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Redescription of *Atractus punctiventris* and Description of Two New *Atractus* (Serpentes: Dipsadidae) from Brazilian Amazonia

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Abstract: We redescribe *Atractus punctiventris* based on the examination of its holotype, two topotypes, and two additional specimens recently collected. We describe two new species of *Atractus* with 15 dorsal scale rows, previously confused with *Atractus insipidus*, from the eastern and western portions of Brazilian Amazonia, respectively. The new species are recognized on the basis of unique combinations of morphological characters. We compare *Atractus punctiventris* and the two new species with all congeners from most lowland provinces of cis-Andean South America. We discuss potential affinities of the three species, mainly by sharing exclusive hemipenial traits with congeners placed in different phenetic groups, and allocate them to distinct species groups of *Atractus*.

Key words: Amazonia; *Atractus badius* group; *Atractus pantostictus* group; Brazilian shield; Hemipenial morphology

The cryptozoic snakes of the genus *Atractus* Wagler 1828 are widely distributed in the Neotropics and occur from Panama to Argentina (Giraudo and Scrocchi 2000; Myers 2003), but with the highest number of species in the trans-Andean region of Colombia (Passos et al. 2009a). *Atractus* is the most species-rich snake genus in the world, with more than 140 valid species at present (Passos et al. 2013a; Salazar-Valenzuela et al. 2014). The genus, as currently understood, represents one of the most morphologically diverse radiations of New World snakes, having adult body size from 100 mm (Passos et al. 2013b) to more than 1 m (Schargel et al. 2013), and a color pattern varying from uniformly colored, banded, or striped (Savage 1960) to putative coralsnake mimetic patterns (Martins and Oliveira 1993; Almeida et al. 2014). Despite renewed interest in the systematics of *Atractus* in the last 10 yr, the taxonomy of this genus remains in a state of flux with frequent resurrections (Passos et al. 2010a), rediscoveries (Passos et al. 2012), synonymizations (Passos et al. 2013a), and descriptions of new species (Salazar-Valenzuela et al. 2014). Notwithstanding, even some recent studies have been unable to propose realistic diagnoses and provide detailed comparisons in the descriptions of putative new species of *Atractus* (e.g., Esqueda 2011). On the other hand, some authors have emphasized that taxonomic studies on *Atractus* must follow an explicit comparative framework comprising the related type series (Passos et al. 2013a) and, when available, representative samples analyzed through rigorous hypothesis testing (Passos et al. 2010a,b; Schargel et al. 2013).

Amaral (1933) described *Atractus punctiventris* based on a single specimen with 15 dorsal scale rows from Villavicencio on the piedmont of the eastern Cordillera of Colombia (= Sabana province from Morrone 2014). Amaral assumed that this species was phylogenetically closest to *Atractus reticulatus* Boulenger 1885 (a species with 15 dorsal scale rows from southern South America; Passos et al. 2010b) and distinguished it from *A. punctiventris* by the length of symphysial, shortening of chinshields, and general color pattern. Amaral (1937) reported an additional specimen of *A. punctiventris* from Sonsón in the northern portion of the Central Cordillera of Colombia, but Passos et al. (2009a) identified this individual as a new species (*Atractus paisa* Passos, Arredondo, Fernandes, and Lynch 2009). Roze (1961) described *Atractus insipidus* on the basis of a single specimen with 15 dorsal scale rows from the Brazil–Venezuela boundary landmark, near the Uraricapará River. Roze (1961) compared *A. insipidus* with *A. reticulatus* and distinguished both species on the basis of different color patterns. Cunha and Nascimento (1983) identified a female specimen from the municipality of Carolina in the state of Maranhão, Brazil as *A. insipidus*. However, 10 yr later Cunha and Nascimento (1993) did not include *A. insipidus* in their account on the snakes from east Brazilian Amazonia and, apparently, had reconsidered their previous identification as *A. insipidus*.

Silva (1993) and Silva et al. (2005) identified many individuals collected during the faunal rescue of the Samuel hydroelectric power plant carried out at the Jamari River (a tributary of Madeira River) in Brazil as *Atractus* cf. *insipidus* and *Atractus insipidus*, respectively. Silva (1993) noted that these specimens match the description of *A. insipidus* except for the higher number of subcaudal scales. Previous comparisons of the holotype of *A. insipidus* and the aforementioned specimen reported by Cunha and Nascimento (1983), with additional samples reported by Silva (1993), suggest that those individuals occurring south of the Amazon River are not conspecific with *A. insipidus* (see Passos et al. 2013a). Therefore our aim in this study, beyond redescribing the poorly known *Atractus punctiventris*, is to define the taxonomic status of the populations of Amazonia previously associated with *A. insipidus* in the literature and herpetological collections.

Materials and Methods

Material Examined

Institutional abbreviations of the specimens examined are as listed in Sabaj Pérez (2013), except for the Coleção

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Herpetológica da Universidade do Ceará (CHUFC), Fortaleza, Ceará, Brazil and the Centro de Estudos e Pesquisas Biológicas da Pontifícia Universidade Católica de Goiás (CEPB), Goiania, Brazil. Data from additional specimens of *Atractus* previously examined can be found in Passos et al. (2005), Passos et al. (2007a,b), Passos and Fernandes (2008), Passos and Arredondo (2009), Passos et al. (2009a,b,c,d,e), Passos et al. (2010a,b,c), Passos and Lynch (2011), Passos and Prudente (2012), Passos et al. (2012), Prudente and Passos (2008, 2010), Passos et al. (2013a,b,c,d), Almeida et al. (2014), and Salazar-Valenzuela et al. (2014). We prepared fully everted and almost maximally expanded hemipenes from the following specimens: IBSP 47078, MNRJ 16511, MNRJ 18035, MNRJ 24363, MPEG 17908, MPEG 23930, MUFAL 10462, and ICN 12162. We provide the authorship and date only in the first mention of each name.

Geographical Data and South American Biogeography

Coordinates of localities were acquired in the field by using Global Positioning System devices (referenced to map datum WGS84) and by consulting data in museum catalogues or databases and available geographical gazetteers (Paynter 1997; Instituto Brasileiro de Geografia e Estatística 2011). We refined, when possible, the provenance of records obtained from the literature or in museum databases without specific field coordinates using the software Google Earth Pro (v7.1.2, Google Inc., Mountain View, CA). The biogeographic regionalization from South America follows the recent proposal of Morrone (2014). Based on this source (the numbers are as cited in fig. 12 of Morrone 2014:24), we restricted our comparative efforts to species recorded in lowlands (up to 1000 m above sea level; asl hereafter) of the following cis-Andean provinces: Sabana (25), Napo (30), Imerí (31), Pantepui (32), Guianan (33), Roraima (34), Pará (35), Ucayali (36), Madeira (37), Rondônia (38), Yungas (39), and Xingu–Tapajós (40). Therefore, during the comparative part of the study, when we refer to the Morrone's provinces we are referring specifically to those as listed above.

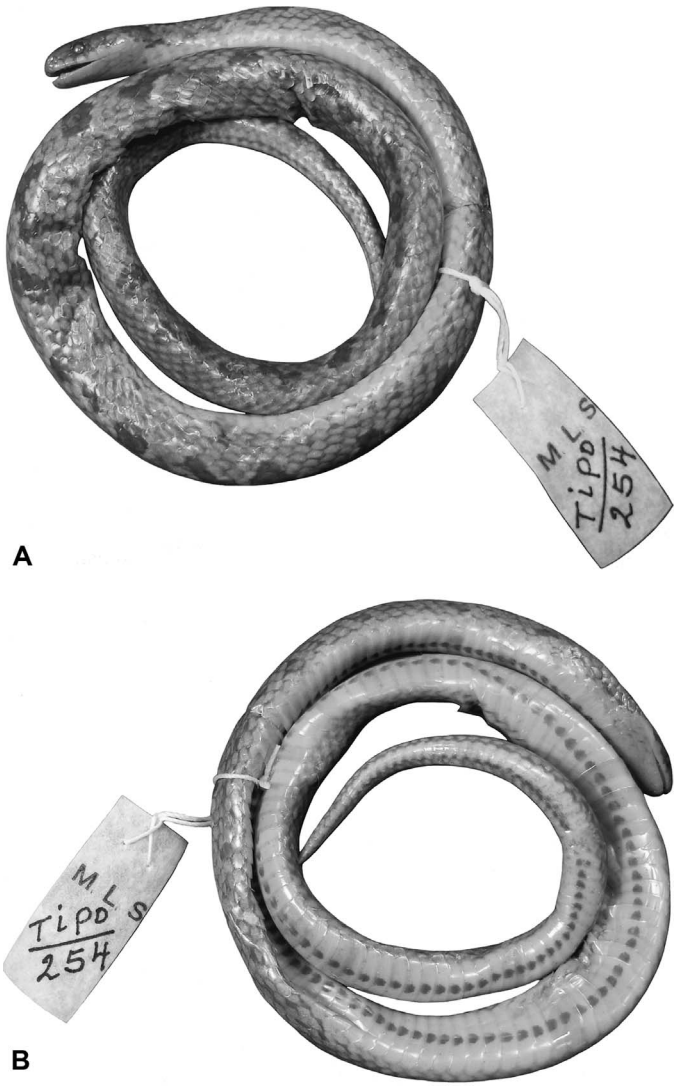

Fig. 1.—Dorsal (A) and ventral (B) views of the holotype of *Atractus punctiventris* (MLS 254) from Villaviciencio, Meta, Colombia.

