

# MORPHOLOGICAL VARIATION IN THE ENDEMIC COLOMBIAN WATER SNAKE, *Helicops danieli* AMARAL, 1937 (SERPENTES: XENODONTIDAE)

por

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## Resumen

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Variación en el patrón de coloración, así mismo de caracteres merísticos y mensurales, se basa en el estudio de 45 ejemplares de esta culebra acuática endémica en Colombia y previamente poca conocida.

**Palabras clave:** Colombia, *Helicops danieli*, Variación, Xenodontidae.

## Abstract

Variation in color pattern, as well as meristic and mensural characters, is based on 45 specimens of this previously little-known endemic Colombian watersnake.

**Key words:** Colombia, *Helicops danieli*, Variation, Xenodontidae.

## Introduction

*Helicops danieli* was described (Amaral, 1937) on the basis of a single specimen from Carare, Santander, Colombia; a second specimen from Quibdó, Chocó—previously identified as *H. leopardinus* (Amaral, 1932)—was also assigned to the new species. Most subsequent papers have

added relatively little to our understanding of this northwesternmost species of the widespread aquatic snake genus *Helicops* beyond adding a few locality records. The most recent distributional summaries are those of Pérez-Santos & Moreno (1988) and Yuki & Castaño (1998). Significant morphological data have been provided only by Yuki (1996), who, in discussing two specimens of *H. danieli*

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that had been misidentified as *H. carinicaudus*, described them in considerable detail and figured an inverted hemipenis. Nevertheless, a comprehensive summary of variation in meristic and mensural characters, as well as color pattern, has yet to appear in print. The purpose of my paper is to do exactly that, within the larger context of an ongoing taxonomic review of the entire genus.

## Materials and methods

In the course of this study, I personally examined 42 preserved specimens of *H. danieli*; in addition, John Lynch provided data on a few selected characters for two recently collected specimens, as did Rubens Yuki for the holotype (Instituto Butantan 9872). Meristic data were recorded for all undamaged specimens, but cephalic measurements were omitted for specimens having a snout-vent length less than 230 mm to avoid possible effects of allometry. Meristic counts included—ventrals (V); subcaudals (SC); supralabials (SL); infralabials (IL); anterior temporals (AT); dorsal scale rows (DSR) at the level of V10, at midbody, and two V anterior to the anal plate; maxillary teeth (Mx). Mensural characters included—tail length/total length (T/TL); head length/snout-vent length (HL/SVL); eye diameter/frontal length (ED/FL); frontal length/parietal length (FL/PL); muzzle length/frontal length (ML/FL); muzzle width/frontal length (MW/FL); anterior frontal width/frontal length (FW/FL); posterior frontal width/ anterior frontal width (FWP/A); prefrontal length/internasal length (Prf/In); anterior/posterior chinshield length (ACS/PCS); dorsal loreal length/ventral loreal length (LD/LV); loreal height/ventral loreal length (LHt/LV); ventral loreal length/muzzle length (LV/ML); total nasal length/muzzle length (TN/ML). All of the preceding ratios are expressed as percentages. I also recorded height of the outermost dorsal scale row/width of the vertebral row (DSR 1/VR), but expressed it as an absolute value rather than as a percentage. All counts and measurements were made by the methods described in **Rossman et al.** (1996).

### *Helicops danieli* Amaral

**Holotype:** Instituto Butantan, IB 9872, a juvenile female, donated by Hermano Daniel.

**Type-locality:** Colombia, Santander, Carare.

**Etymology:** Named in honor of the holotype's donor, Hermano Daniel, a pioneer in Colombian herpetological research.

**Definition:** A very large (maximum recorded SVL 800 mm) species of *Helicops* characterized by having: a maxi-

imum of 19 DSR at midbody; the single internasal usually (ca 75%) in contact with the rostral; a large number of V (males 130-141, females 125-135); a moderately large number of SC (males 61-70, females 76-86); the dorsum with four or five rows of alternating dark spots; the light ventral color extending onto dorsum as high as DSR 2; the venter light with two rows of broad black semilunar markings, the same pattern extending onto the SC.

