones mostly with a single black ventral spot.

*Measurements of type.*—Total length 460 mm., tail 51 mm.

*Notes on paratypes.*—A second female specimen in the Senckenberg Museum, no. 20709, with the same locality data as the type, is presumably from the same collector; it is credited in the Senckenberg Museum records as from O. Boettger, 1905. It has 197 ventrals, an undivided anal plate, and 38 caudals, of which the second and third are entire; and there are only  $6\frac{1}{3}$  triads of black rings on the body. This specimen has been acquired by exchange by Chicago Natural History Museum, and is now our no. 65163. With these specimens I associate a male in the Museum of Natural History of Vienna, collected at Marabitanos, Amazonas, on the upper Rio Negro, by the well-known ornithologist and zoological collector Johann Natterer; and a fourth specimen, also a male, no. 420 in the National Museum of Rio de Janeiro, collected by Colonel Lako on the Alto Rio Negro, "Fronteira de Cucus," Amazonas. These two males have, respectively, 186 ventrals and 39 caudals, and 193 ventrals and 40 caudals. In the Vienna specimen the temporals are 1-1 on each side, but in the other specimens the temporals are 1-2 as in the type. Both males have the triads on body and tail  $6\frac{1}{3} + \frac{2}{3}1$ .

\* *Comparisons.*—While the four specimens at hand are plainly referable to *Micrurus surinamensis*, there is a wide gap between their scale counts and those of typical *surinamensis* from the Guianas, nor is there any overlap with the larger series of the typical subspecies known from the upper Amazon region in Colombia, Ecuador, and Peru.

The range of variation in these respects in the two subspecies is as follows:

	No. of specimens	<i>s. surinamensis</i>	No. of specimens	<i>s. nattereri</i>
Ventrals ♂	25	162-174	2	186-193
Ventrals ♀	19	173-187	2	197-206
Caudals ♂	22	31-37	2	39-40
Caudals ♀	16	30-34	2	38

It is to be noted that while the gap in caudal counts is small, it remains distinctive even with the large series of the typical subspecies now available.

The only remotely plausible suggestion I can make as to the origin of *Micrurus surinamensis nattereri* is that its isolation may somehow have been related to the Guiana Highland and its outlying mountains, such as Mount Duida. Until the range of this form is better known (and perhaps that of the more widespread *surinamensis surinamensis* as well), it seems useless to speculate even as to which is the more primitive and which the derived form.

### *Micrurus surinamensis surinamensis* Cuvier

*Elaps Surinamensis* Cuvier, 1817, *Regne Animal*, ed. 1, 2: 84—Surinam [by implication]; Wagler, 1830, *Syst. Amphib.*, p. 193; Schlegel, 1837, *Physion. Serp.*, 2: 445, and atlas, pl. 16, figs. 8–9; idem, 1844, *Abbild. Amphib.*, p. 137, and atlas, pl. 46, fig. 9; Duméril and Bibron, 1854, *Erpét. Gén.*, 7: 1224; Günther, 1858, *Cat. Col. Snakes Brit. Mus.*, p. 234; Jan, 1872, *Icon. Gén.*, *Livr. 42*: pl. 3, fig. 1; Cope, 1876, *Journ. Acad. Nat. Sci. Phila.*, (2), 8: 182; idem, 1886, *Proc. Amer. Soc.*, 23: 95; Boulenger, 1896, *Cat. Snakes Brit. Mus.*, 3: 414; Boettger, 1898, *Kat. Rept. Senck. Ges.*, II Teil (Schlangen), p. 125; Cope, 1899, *Phila. Mus. Sci. Bull.*, 1: 20; Quelch, 1899, *Ann. Mag. Nat. Hist.*, (7), 3: 407; Gomes, 1918, *Mem. Inst. Butantan*, 1: 76.

*Micrurus surinamensis* Beebe, 1919, *Zoologica*, 2: 216; Amaral, 1925, *Comm. Linhas Telegr. Estrat. Matto Grosso Amazonas*, 84, *Annexo 5*: 26; idem, 1925, *Proc. U. S. Nat. Mus.*, 67, *Art. 24*: 17; idem, 1929, *Mem. Inst. Butantan*, 4: 112, 232; idem, 1932, *Mem. Inst. Butantan*, 7: 122; Schmidt, 1936, *Field Mus. Nat. Hist.*, *Zool. Ser.*, 20: 197; Maria, 1942, *Rev. Acad. Sci. Col.*, 5, no. 17: 100; Dunn, 1945, *Caldasia*, 3: 212.