Techniques and Characters

Terminology for cephalic shields follows Savage (1960) as augmented by Peters (1964) whereas ventral and subcaudal counts follow Dowling (1951). Condition of the loreal scale follows Passos et al. (2007b). Measurements were taken with a dial caliper (Mitutoyo) to the nearest 0.1 mm, except for snout–vent length (SVL) and tail length, which were measured with a ruler to the nearest 1 mm. Measurements and descriptions of paired cephalic scales are strictly based on the right side of head. Counts of body marks (blotches, spots, and dots), in some taxa, were performed separately for each side of the dorsum because these marks are not always transversally continuous along the sides of vertebral region: herein, the term "blotch" refers to broader (two or more scales long and wide) dorsal marks located on the vertebral and paravertebral regions, and the term "spot" refers to small (less than two scales long and wide) marks throughout the dorsum or venter whereas "dot" refers to any mark smaller than a scale. Sex was determined on the basis of presence–absence of hemipenes verified through a ventral incision at the base of the tail. We examined maxillae in situ under a Stemi 2000C (Zeiss) stereoscope through a narrow lateromedial incision between the supralabials and the maxillary arch. After removing tissues covering the maxillary bone, we counted teeth and empty sockets. The method for preparation of preserved hemipenis was modified from Pesantes (1994) in replacing potassium, oxygen, and hydrogen (KOH) with distilled water (see Passos et al. 2013c) and observing the precautions highlighted by Zaher and Prudente (2003). Prior to inflation with petroleum jelly, the organs remained 15–20 min in an alcohol solution of Alizarin red in order to stain the ornamented calcareous structures according to adaptations made by Harvey and Embert (2009) and Nunes et al. (2012) from original procedures used by Uzzell (1973). Terminology for hemipenial descriptions follows Dowling and Savage (1960) and Zaher (1999) with a few minor adaptations. We follow Passos et al. (2009e) and Passos et al. (2010b) with respect to conditions of the morphological characters used in diagnosis and description.

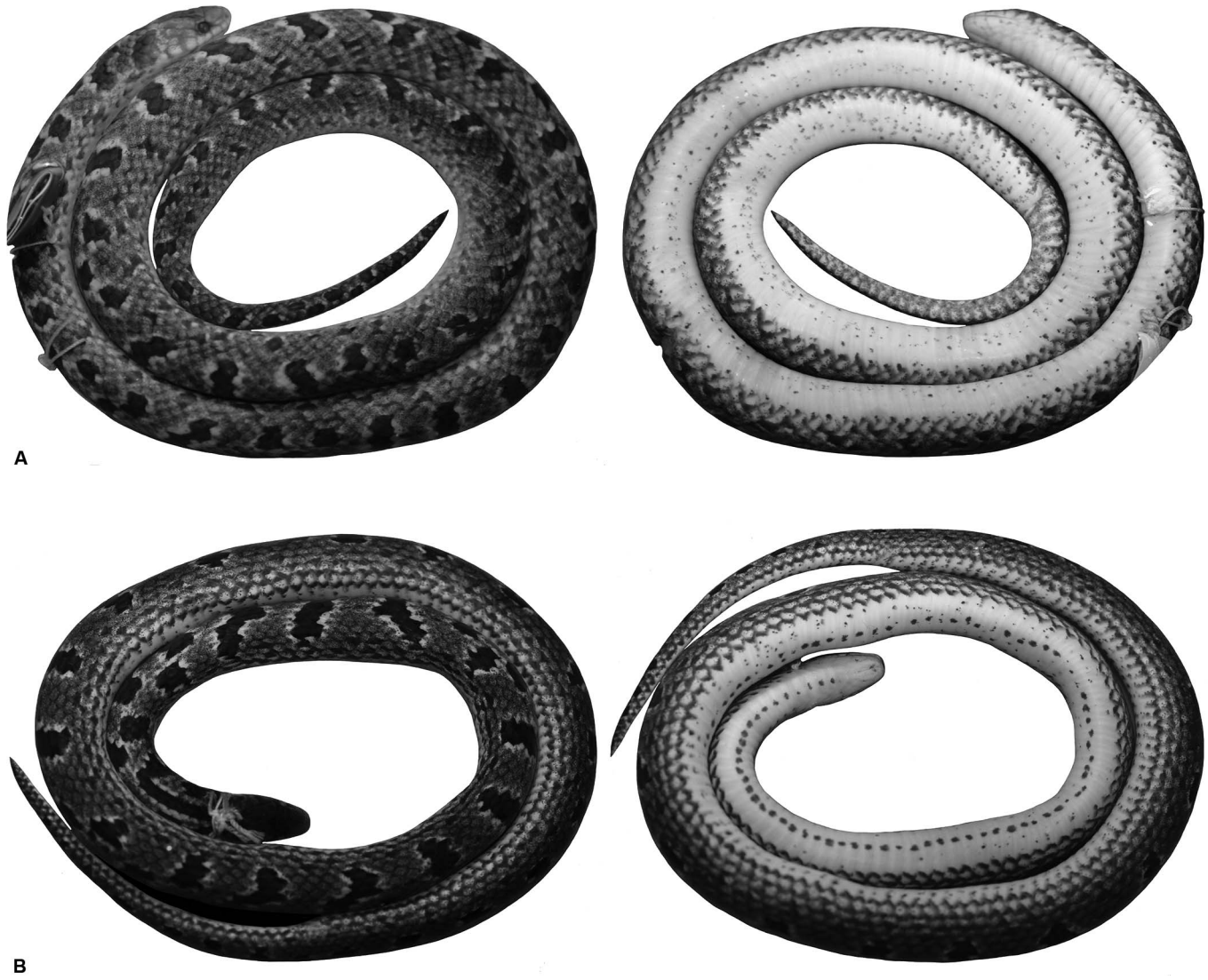

Fig. 2.—Dorsal (left) and ventral (right) views of the recently collected specimens of *Atractus punctiventris*. ICN 7170 (A) from Nunchia, Casanare, and ICN 12162 (B) from San Luís de Gaceno, Boyacá, Colombia.

Results

Taxonomic Status of the Populations of *Atractus* Previously Referred to *Atractus insipidus*

Firstly, we redescribe *Atractus punctiventris* on the basis on the examination of its holotype and two topotypes as well as on two recently collected specimens from departments of Boyacá and Casanare, Colombia. Thereafter, we compared qualitatively the samples from Brazilian Amazonia with all known specimens of *A. punctiventris*, *A. insipidus*, and the cis-Andean congeners from provinces 25 and 30–40 of Morrone (2014). We conclude that two populations previously identified as *Atractus insipidus* in the eastern (Cunha and Nacimento 1983) and western (Silva 1993; Silva et al. 2005) portion of Brazilian Amazonia are not conspecific with *A. insipidus* and *A. punctiventris* or any previously recognized congener (see below in comparisons). Furthermore, these are allopatric, and each population has unique qualitative characters of color pattern and hemipenis in addition to nonoverlapping meristic and morphometric characters (Table 1). Probably, each has distant affinities considering the distinct hemipenis morphologies (see figures and Discussion). Therefore, we recognize both populations here as distinct species based on the combination of color pattern and unique states of morphological characters in the genus.

Species Descriptions

Atractus punctiventris Amaral 1933
(Figs. 1, 2; Table 1)

Atractus punctiventris Amaral 1933:117.

Holotype.—Adult male, MLS 254 (formerly MLS 102), collected by Brother Nicéforo-Maria in the municipality of Villavicencio (04°09′N, 73°38′W, ca. 500 m asl), department of Meta, Colombia (Fig. 1).

Referred specimens.—Colombia: Meta: Villavicencio (MLS 254, holotype, and 255–56 topotypes); Casanare: Nunchía (ICN 7170); Boyacá: San Luís de Gaceno (ICN 12162).

TABLE 1.—Meristic and morphometric range of variation for all known specimens of *Atractus punctiventris* and the two new species described in the present study. The numbers in brackets represent the total number of individuals available in collections for each sex. The number of maxillary teeth was placed together for both sexes because this variable is not secondarily dimorphic. SVL = snout–vent length.

	Atractus punctiventris		*Atractus boimirim* sp. nov.		*Atractus tartarus* sp. nov.	
	Males (3)	Females (2)	Males (6)	Females (10)	Males (9)	Females (7)
Adult SVL (mm)	249–345	375–415	150–270	180–390	260–360	329–570
Tail length/SVL ratio	14.4–15.6	12.5–14	12.2–13.7	8.3–9.9	15.5–18.1	9.7–13.6
Midbody diameter (mm)	5.0–7.5	7.4	3.0–4.8	3.5–9.1	4.5–9.6	6.6–14.8
Ventrals	155–167	170–183	143–154	150–162	146–157	154–169
Subcaudals	32–36	27–34	23–28	18–23	29–38	23–31
Maxillary teeth	5–7		7		9–11	

Diagnosis.—*Atractus punctiventris* can be distinguished from all congeners by the following combination of characters: (1) smooth dorsal scale rows generally 15/15/15; (2) postoculars two; (3) loreal moderately long; (4) temporal formula 1+2; (5) supralabials usually seven, third and fourth contacting eye; (6) infralabials usually seven, first three contacting chinshields; (7) maxillary teeth five to six; (8) gular scale rows three; (9) preventrals one or two; (10) ventrals 170–183 in females, 155–167 in males; (11) subcaudals 27–34 in females, 32–36 in males; (12) in preservative, dorsum pale brown to brown with a series of brown to black irregular light bordered blotches; (13) in preservative, venter creamish white with brown dots or spots generally arranged in the center of ventral scales usually forming a conspicuous midline along belly; (14) maximum body size moderate in females (415 mm SVL) and males (345 mm SVL); (15) moderately long tail in females (12.5–14.0% SVL) and in males (14.4–15.6% SVL); (16) hemipenis slightly bilobed, semicapitate, and semicalyculate.