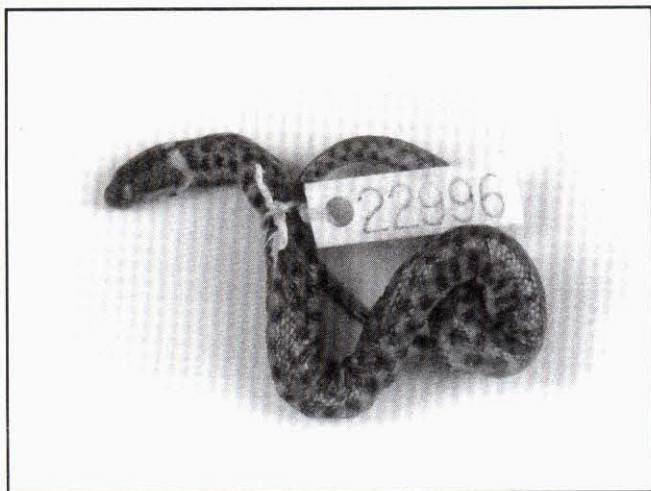
The combination of a spotted dorsum with a linear pattern of dark spots on a light venter readily distinguishes *H. danieli* from all other species in the genus.

**Variation:** Meristic and mensural variation are summarized in Tables 1 and 2. Many characters exhibit sexual dimorphism—some slight (e. g., relative headlength, number of maxillary teeth), some pronounced (e. g., relative tail length, number of subcaudals). Males tend to have fewer DSR, SL, IL, and V, but more SC and MX teeth. Females tend to have a proportionately shorter tail, shorter head (or longer body), smaller eye, shorter PCS, and a higher DSR 1.

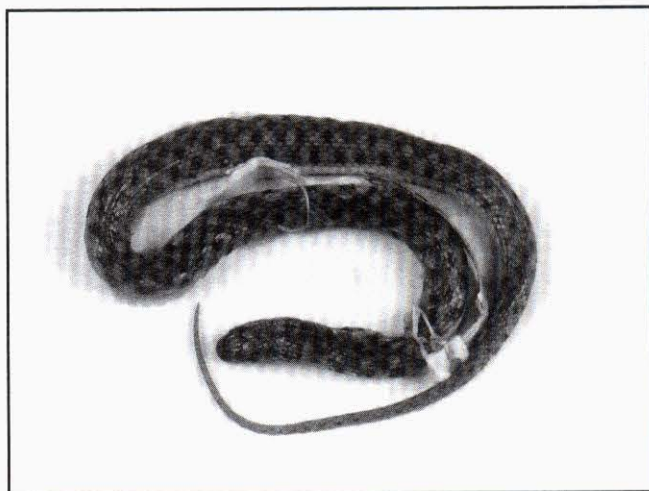
Reduction in the number of DSR from 19 to 17 results either from the fusion of rows 3 and 4 or the loss of row 4. The point of reduction lies 82% of the body length posteriorly (as determined by V location) in the eleven specimens examined for this feature. The internasal is clearly in contact with the rostral in 25 specimens, they are separated by contact between the opposing nasals in seven, and the four scales meet in a single point in three. The ten largest females average 673 mm (500-800) in SVL and the nine largest males average 413 mm (355-457). Mature males (>350 mm SVL) have tubercles on the chinshields and anterior infralabials.

The scales of DSR 1 and 2 are white, or cream, like the adjacent venter. The dorsum is some shade of olive brown with four or five rows of alternating dark spots, those of the ventral row (when present) often less distinct than those in the dorsolateral and lateral rows. Spots in the latter two rows are 1-2 scales long; those in the lateral row extend from DSR 3-5 (or 6), in the dorsolateral row from DSR 7-9. The dark spots are much more distinct in smaller individuals (Figs. 1-2), often becoming obscured by the brown pigment in larger individuals (Fig. 3). Ontogenetic variation in dorsal pattern also is apparent in the nuchal region, where, in juveniles, a prominent yellowish collar is interrupted middorsally by the anterior extension of the dark nuchal band (Fig. 1). The light collar soon disappears as an individual increases in size (Fig. 2), but the dark nuchal band and its anterior extension remain visible even in large adults (Fig. 3). The top of the head is