*Notes on types.*—Although Cuvier's original description consists only of the reference to Seba's figures (*Locupletissimi . . .*, 1735, vol. 2, pl. 86, fig. 1, here reproduced; and pl. 6, fig. 2), the two specimens in the *Museum National d'Histoire Naturelle* in Paris are thought by Duméril and Bibron to have been named and labelled by Cuvier and are to be regarded as cotypes. Duméril and Bibron, indeed, indicate that these specimens may have served as the originals of the Seba figures.

The two cotypes are from Surinam, the male specimen, no. 4629, being without indication of the collector, whereas the smaller female specimen (without number) is from the collections of Levaillant. The larger of these specimens, no. 4629, may be designated as the type.



FIG. 5. Illustration from Seba (*Locupletissimi . . .*, vol. 2, pl. 86), on which Cuvier based the description of *Elaps Surinamensis*.

The significant data for these specimens are as follows:

Paris Mus.	Dorsals	Ventrals	Caudals	Triads of black rings	Measurements Total length	Tail
No. 4629 ♂ . . .	17-15-15	174	37	6½+½1	869	114
No number ♀ .	17-15-15	180	32	8½+½1	...	...

*Diagnosis.*—A large coral snake of the genus *Micrurus* with a pattern of red, yellow, and black rings; with a stocky body and a low number of ventrals and caudals; head widened, its shields characterized by the small and narrow frontal; scale rows on neck 17, reducing to 15 by fusion of second and third scale rows at about the tenth widened ventral; head red, the shields bordered posteriorly with black; black rings on body in triads, the triads separated by broad red zones, and each triad consisting of a wide black ring between two narrow yellow rings, which are bordered in turn by narrow black rings adjacent to the red zones; the first triad invariably complete, the last usually only two-thirds complete at the anus; anal plate divided; in the largest males from one to three tuberculate

scales at the sides of the anus; ventrals 162-174 in males, 173-187 in females; caudals 31-37 in males, 30-34 in females.

*Variation and habits.*—The extremes of variation in number of triads of black rings on the body are  $5\frac{2}{3}$  to  $8\frac{1}{3}$ , or, for body plus tail, 7 to 10. The average number of triads on the body is greater in females than in males, the distribution being as follows:

Number of triads on body.....	5	6	7	8
Number of specimens, males....	2	19	4	0
Number of specimens, females..	0	8	8	3

The widths of the rings composing a typical triad, in numbers of ventrals, and at midbody, in C.N.H.M. no. 59180 (by way of example), are:

Red	Black	Yellow	Black	Yellow	Black	Red
10	2	3	5	3	2	9

The yellow rings are normally much narrowed above, the narrow black rings correspondingly a little widened and the central black ring much widened. The scales of the red zones, on the posterior half of each scale, are heavily marked with black, those of the yellow zones somewhat less so.

The postoculars, normally two, may be fused or divided; a single postocular appears symmetrically in three specimens, and one specimen has three postoculars on the right side. The temporals are normally 1-1 on each side, 1-2 symmetrically in ten specimens, and 1-1 on one side, 1-2 on the other in ten; a single specimen has the temporals 1-2 on the left side, 1-3 on the right. Variation in the number of upper labials is extremely rare—the count of 6-7 occurs once, 7-7 forty-one times, 7-8 three times, and 8-8 once. Lower labials are still more uniformly 7-7, with only a single specimen that deviates in this respect with 7 on the left and 8 on the right side.

*Micrurus surinamensis* is one of the largest species of the genus, with a maximum known length of 1105 mm., in a specimen from Peru.<sup>1</sup> Eight specimens, five females and three males, exceed 900 mm. in total length. The body is proportionately stocky, and the heavy body appears to be associated with an unusually large number of eggs; I find eleven eggs in a specimen from Peru in the Bassler collection. These measure about  $20 \times 40$  mm.

<sup>1</sup> I am unable to verify the record length of "un metro ochenta" given by Dunn (1944, p. 212). I believe that it must mean "un metro ochenta mm."

The only clue to the food of this species, perhaps a significant one, is supplied by one of Dr. Bassler's specimens from Iquitos. In its stomach was a small eel, *Synbranchus marmoratus*.

*Geographic variation.*—The material at hand or already examined is still far from adequate for a definitive analysis of geographic variation within the typical subspecies.

The geographic distribution of the forty-seven specimens examined by myself, with two additional records from the literature, is as follows:

	No. of specimens
The Guianas.....	8
Pará (Lower Amazon).....	3
Amazonas (Middle Amazon, Juma River).....	1
Peru (Amazonian drainage).....	23
Ecuador.....	4
Colombia.....	3
Bolivia.....	2
Mato Grosso.....	3

The geographic variation in this series is of an entirely different order than that between the series as a whole and the subspecies *nattereri*. It is evident that the material from Bolivia and Mato Grosso affords no more than a clue to the fact that the populations at the southern border of the range are not especially distinct. The three specimens known from Mato Grosso are without definite locality. I tentatively assume them to be from the Amazon drainage in the northeastern part of the state.