Comparisons.—Among congeners from cis-Andean provinces of Morrone (2014), *Atractus punctiventris* shares only with *Atractus major* Boulenger 1894 and *Atractus schach* (Boie 1827) a pale brown dorsum with dark brown light-bordered blotches, seven upper and lower labials, five to six maxillary teeth, and a creamish white venter frequently covered with a median longitudinal line caused by the linear arrangement of centered, round, dark brown spots. *Atractus punctiventris* differs from both by having 15 dorsal scale rows and slightly bilobed hemipenis (vs. 17 and moderately bilobed hemipenis). Furthermore, *A. punctiventris* differs from *A. major* by having the hemipenial body twice as long as the capitulum with capitular groove evident on the asulcate side of the organ (vs. hemipenial body equivalent in size to capitulum with capitular groove indistinct on both sides of the organ); from *A. schach* by having the first three infralabials contacting chinshields (vs. four). *Atractus punctiventris* occurs in sympatry at least with *Atractus elaps* (Günther 1858) and *Atractus univittatus* (Jan 1862), but differs from *A. univittatus* by having 15 dorsal scale rows at midbody and hemipenial body twice as long as capitulum (vs. 17 dorsal scale rows and hemipenial body equivalent in size to capitulum) and from *A. elaps* by having a pale brown dorsum with black blotches light-bordered (vs. red dorsum with complete black rings forming dyads or tetrads separated by white rings).

Redescription of the holotype.—Adult male, SVL 269 mm, tail length 42 mm (15.6% SVL); head slightly distinct from body; head length 10.8 mm (4.0% SVL); head width 5.1 mm (47% head length); head arched in lateral view; snout rounded in dorsal view, truncate in lateral view; canthus rostralis conspicuous; rostral nearly triangular in frontal view, 2.2 mm wide, 1.1 mm high, visible in dorsal view; internasal 1.0 mm long, 0.9 mm wide; internasal suture sinistral with respect to prefrontal suture; prefrontal 2.2 mm long, 2.1 mm wide; supraocular subtrapezoidal, 1.4 mm long, about twice as long as wide; frontal triangular, 2.8 mm long, 2.6 mm wide; parietal 4.2 mm long, 2.0 mm wide; nasal divided, nostril restricted to prenasal; prenasal 0.9 mm high, 0.4 mm long; postnasal 0.6 mm high, 0.5 mm long; loreal 1.9 mm long, 0.6 mm high; second and third (left side) and second and fourth (right side) supralabials contacting loreal; eye diameter 1.5 mm; pupil rounded; two postoculars similar in height; upper postocular 0.7 mm long; lower postocular shorter (0.5 mm); temporal formulae 1+2; first temporal about twice as long as high; upper posterior temporals fused, 3.1 mm long, 0.7 mm wide; supralabials seven, third and fourth contacting eye; second supralabial slightly higher than first and similar in height to third supralabial; seventh supralabial higher and longer than remaining supralabials; symphysial subtriangular, 1.5 mm wide, 0.6 mm long; first pair of infralabials preventing symphysial–chinshields contact; infralabials seven, first three contacting chinshields; chinshields 2.7 mm long, 1.2 mm wide; gular scale rows three; preventrals two; ventrals 155; subcaudals 33/32 from left to right side, respectively; moderately long caudal spine (equivalent in length to last subcaudal) and slightly acuminate; dorsal scale rows 15/15/15, lacking apical pits and supracloacal tubercles; midbody diameter 5.8 mm (2.1% SVL); maxillary teeth five on right side and six on left side; first four maxillary teeth of equivalent size, except for smaller last one tooth (right side) or last two (left side) teeth; spacing similar among teeth, including between fourth and last one or two teeth.

Dorsum of head brown with some pale brown or beige spots covering posterior portions of parietal shields and anterior scales of temporal region; dorsal ground color of head somewhat faded but preserved pattern resembles cephalic-cap; background of head brown, extending to dorsal edges of supralabials, except for third to fifth supralabials in which brown pigmentation extends from dorsoposterior region along scale sutures, reaching labial border; sides of head with conspicuously brown postorbital stripe ranging from postocular and anterior temporal scales to neck region; posterior temporal scales beige; occipital scales uniformly brown; infralabials and gular region creamish white with a few brown spots covering first pair of infralabials, anterior chinshields, and preventrals; venter creamish white with conspicuous midline by arrangement of rhomboidal brown

Fig. 3.—Sulcate (A) and asulcate (B) sides of hemipenis of *Atractus punctiventris* (ICN 12162) from San Luís de Gaceno, Boyacá, Colombia.

spots at center of each ventral scale; ventral surface of tail creamish white, with brown dots concentrated on median suture between subcaudals; dorsal ground color beige with 42 (body) +8 (tail) irregular brown blotches (two to seven scales long and one to four scales wide) along vertebral and paravertebral regions of flanks; first body blotch not connected to postorbital stripe, forming incomplete nuchal band (three scales long); blotches with pale border (light brown) and transversally oriented along longitudinal axis of body, sometimes reaching paraventral (first two dorsal scale rows) region; small brown spots (half scale to two scales long) located at interspaces between body blotches on paraventral region; spots irregularly distributed along interspaces, not connected along paraventral region (Fig. 1).

Color pattern variation of adults in preservative.—Two adult topotypes of *A. punctiventris* (MLS 255–56 male and female, respectively) with color patterns remarkably similar to holotype, differing from it mostly in number of dorsal blotches along body (40–45) and tail (seven to nine), respectively. Additional female (ICN 7170) and male (ICN 12162) have similar but much-better preserved color patterns, with dorsal coloration more contrasting between dark brown blotches (Fig. 2); ICN 7170 has 56+11 (two to four scales wide and one to two scales long) white-bordered (one scale) dorsal blotches and pale brown ground color; ICN 12162 has 41+10 (three to seven scales wide and two to three scales long) white-bordered (one scale) dorsal blotches and beige ground color; paraventral region with isolated dark brown spots (one scale long and wide) along interspaces between main dorsal blotches (ICN 7170; Fig. 2A) or lacking such marks (ICN 12162; Fig. 2B); paraventral region white with brown pigmentation restricted to scale edges (ICN 12162), displaying barely reticulate pattern; ventral surface of body generally with conspicuous midline by arrangement of rhomboidal brown spots in center of each ventral scale (MLS 255–56, ICN 12162); ICN 7170 has the first half of belly almost uniformly creamish white with a few dispersed brown dots on lateral region of ventral scales; from midbody to tail dispersed brown dots become more concentrated at medial region of belly; terminal third of belly with dots more concentrated and irregularly distributed; tail mostly brown (caused by high concentration of brown dots on anterior and lateral margins of each subcaudal), with cream area restricted to posterior regions of subcaudals (Fig. 2B).

Hemipenis morphology.—Organ in situ (retracted) extends and bifurcates at level of sixth to seventh subcaudals ($n = 2$); fully everted hemipenis slightly bilobed, semicapitate, and semicalyculate (Fig. 3; ICN 12162); lobular region and hemipenial body similar in width; lobes barely clavate with flattened apices on sulcate side and with a more-rounded aspect on asulcate side of organ; lobes symmetrical and little distinct from capitulum, with higher concentration of calyces; lobes uniformly scattered with spinulate calyces on both sides of hemipenis; calyces on distal region of lobes ornamented with fewer spinules gradually replaced by papillae toward apices of lobes; lobular crests not evident; capitular groove well defined on asulcate side and indistinct on sulcate side of hemipenis; capitulum half length of hemipenial body on both sides of organ; hemipenial body subcylindrical and scattered with large hooked spines, except proximal region; basal region of hemipenial body scattered with a few moderately large spines intercalated with small spines and nude areas; sulcus bifurcates for about half of organ with each branch centrifugally oriented, running to tip of lobes; sulcus spermaticus margins broad at level of division and narrowed above capitular crotch; sulcus spermaticus bordered by spinules from base of organ to apices of lobes; basal naked pocket restricted to most-basal region of hemipenial body; proximal region of hemipenis with longitudinal plicae and dispersed spinules (Fig. 3).

Meristic and morphometric variation.—Largest male 345 mm SVL, tail length 52 mm; largest female 415 mm SVL, tail length 58 mm; tail 14.4–15.6% SVL ($n = 3$) in males and 12.5–14.0% in females ($n = 2$); dorsal scale rows 15/15/15 ($n = 4$) or 15/17/17 ($n = 1$); ventrals in males 154–167 ($n = 3$), 170–183 ($n = 2$) in females; subcaudals in males 32–36 ($n = 3$), 27–34 ($n = 2$) in females; supralabials 6 ($n = 1$ side) or 7 ($n = 5$ sides); infralabials 6 ($n = 4$ sides) or 7 ($n = 6$ sides); preventrals 1 ($n = 1$) or 2 ($n = 4$); maxillary teeth