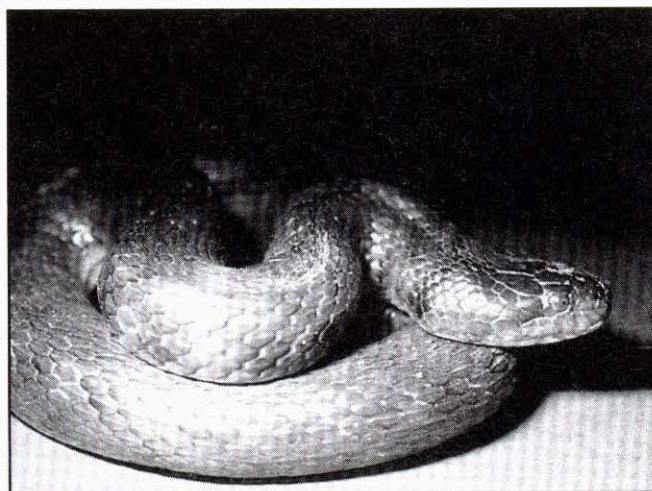




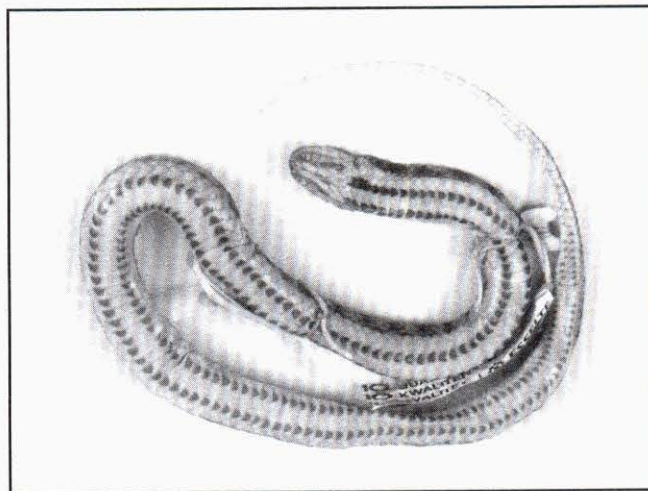
**Figure 1.** Dorsal view of juvenile (148 mm SVL) female *Helicops danieli* (ANSP 22996) from "New Grenada."



**Figure 2.** Dorsal view of subadult (316 mm SVL) female *Helicops danieli* (ANSP 25668) from Barranquilla, Atlántico, Colombia.



**Figure 3.** Dorsolateral view of living adult (800 mm SVL) female *Helicops danieli* (ICN 9972) from Hda. El Ceibal, Santa Catalina, Bolívar, Colombia.



**Figure 4.** Ventral view of subadult (316 mm SVL) female *Helicops danieli* (ANSP 25668) from Barranquilla, Atlántico, Colombia.

olive brown, and this color extends ventrally across SL 1-3 to the lip and across the dorsal portions of DSR 4-8 to a varying extent.

The venter is cream in life with two rows of black semi-lunar marks. These black marks range in size from being fairly small (Fig. 4) to so expanded that they fuse midventrally (Fig. 5). Paired black spots also appear on the SC, being confined to the anterior scales in some individuals (Fig. 4) and extending nearly the entire length of the tail in others (Fig. 5). The chin and throat areas also

are marked by varying amounts of black pigment. There invariably is at least some pigment along the lower margin of the IL, but the extent—or even presence—of pigment on the chinshields may differ dramatically (Figs. 4-5). This statement also applies to whether or not there is a black bar connecting the spots on the gular scales to an area of dark pigment on the posterior SL (Figs. 4-5).