Much the most distinct of these series of populations is that obtained by lumping together the eight specimens from the three Guianas; in these, though the range of variation is included within that of the Peruvian series, the average of both ventrals and caudals is higher:

	No. of specimens	Guianas	No. of specimens	Upper Amazon Region
Ventrals ♂.....	5	170-174 (av. 172)	19	162-174 (av. 167)
Ventrals ♀.....	3	179-182 (av. 180)	13	175-187 (av. 180)
Caudals ♂.....	5	36-37 (av. 37)	16	31-37 (av. 34)
Caudals ♀.....	3	32-33 (av. 32)	11	30-34 (av. 31)

The distribution of the fifty-three known specimens of the two subspecies, when plotted on a map, is seen to be peripheral to the Amazon Basin. From the interior of the Amazonian region only a single specimen is reported, collected by A. G. Jenkins at Juma River, Amazonas (A.M.N.H. no. 8593); this locality appears to me

to require confirmation, for in a hundred years of collecting no other specimen has been taken in the vast interior lowland. It is remarkable that *Micrurus surinamensis nattereri* should be so widely separated from the nearest known populations of *surinamensis surinamensis*. This leaves the range of the species in the Guianas well isolated from that in the eastern slopes of the Andes and the

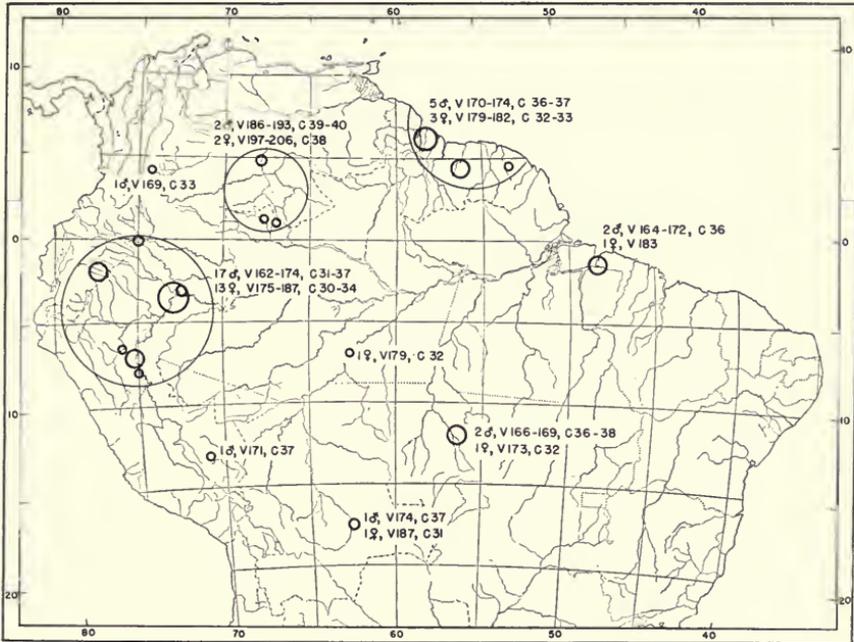


FIG. 6. Distribution and variation of the species *Micrurus surinamensis*. The numbers of specimens from the area or locality marked by the centers of the smaller circles are roughly proportional to the areas of the circles.

upper Amazon region, and from the Brazilian and Bolivian localities; but as the variation of the Guiana series is included within that of the larger Peruvian collection, I believe that the present state of our knowledge is best reflected by the recognition of only two forms. The species appears to be rare in the southern part of its range, for there are only two specimens in the Steinbach material from Bolivia, the collecting of which extended over at least thirty years, and there are only three specimens known from Mato Grosso.

That the general pattern of distribution of *surinamensis* can scarcely be an accident of collecting is shown by the relative abundance of *Micrurus spixi* in the middle and lower Amazon regions.

One might legitimately speculate that the larger form, *spixi*, with a continuous distribution through the Amazon drainage, has been an effective competitor of *surinamensis* in this area. The ranges of the two species have a broad overlap in the headwaters of the Amazon tributaries; but more exact field observation might well discover ecological differences in habits or in habitat that would explain their occurrence together. The supposition of ecological incompatibility of *Micrurus spixi* and *M. surinamensis* does not invalidate the further hypothesis that the present range of *surinamensis* may have become established at a time when the Amazon Basin was an inland sea. It is my belief that elapid snakes reached South America in the Late Mesozoic or Early Tertiary via the connection of the continent with North America; that the stock spread and diverged into species very rapidly; and that the more distinct species reflect that early speciation.

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