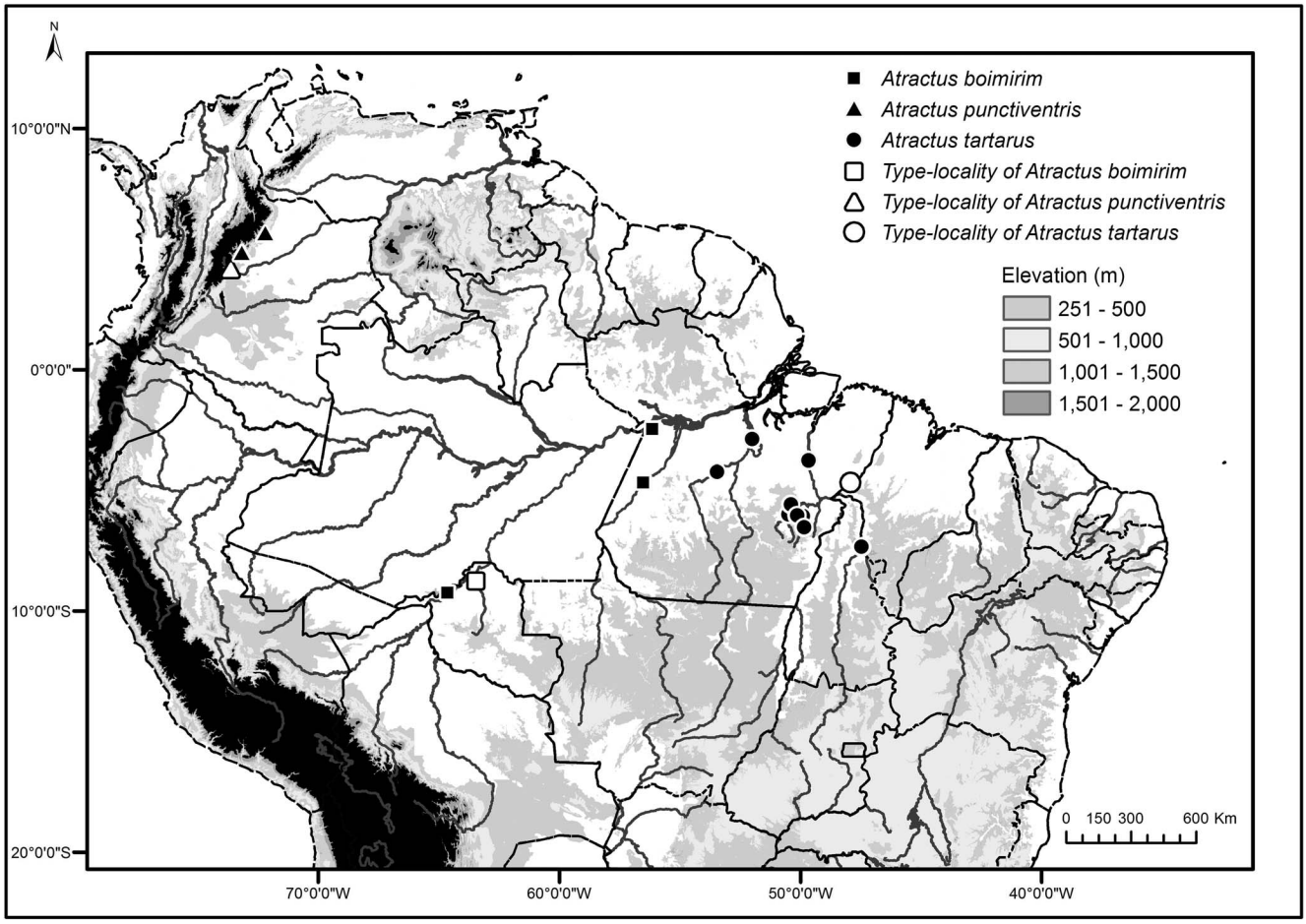

FIG. 4.—Known distribution of *A. punctiventris*, *A. boimirim* sp. nov., and *A. tartarus* sp. nov. The map regions in white and black represent areas with elevations below 250 m and above 2000 m, respectively.

5 ($n = 3$ sides), 6 ($n = 4$ sides) or 7 ($n = 1$); body diameter 5.0–7.5 mm; anal glands in females extend at level of sixth subcaudal.

Distribution.—Known from the municipalities of Villavicencio (04°09′N, 73°38′W), Meta; San Luís de Gaceno (04°49′N, 73°10′W) Boyacá; and Nunchía (05°38′N, 72°12′W), Casanare. This region comprises an area of intense agricultural activity in Colombia located between three major vegetation physiognomies: the highland sub-Andean forest and the lowland sub-hygrophilous rainforest and the Neotropical savannas (locally referred to as Llanos), between 400–500 m elevation (Fig. 4).

Remarks.—The variation observed in the number of dorsal scale rows on the midbody of *A. punctiventris* (MLS 256), although unusual in the genus, is known to occur in highland (*Atractus erythromelas* Boulenger 1903; Passos et al. 2009e) as well as in lowland species (*A. major*). While in *A. erythromelas* the reduction from 17 to 15 dorsal scale rows occurs in high population frequency in localities around the city of Mérida in Venezuela, in *A. major* there is only one specimen (CBF 2288) with 15 dorsal scale rows at midbody among more than 80 specimens examined by senior author (Passos 2008). Most probably, the Bolivian specimen is anomalous in having 15 dorsal series of scales. Even considering the restricted sample for the species, this seems to be the case with *A. punctiventris*.

Atractus ***boimirim*** sp. nov.
(Figs. 5–8A, Table 1)

Atractus cf. *insipidus* Silva 1993:52 [CEPB 2951–53, 3064, 3291, 3293, 3329, 3332, 3334, 3658, and 3659].
Atractus insipidus Silva et al. 2005:39 [CEPB 2951–53, 3332, and 3334 in specimen examined].

Holotype.—Adult male (MPEG 17908) collected between 14 November 1988 and 29 March 1989 by N. Jorge da Silva Jr. and team in the faunal rescue operation for the construction of the Samuel Hydroelectric Power Plant at Jamari River (see Silva 1993 for more details about the type locality), Vila Cachoeira de Samuel (08°45′S, 63°27′W, ca. 100 m asl), municipality of Porto Velho, state of Rondônia, Brazil (Fig. 5). The holotype and ten additional paratypes were previously catalogued in the CEPB collection but, unfortunately, the association of each specimen with the old numbers was lost.

Paratypes.—Sixteen specimens, all from Brazil: 10 (6 females and 4 males), with same data as the holotype (MPEG 17909–11, 17916–17, MPEG 17922, and MPEG 17967–70); female (MPEG 23965) collected on 25 March

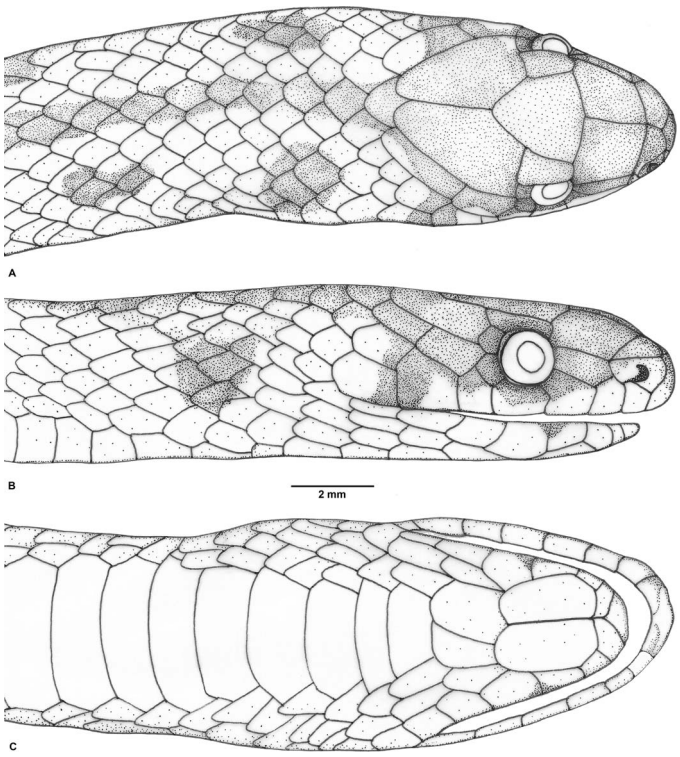

Fig. 5.—Dorsal (A), lateral (B), and ventral (C) views of head of the holotype of *Atractus boimirim* (MPEG 17908) from Jamari River, Vila Cachoeira do Samuel, Porto Velho, Rondônia, Brazil.

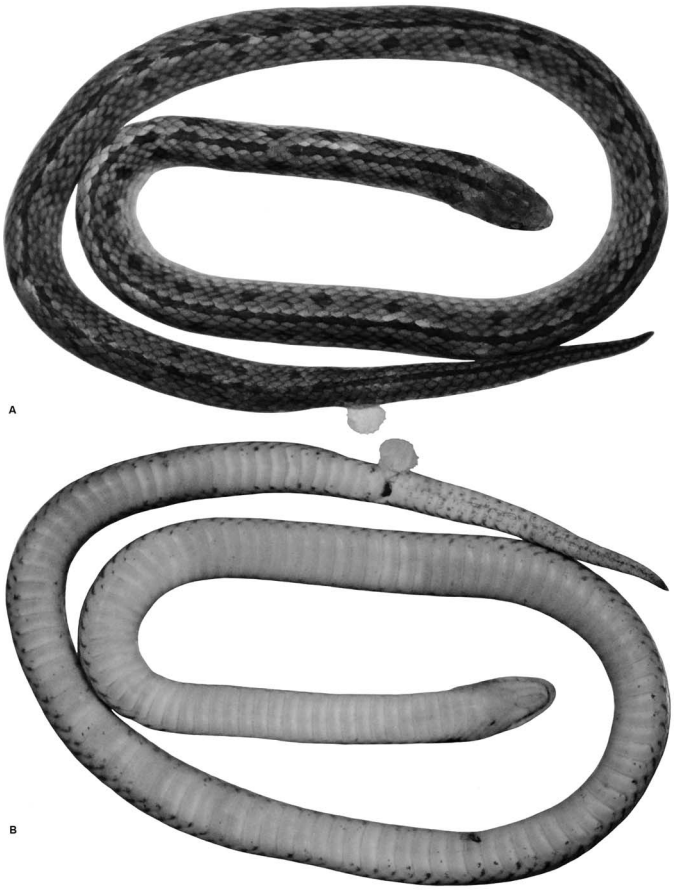

Fig. 6.—Dorsal (A) and ventral (B) views of the holotype *Atractus boimirim* (MPEG 17908) from Jamari River, Vila Cachoeira do Samuel, Porto Velho, Rondônia, Brazil.