**Renjifo & Lundberg** (1999) included two color photographs of living *H. danieli* in their book (the head and a section of body of an adult appears on page 86, and a

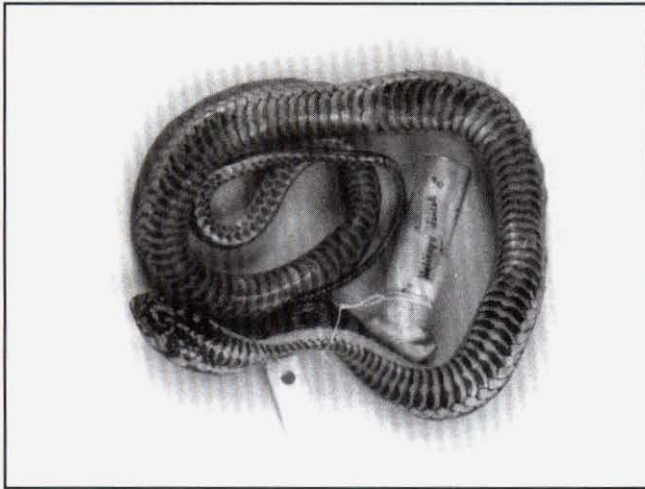


Figure 5. Ventral view of adult (442 mm SVL) male *Helicops danieli* (ANSP 25668) from Turbo, Antioquia, Colombia.

Table 1. Individual and sexual variation of selected meristic characters in *Helicops danieli*. Values represent number of scales (number of specimens-percentage of sample). M = males, F = females.

Character	Sex	Values
Anterior DSR	M	19(13-81.3), 20(1-6.3), 21(2-12.5)
	F	19(21-77.8), 20(5-18.5), 21(1-3.7)
Midbody DSR	M	19(16-100.0)
	F	19(26-96.3), 20(1-3.7)
Posterior DSR	M	16(2-12.5), 17(12-75.0), 18(1-6.3), 19(1-6.3)
	F	16(2-7.4), 17(19-70.4), 18(6-22.2)
Total SL	M	16(16-100.0)
	F	16(24-85.7), 17(3-10.7), 18(1-3.6)
Total IL	M	20(12-80.0), 21(3-20.0)
	F	20(15-57.7), 21(6-23.1), 22(5-19.2)
Total AT	M	2(15-93.8), 4(1-6.3)
	F	2(26-100.0)

Table 2. Individual and sexual variation of selected meristic and mensural characters in *Helicops danieli*. Values represent mean  $\pm$  one S. D. (range of variation) number of specimens

Character	Sex	Values
No. of V	M	129.4 $\pm$ 2.66(125-135)16
	F	135.4 $\pm$ 2.97(130-141)29
No. of SC	M	79.8 $\pm$ 2.70(76-86)15
	F	65.3 $\pm$ 2.75(61-70)20
No. of Mx teeth	M	17.8 $\pm$ 0.71(17-19)8
	F	17.1 $\pm$ 1.04(16-20)13
T/TL (%)	M	30.3 $\pm$ 2.10(26.4-33.4)15
	F	23.5 $\pm$ 0.95(20.7-25.2)20
HL/SVL (%)	M	5.5 $\pm$ 0.36(4.7-6.0)9
	F	5.2 $\pm$ 0.19(4.9-5.5)8
ED/FL (%)	M	50.7 $\pm$ 2.76(47.2-56.1)11
	F	48.0 $\pm$ 4.96(41.9-56.9)14
FL/PL (%)		83.6 $\pm$ 6.03(68.2-91.6)25
ML/FL (%)		64.9 $\pm$ 6.01(55.5-82.4)25
MW/FL (%)		51.3 $\pm$ 5.36(43.0-62.5)19
FW/FL (%)		41.6 $\pm$ 5.01(34.4-55.6)26
FWP/A (%)		126.7 $\pm$ 9.70(100.0-151.5)26
Prf/In (%)		73.6 $\pm$ 9.35(54.2-89.7)25
ACS/PCS (%)	M	88.8 $\pm$ 7.19(78.9-101.1)10
	F	100.8 $\pm$ 8.39(89.4-119.6)15
LD/LV (%)		53.2 $\pm$ 6.30(41.0-63.2)19
LHu/LV (%)		94.6 $\pm$ 10.27(69.0-113.2)19
LV/ML (%)		43.8 $\pm$ 4.37(36.0-52.4)16
TN/ML (%)		58.5 $\pm$ 5.27(50.3-71.4)16
DSR 1/VR	M	1.74 $\pm$ 0.12(1.58-1.94)9
	F	1.82 $\pm$ 0.09(1.67-1.92)8

smaller individual in the process of being ingested by an immature *Clelia clelia* appears on the front cover).