2009 at surroundings of Jaci-Paraná River, tributary of Madeira River, during the faunal rescue for the implantation of the Jirau Hydroelectric Power Plant (09°15′S, 64°38′W, ca. 60 m asl), municipality of Porto Velho, Rondônia; female (MPEG 25259) and male (MPEG 25260) collected by J. Frota between January and March 2010 and (MPEG 21233) collected by M. Hoogmoed on 5 February 2005 at Sapopema base camp (04°40′S, 56°32′W, ca. 145 m asl), Parque Nacional da Amazônia, municipality of Itaituba, state of Amazonas; female (MNRJ 24864, formerly MPEG 22638), collected by T. Avila-Pires on 27 January 2008 at Capiranga base camp (02°28′S, 56°09′W, ca. 30 m asl), municipality of Juruti, state of Pará.

Diagnosis.—*Atractus boimirim* can be distinguished from all congeners by the following combination of characters: (1) smooth dorsal scale rows 15/15/15; (2) postoculars two; (3) loreal moderately long; (4) temporal formula usually 1+2; (5) supralabials seven, third and fourth contacting eye; (6) infralabials seven, usually first four contacting chinshields; (7) maxillary teeth seven; (8) gular scale rows three; (9) preventrals usually two; (10) ventrals 150–162 in females, 143–154 in males; (11) subcaudals 18–23 in females, 23–28 in males; (12) in preservative, dorsum pale brown with a series of alternating black spots usually completely separated by a conspicuous black vertebral stripe sometimes interrupted on the posterior region of body; (13) venter uniformly creamish white or scattered with brown dots concentrated on lateral portions of ventral scales; (14) maximum body size moderate in females (390 mm SVL), small in males (270 mm SVL); (15) tail size small in females (8.3–9.9% SVL), moderately long (12.2–13.7% SVL) in males; (16) hemipenis moderately bilobed, noncapitate, and slightly calyculate.

Comparisons.—Among all congeners, *A. boimirim* shares only with *A. schach*, *A. major*, and *A. punctiventris* a pale brown to beige dorsum with white-bordered black marks on the paravertebral region, seven upper and lower labials, and five to seven maxillary teeth. *Atractus boimirim* differs from *A. major* and *A. schach* by having 15 dorsal scale rows, alternating spots restricted to one flank side, usually separated from those on the opposite side by a conspicuous vertebral line, and venter uniformly cream or with a few brown dots on lateral margins of ventral scales (vs. 17 scale rows, wide transverse blotches crossing vertebral region and venter creamish white, usually with median longitudinal line formed by the arrangement of centered, round, dark brown spots or scattered with brown spots or blotches in both species); from *A. punctiventris* by having seven maxillary teeth (vs. five or six), usually four gular scale rows (vs. three), 150–161 ventrals in females and 143–147 in males (vs. 170–183 in females and 155–162 in males), 18–23 subcaudals in females and 23–28 in males (vs. 27–34 in females and 32–33 in males), dorsum of body anteriorly with a conspicuous black vertebral stripe separating alternated spots (vs. dorsal blotches crossing vertebral region and lacking such stripe), and belly generally immaculate creamish white or covered with a few disperse dots (vs. belly creamish white usually

FIG. 7.—Color pattern variation of *Atractus boimirim*, in preservative, from Juruti (A = MNRJ 24864; subadult female) and Itaituba (B = MPEG 25260; juvenile male), Pará, Brazil.

with a conspicuous midventral stripe formed by linear arrangement of central dots).

With respect to the other cis-Andean species of *Atractus* from South American provinces of Morrone (2014), *A. boimirim* differs from *Atractus alphonsehogei* Cunha and Nascimento 1983, *Atractus altagratiae* Passos and Fernandes 2008, *A. badius* (Boie 1827), *Atractus caxiuana* Prudente and Santos-Costa 2006, *Atractus collaris* Peracca 1897, *Atractus favae* (Filippi 1840), *Atractus flammigerus* (Boie 1827), *Atractus fuliginosus* (Hallowell 1845), *Atractus hoogmoedi* Prudente and Passos 2010, *Atractus latifrons* (Günther 1868), *Atractus limitaneus* Amaral 1935, *A. major*, *Atractus natans* Hoogmoed and Prudente 2003, *Atractus snethlageae* Cunha and Nascimento 1983, *Atractus torquatus* (Duméril, Bibron, and Duméril 1854), *A. univittatus* (Jan 1862), and *Atractus zidoki* Gasc and Rodrigues 1979 by having 15 dorsal scales rows (vs. 17). The new species shares 15 dorsal scale rows with the following congeners from aforementioned region: *Atractus albuquerquei* Cunha and Nascimento 1983, *Atractus avernus* Passos, Chiesse, Torres-Carvajal and Savage 2010, *Atractus boettgeri* Boulenger 1896, *Atractus charitoae* Silva 2004, *Atractus edioi* Silva, Silva, Ribeiro, Souza and Souza 2005, *A. elaps*, *Atractus emmeli* Boettger 1888, *Atractus franciscopaivai* Silva 2004, *Atractus heliobelluomini* Silva 2004, *Atractus occipitoalbus* (Jan 1862), *Atractus orcesi* Savage 1955, *Atractus paravertebralis* Henle and Ehrl 1991, *Atractus poeppigi* (Jan 1862), *Atractus taeniatus* Griffin 1916, and *Atractus trilineatus* Wagler 1828. *Atractus boimirim* differs from all of them by having a brown dorsum with alternating black spots frequently separated from those on the opposite side by a vertebral black stripe and a conspicuous descending postocular stripe (vs. dorsum variable but never with alternated black blotches separated by vertebral line and having a conspicuous descending postocular stripe). *Atractus boimirim* also differs from the Pantepui species *A. insipidus*, with which it was previously confused (see Passos et al. 2013a), by having 143–154 ventral and 23–28 subcaudal scales in males (vs. 157 ventral and 34 subcaudals in the single known male).

FIG. 8.—General view in life of the body and detailed view of the left side of the head of *Atractus boimirim* (A = MPEG 23965; female) from Jirau Hydroelectric Power Plant, Porto Velho, Rondônia and general view in life of *Atractus tartarus* (B = MNRJ 16511; holotype) from Vila Palestina, Rondon do Pará, Pará, Brazil. Photos 8A and 8B by "Systema Naturae Ltda" and R. Bérnils, respectively. A color version of this figure is available online.

Description of the holotype.—Adult male, SVL 270 mm, tail length 36 mm (13.3% SVL); head slightly distinct from body; head length 11.4 mm (4.2% SVL); head width 5.9 mm (52% head length); rostral–orbit distance 3.2 mm; nasal–orbit distance 2.0 mm; interorbital distance 3.6 mm; head flattened in lateral view; snout rounded in dorsal view, truncate in lateral view; canthus rostralis little conspicuous;

rostral subtriangular in frontal view, 1.9 mm wide, 1.3 mm high, well visible in dorsal view; internasal 0.7 mm long, 1.1 mm wide; internasal suture sinistral with respect to prefrontal suture; prefrontal 2.0 mm long, 2.1 mm wide; supraocular subtrapezoidal, 1.6 mm long, 0.9 mm wide at broadest point; frontal pyramidal, 3.0 mm long, 2.4 mm wide; parietal 4.1 mm long, 2.3 mm wide; nasal entirely divided, nostril almost restricted to prenasal; prenasal 0.7 mm high, 0.3 mm long; postnasal 0.6 mm high, 0.5 mm long; loreal 1.4 mm long, 0.4 mm high; second and third supralabials contacting loreal; eye diameter 1.5 mm; pupil rounded; two postoculars similar in height; upper postocular 0.6 mm long, 0.5 mm high; lower postocular narrowing ventrally; temporal formula 1+2; first temporal 2.2 mm long, 1.5 mm high; upper posterior temporals fused, 1.9 mm long, 0.8 mm wide; supralabials seven, third and fourth contacting eye; first supralabial shorter (0.7 mm high) than second (1.0 mm high) and similar in length; third supralabial similar in height and longer (1.1 mm) than second; sixth supralabial taller (1.4 mm) and seventh longer (1.8 mm) than remaining supralabials; symphysial subtriangular, 1.4 mm wide, 0.7 mm long; first pair of infralabials preventing symphysial–chinshields contact; infralabials seven, first four contacting chinshields; chinshields 2.7 mm long, 1.2 mm wide; gular scale rows three; preventral one; ventrals 148; subcaudals 25/26 respectively from left to right side; dorsal scale rows 15/15/15, lacking apical pits and supracloacal tubercles; mid-body diameter 7.6 mm (2.8% SVL); long and very acuminate caudal spine. Maxillary bone arched upward anteriorly in lateral view, ventral portion curved on anterior and nearly flattened on median to posterior portion; maxillary with seven teeth; teeth angular in cross section, robust at base, narrower at apices, curved posteriorly; first two teeth smaller and closer spacing; third to fifth teeth large, moderately spaced, similar in size; last two teeth gradually reduced in size and spacing; maxillary diastema absent or indistinct from interspaces between fifth and sixth teeth; last two teeth smaller and less spaced than the anterior teeth; lateral process of maxilla well developed.

Dorsum of head brown with some beige spots covering rostral and internasals; dorsal ground color of head brown, extending to end of parietals; background of head brown, extending to dorsal edges of supralabials, except for third to fifth supralabials in which brown pigmentation extends to their lower half; lateral sides of head with conspicuously descending postorbital brown stripe ranging from postocular and anterior temporal scales to posterior region of sixth and anterior portion of seventh supralabial; posterior lower temporal and lower occipital scales cream, forming light area (cream) on lateral sides of head; infralabials and gular region uniformly cream; venter cream with few dispersed brown dots on lateral region of ventral scales; ventral surface of tail cream with brown dots concentrated on anterior and median sutures between subcaudals; dorsal ground color pale brown with conspicuous black vertebral stripe and 35/32 black blotches on right and left sides, respectively; vertebral stripe (one scale wide in most of its extension) connected to cephalic-cap and extends to end of tail; vertebral stripe interrupted at some points in posterior region of body and having less than one scale of width; first body blotch (= nuchal band; three to four scales wide and long) not connected to cephalic-cap; other dorsal marks (spots) gradually decreasing in size from anterior (two scales wide and long) to posterior (one scale wide and long) region of body; posterior body marks less conspicuous; interspaces between spots covered with dispersed straight narrow lines (one scale long) from second to sixth scale row; first dorsal scale row cream with invasion of brown pigment on posterior region of each scale; dorsal surface of tail pale brown with conspicuous vertebral stripe extending to terminal scale (Figs. 5–6).

Color pattern of juveniles in preservative.—Immature specimens usually with conspicuous, uninterrupted, black vertebral stripe; occasionally, black nuchal band interrupted or connected to vertebral stripe; vertebral stripe sometimes restricted to anterior third of body; black dorsal spots smaller (one or two scale long and wide; Fig. 7B).

Color pattern variation of adults in preservative.—Dorsum of head brown from rostral to parietal shields; snout region occasionally with beige to pale brown spots or dots covering rostral, internasals, and loreal scales; pale brown pigment irregularly distributed above parietal region; sides of head brown usually at level of upper margins of supralabials; supralabials mostly creamish white with brown pigmentation occasionally reaching labial border on third and fourth supralabials, and dark brown dots covering anterior region of sixth and posterior region of seventh supralabial; blotches above sixth and seventh supralabial connected to descending dark brown postocular stripe; postocular stripe generally two scales wide, extending from postocular region to supralabials; symphysial, first pair of infralabials, and anterior region of chinshields occasionally scattered with a few brown irregular dots anteriorly concentrated; venter usually uniformly creamish white, occasionally with small brown dots concentrated on lateral region of ventral scales; occasionally, brown dots covering entire anterior surfaces of ventral scales; underside of tail creamish white with brown dots concentrated on suture between paired subcaudals; tail occasionally mostly brown by high concentration of dispersed brown dots or spots; dorsal ground color of body beige to pale brown with 30–60 dark brown, light-bordered (creamish brown) marks on vertebral region (blotches) or restricted to flanks (spots), and small dots on interspaces between main dorsal marks; anterior dorsal marks usually broad and eventually connected to blotch from opposite side, forming conspicuously black nuchal collar (four scales long); black vertebral line (one to one and half scales wide) connected to black cephalic-cap and generally extending to tail ($n = 6$), separating spots on each side of body; vertebral line occasionally interrupted in some regions along body axis ($n = 3$); vertebral line sometimes restricted to anterior region of body ending at level of eighth to 15th ventral scale ($n = 4$); more rarely ($n = 1$) vertebral stripe entirely replaced by blotches (three scales wide and long); alternate spots occasionally reduced in size (one scale long and two scales wide) and not connected to vertebral line or to brown paraventral dots; brown dots between dorsal marks generally fuzzy and located on scale edges; paraventral dots usually restricted to dorsal margins of first dorsal scale row; generally main dorsal marks (blotches and spots) and paraventral dots with ill-defined, lighter (cream) border (one or one-half scale wide; Figs. 6–7).

Color in life.—Dorsum of head brown, with snout region brown broadly suffused with yellow; supralabials yellow,

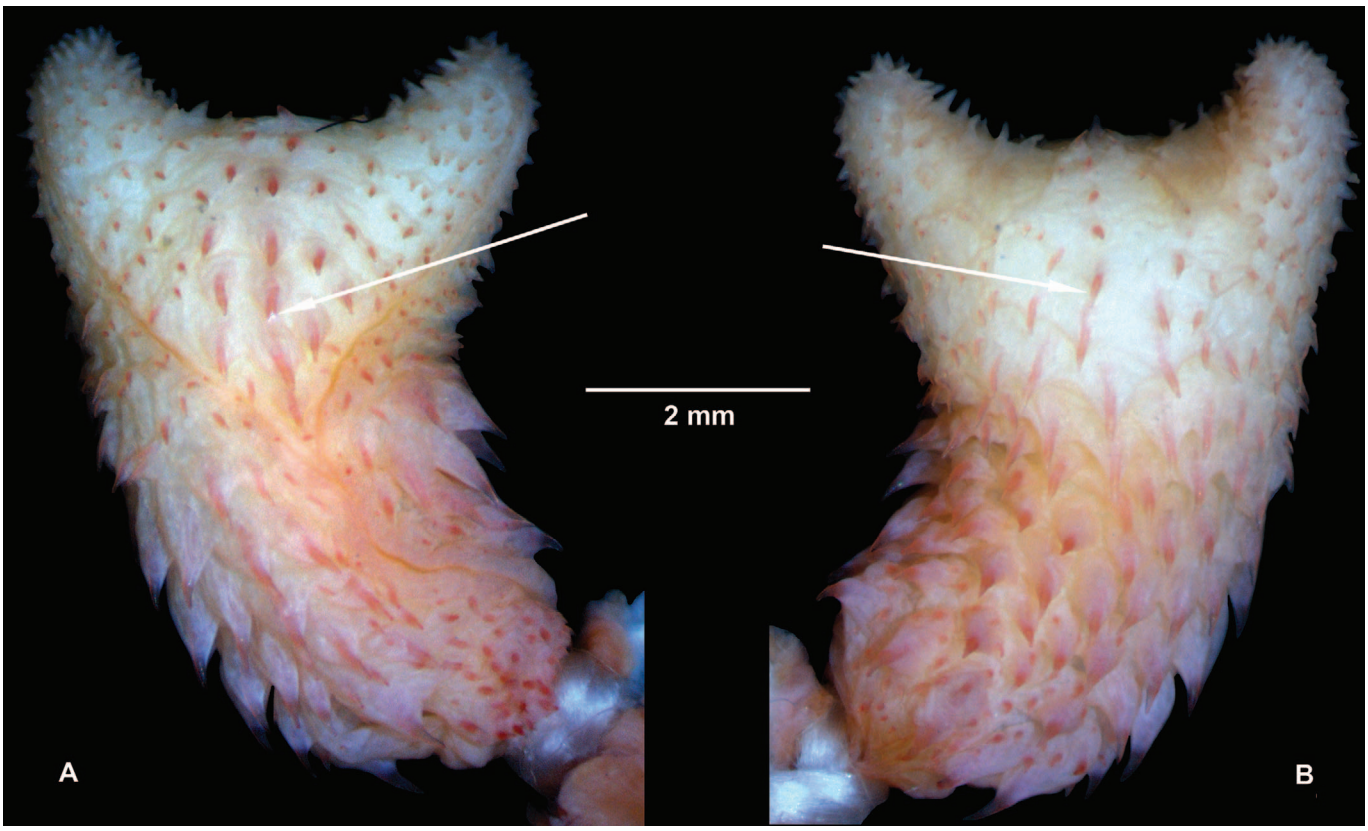

Fig. 9.—Sulcate (A) and asulcate (B) sides of hemipenis of the holotype of *Atractus boimirim* (MPEG 17908) from Vila Cachoeira do Samuel, Porto Velho, Rondônia, Brazil. White arrows indicate alary spines. A color version of this figure is available online.

marked with fuzzy brown dots on third and fourth and dark brown spots on posterior region of sixth and anterior portion seventh supralabials; dark brown or black postocular stripe connected to spots on sixth and seventh supralabials, forming descending postocular stripe; infralabials, gular region, and venter creamish yellow; belly creamish yellow with dispersed brown dots usually restricted to lateral portion of ventral scales; ventral surface of tail nearly brown due to heavy concentration of small brown dots; dorsal ground of body dark reddish to orange brown with alternated black marks; black marks with lighter border (beige) little evident; dorsal edges of second dorsal scale row black; first dorsal scale rows creamish yellow (Fig. 8A).

Hemipenial morphology.—Organ in situ bifurcating and extending at level of seventh subcaudal. Fully everted and maximally expanded hemipenis (MPEG 17908) moderately bilobed, noncapitate, and slightly calyculate; lobes attenuated, centrifugally oriented, and lobular region wider than hemipenial body; lobes ornamented on their bases by poorly defined calyces, more evident on asulcate side of hemipenis; calyces replaced by conspicuous papillae toward apices of lobes; tip of lobes uniformly scattered with vertically oriented robust papillae; intralobular area with median projection somewhat directed upward, ornamented with robust papillae; distal portion of hemipenial body from both sides of organ ornamented with few alary spines (sensu Passos et al. 2013d); region inside sulcus spermaticus branches with three longitudinal series of alary spines; spines arranged with five longitudinal series on center and with three on each lateral row; central area from asulcate side of organ almost nude, with very few and poorly developed spines; hemipenial body with irregular flounce (apparently caused by connection of basal region of alary spines) for about half of their length; capitular groove indistinct in both sides of organ, and hemipenis lacking change in ornamentation (= absence of capitulum, see discussion for more details); hemipenial body at level of first irregular flounce to its proximal region uniformly scattered with hooked spines large at their bases; larger spines located laterally below sulcus spermaticus bifurcation; sulcus spermaticus bifurcates for about half of organ with each branch centrifugally oriented, running to tip of lobes; sulcus spermaticus margins relatively narrow, deep, and smooth; sulcus spermaticus bordered by papillae from base to apices of lobes; basal naked pocket restricted to most basal region of organ; proximal region of hemipenis with longitudinal plicae and dispersed small spines (Fig. 9).