**Distribution:** With two exceptions (discussed below), *Helicops danieli* appears to be confined to northwestern Colombia (Fig. 6) in drainages that empty into the Caribbean, directly or indirectly (the Atrato, Sinú, Cauca, and Magdalena rivers). Most records are from low elevations

(below 500 m) and the record for Medellín should be verified. Pérez-Santos & Moreno (1988) plotted a *H. danieli* record from the general vicinity of Cúcuta, Norte de Santander, in the Maracaibo drainage, but they did not include that region in their text where they characterized the distribution of the species. No museum specimen was cited, so it isn't possible to determine if the record is valid or in error.



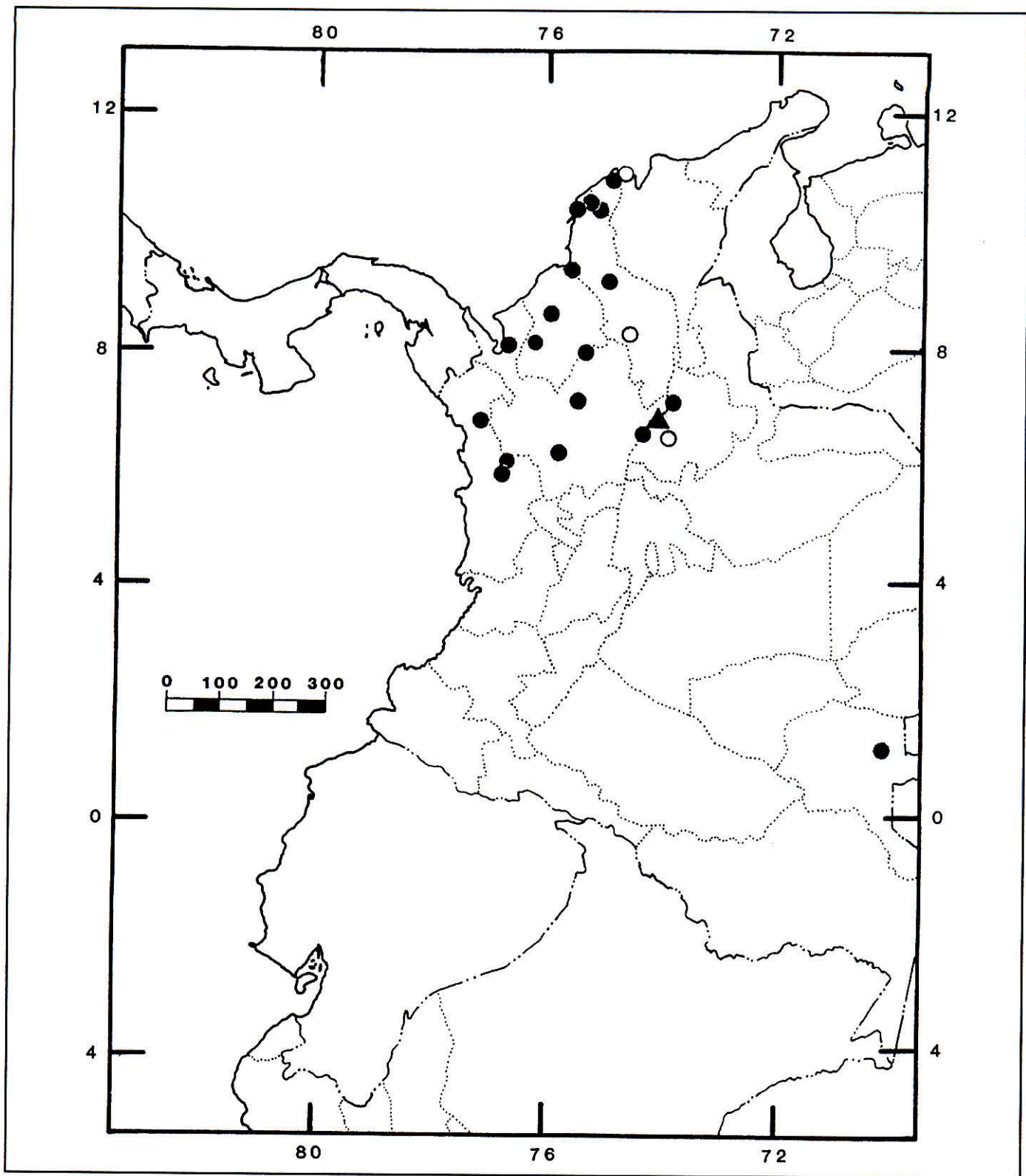


Figure 6. Map of northwestern South America showing the known distribution of *Helicops danieli*. Solid circles represent specimens personally examined or verified, hollow circles unverified but probably valid records, and the solid triangle the type-locality

On the other hand, the range extension reported by **Yuki & Castaño** (1998) is based on ICN 242, an adult male purportedly from Mitú, Vaupés, in the Amazonian drainage. Rubens Yuki kindly provided me with a photograph of this specimen, and there is no doubt that it was correctly identified by them. However, the fact that this locality lies east of the Andes, more than 700 km removed from the main range of the species, raises some question as to whether or not the specimen might have been inadvertently mislabeled. Acquisition of additional material from Mitú—or other localities in the Amazon drainage—would remove any certainty surrounding this specimen.

On their map, **Yuki & Castaño** (1998) mistakenly plotted the type-locality of *H. danieli* (Carare, Santander—middle Magdalena drainage) in the general vicinity of Popayán, Cauca (upper Cauca drainage). The type-locality is correctly placed in my map (Fig. 6).