Meristic and morphometric variation.—Largest male 270 mm SVL, tail length 36 mm; largest female 390 mm SVL, tail length 38 mm; tail 12.2–13.7% SVL (mean = 12.9, SD = 0.6, $n = 5$) in males, 8.3–9.9% (mean = 9.3, SD = 0.5, $n = 8$) in females; body diameter 3.0–4.8 (mean = 3.8, SD = 0.7, $n = 6$) in males, 3.5–9.1 (mean = 4.6, SD = 2.0, $n = 8$) in females; ventrals 143–154 (mean = 146.5, SD = 4.0, $n = 6$) in males, 150–162 (mean = 156.1, SD = 4.6, $n = 10$) in females; subcaudals 23–28 (mean = 25.4, SD = 1.5, $n = 6$) in males, 18–23 (mean = 20.3, SD = 1.9, $n = 8$) in females; infralabials contacting chinshields 3 ($n = 2$ sides) or 4 ($n = 28$ sides); temporal formulae 1+2 ($n = 21$ sides) or 2+2 ($n = 1$ side); preventrals 1 ($n = 1$), 2 ($n = 12$) or 3 ($n = 5$); dorsal

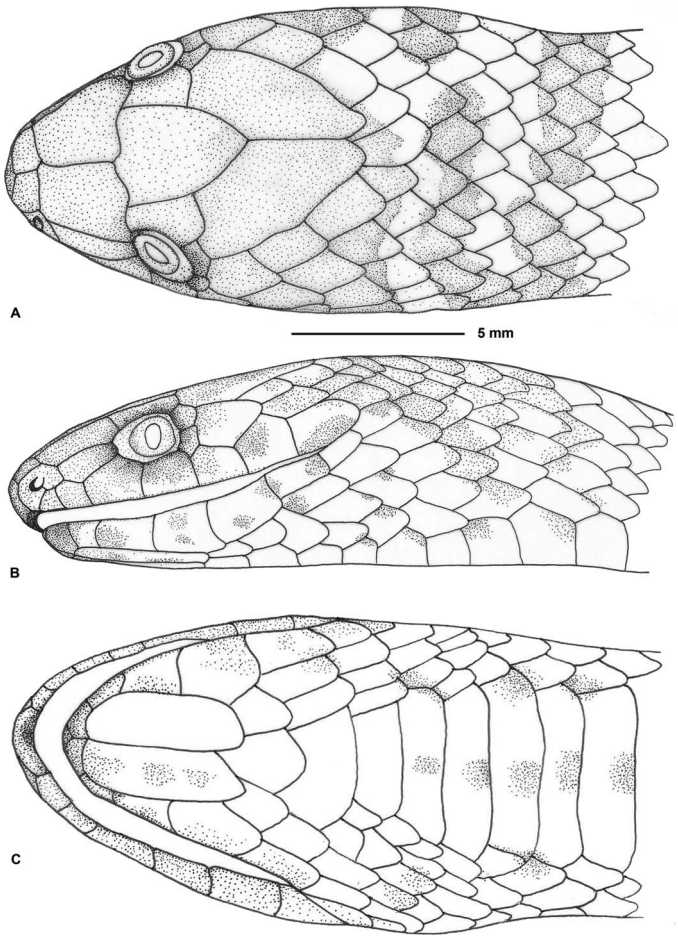

Fig. 10.—Dorsal (A), lateral (B), and ventral (C) views of head of the holotype of *Atractus tartarus* (MNRJ 16511) from Vila Palestina, Rondon do Pará, Pará, Brazil.

scales rows at the level of second subcaudal 6–9 (mean = 7.5, SD = 0.8, n = 32 sides); retracted hemipenis extends and bifurcates at level of sixth to seventh subcaudal (n = 4).

Etymology.—The specific epithet "*boimirim*" is a Tupi indigenous name (the linguistic branch of most Brazilian Indians), here employed as a noun in apposition alluding to the small body size of the new species (*bóî* = snake; *mirim* = small). The spelling ('m) with the prefix 'm before the snake radical *bóî* is optional in some variants of the Tupi-Guarani vocabulary (see Amaral 1977 for examples).

Distribution.—Western portion of Brazilian Amazonia, from the municipality of Porto Velho, in the state of Rondônia, northwest to the municipalities of Itaituba and Juriti on the interfluvium of the Madeira and Tapajós Rivers. *Atractus boimirim* occurs in Amazonian rainforest at 30–145 m elevations (Fig. 4).

Atractus ***tartarus*** sp. nov.
(Figs. 8B–13, Table 1)

Atractus insipidus Cunha and Nascimento 1983:10 [MPEG 336]

Holotype.—Adult male (MNRJ 16511) collected by R.S. Bérnils, H. Wogel, and P.S. Abe on 07 February 2008 at Vila Palestina (04°40′S, 47°56′W, ca. 200 m asl), municipality of Rondon do Pará, state of Pará, Brazil (Fig. 9).

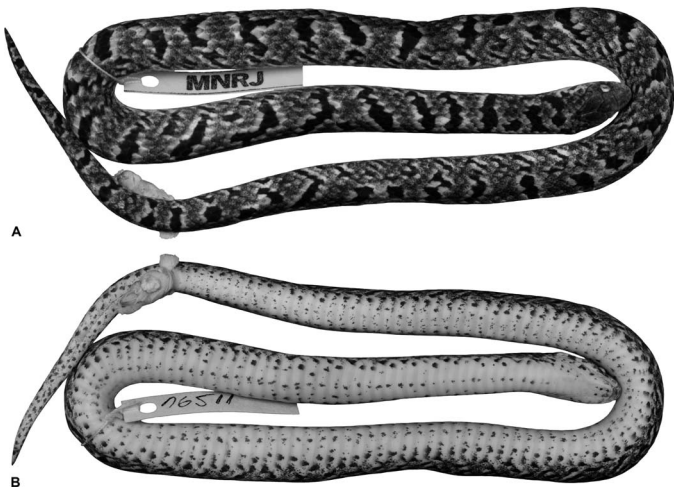

Fig. 11.—Dorsal (A) and ventral (B) views of the holotype of *Atractus tartarus* (MNRJ 16511) from Vila Palestina, Rondon do Pará, Pará, Brazil.

Paratypes.—Fifteen specimens, all from the state of Pará in Brazil, except for adult female (MPEG 336) collected by J. Davis at Belém–Brasília Highway, municipality of Carolina (07°20′S, 47°28′W, ca. 155 m asl), state of Maranhão. Juvenile male (CHUFC 1386) collected by R.B. Marques on 08 October 1988 at ESSEX Mining, near Igarapé Jabuti (04°14′S, 53°28′W, ca. 150 m asl); adult male (MNRJ 18035) collected by R.B. Castro, P. Yumi, and B. Ueoka on 26 October 2008 and adult female (MNRJ 18039) collected on 29 January 2009 at municipality of Parauapébas (06°04′S, 49°54′W, ca. 170 m asl); adult male (MPEG 22991) collected on 12 November 2004 by Elildo Jr. at Barragem da Pêra (06°02′S, 50°08′W), municipality of Parauapébas; adult male (IBSP 47078) from municipality of Tucuruí (03°46′S, 49°40′W, ca. 60 m asl); adult male (MNRJ 24363) collected on 25 July 2013 and female (MNRJ 24364) collected on 03 August 2013 by W. Vaz during the faunal rescue from Belo Monte Hydroelectric Power Plant at municipality of Vitória do Xingú (02°53′S, 52°00′W, ca. 15 m asl); adult male (MUFAL 10445, a damaged specimen without head) collected on 04 May 2011, adult male (MUFAL 10462) and female (MUFAL 10447) collected on 30 June 2011 at Floresta Nacional de Carajás (06°00′S, 50°30′W, ca. 400 m asl), municipality of Parauapébas; adult (MPEG 23929) and juvenile (MPEG 23931) females collected on 06 November 2009 and juvenile male (MPEG 23930) collected on 27 November 2009 at Floresta Nacional do Tapirapé-Aquiri (05°35′S, 50°24′W), municipality of Marabá; and adult female (MPEG 12373) collected at municipality of Canaã de Carajás (06°32′S, 49°51′W, ca. 300 m asl).