**Specimens examined (or verified):** **ANTIOQUIA:** Río Porce, near estación Botero (ILS 2085); Turbo (ANSP 25072, ILS 737); Puerto Berrio (AMNH 20397); Río Cauca, Caucasia (ILS 2132); Río Cauca, Yarumal (ILS 1811); Medellín (AMNH 35608, 35718). **ATLÁNTICO:** Barranquilla (ANSP 25668, ILS 736, MZUSP 2144-45, ZMH R04338-39); Ciénega de Amajahuevo, CVM fishery station (FMNH 165216-19, 165524). **BOLÍVAR:** vicinity of Cartagena (FMNH 165276); Canal de Duque, San Cristóbal (AMNH 97459-62); Río Cauca, Magangué (ILS 734); Santa Catalina, Hacienda El Ceibal (ICN 9971-72). **CHOCÓ:** "Isthmus of Panama, Atrato River" (ANSP 11659); Ciénega[,] Agua Clara River (AMNH 18239); Quibdó (ICN 1391, ILS 735); vicinity of Opagadó (LACM 7275). **CORDOBÁ:** Río Sinú, Montería (ILS 2139, 2234-35); upper Río Uré, close to CVM camp (FMNH 165298); Río Sinú, Urrá (**Renjifo & Lundberg**, 1999, cover, p. 86). **SANTANDER:** Barrancabermeja (ICN 11548); Carare (IB 9872, holotype). **SUCRE:** Caño Francés, E of Tolú (FMNH 165625); between Tolú and Sincelejo (FMNH 165895). **NO SPECIFIC LOCALITY:** "Magdalena Valley (BM[NH]) 1905.5.15.3-4"; "New Grenada" (ANSP 22994-99); "Central America" (LSUMZ 83319); no data (USNM 12475).

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History), London (BM[NH]); Field Museum of Natural History, Chicago (FMNH); Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá (ICN); Instituto de La Salle, Bogotá (ILS); Louisiana State University Museum of Natural Science, Baton Rouge (LSUMZ); Museu de Zoologia, Universidade de São Paulo (MZUSP); National Museum of Natural History, Smithsonian Institution, Washington (USNM); and Zoologisches Museum Hamburg (ZMH).

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