Diagnosis.—*Atractus tartarus* can be distinguished from all congeners by the following combination of characters: (1) smooth dorsal scale rows 15/15/15; (2) postoculars two; (3) loreal moderately long; (4) temporal formulae usually 1+2; (5) supralabials seven, third and fourth contacting eye; (6) infralabials seven, first four contacting chinshields; (7) maxillary teeth nine to eleven; (8) gular scale rows three; (9) preventrals one or two; (10) ventrals 154–169 in females, 146–157 in males; (11) subcaudals 23–31 in females, 29–38 in males; (12) in preservative, dorsum, varying from beige to brown with a series of small black spots or irregular black blotches light-bordered more or less conspicuously; (13) in

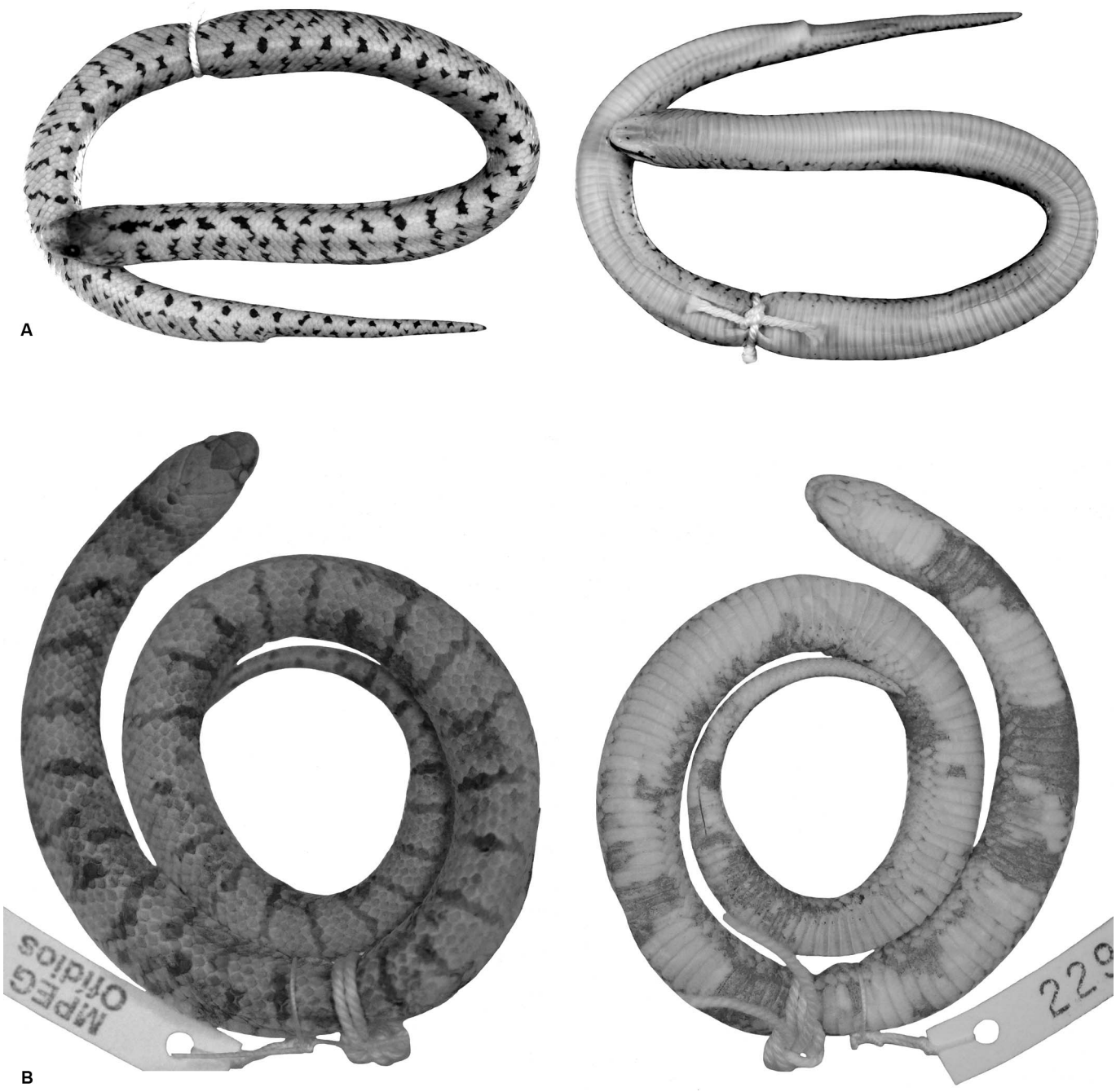

Fig. 12.—Color pattern variation of juvenile specimens of *Atractus tartarus*, in preservative, from Igarapé Jaboti (A = CHUFC 1386; male) and Barragem Pêra (B = MPEG 22991; male), Parauapébas, Pará, Brazil.

preservative, venter uniformly creamish white or with brown dots on the lateral portions of ventral scales; (14) maximum body size large in females (570 mm SVL), moderately long in males (365 mm SVL); (15) tail moderately long in females (9.7–13.6% SVL), long in males (15.5–18.1% SVL); (16) hemipenis moderately bilobed, semicapitate, and semicalyculate.

Comparisons.—Among all congeners, *A. tartarus* shares only with *A. boimirim* and *A. punctiventris* 15 dorsal scale rows, a beige to brown dorsum with black marks (spots or blotches) frequently light-bordered on the flanks, seven upper and lower labials, and a creamish white venter frequently with longitudinal lines caused by regular arrangement of the dots, blotches, or both. *Atractus tartarus* differs from both species by having nine to eleven maxillary teeth (vs. five to six maxillary teeth in *A. punctiventris* and seven maxillary teeth in *A. boimirim*). Additionally, *A. tartarus* differs from *A. boimirim* by having a semicapitate and strongly calyculate hemipenis and lacking a black descending postocular stripe (vs. hemipenis noncapitate and with few well-defined lobular calyces and presence of a conspicuous black descending postocular stripe) and distinct values in the meristic and morphometric characters examined (Table 1); from *A. punctiventris* by having four infralabials in contact

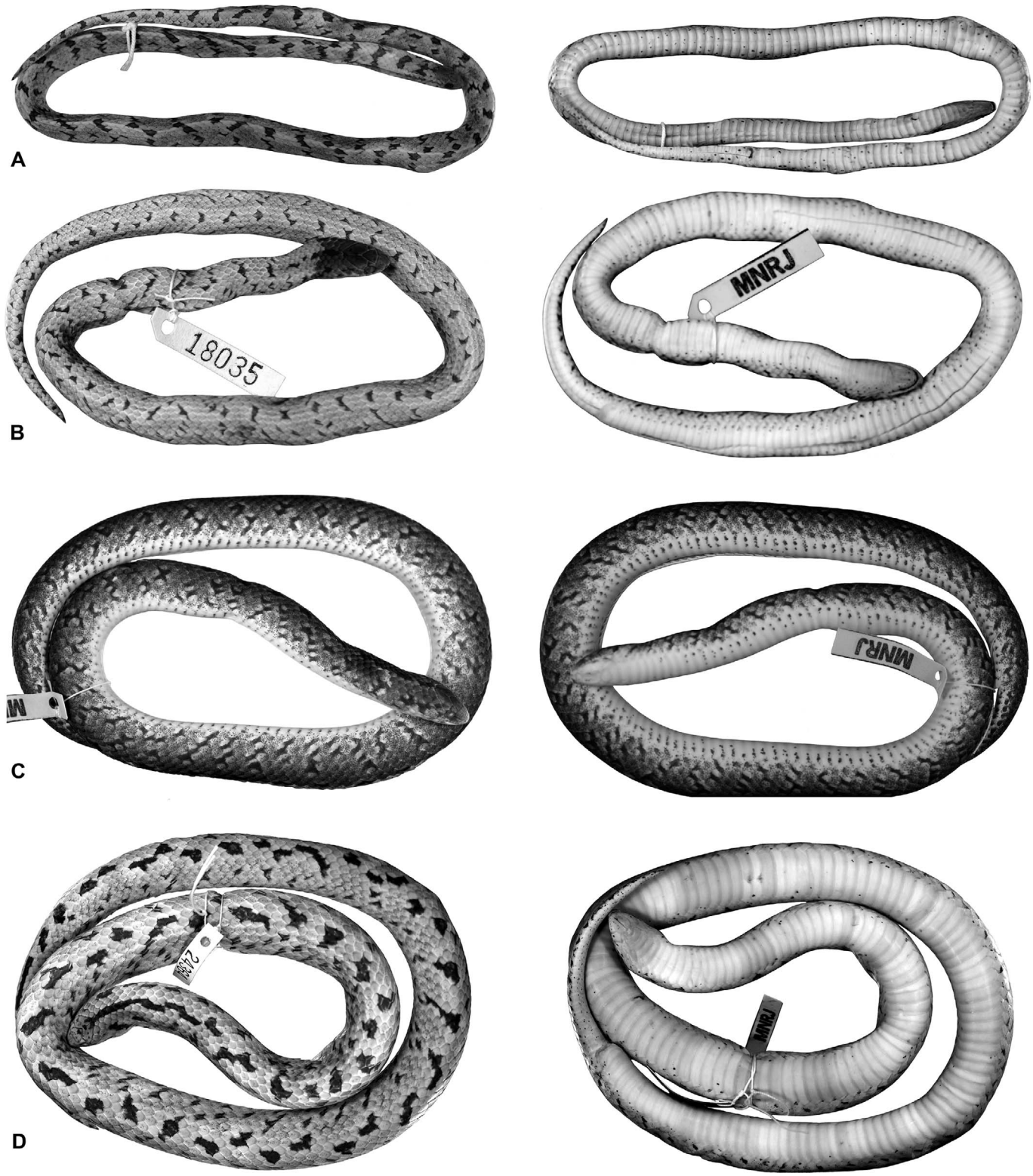

Fig. 13.—Color pattern variation of adult specimens of *Atractus tartarus*, in preservative, from Tucuruí (A = IBSP 47078; male), Parauapébas (B, C = MNRJ 18035 and 18039; male and female, respectively), and Altamira (D = MNRJ 24363; female), Pará, Brazil.

with chinshields and 154–169 ventrals in females and 146–157 in males, (vs. three infralabials contacting chinshields and 170–183 ventrals in females and 155–163 in males).

With respect to cis-Andean species of *Atractus* from provinces of Morrone (2014), *A. tartarus* differs from *A. alphonsehogei*, *A. altagratiae*, *A. badius*, *A. caxiuana*, *A. collaris*, *A. favae*, *A. flammigerus*, *A. fuliginosus*, *A. hoogmoedi*, *A. latifrons*, *A. limitaneus*, *A. major*, *A. natans*, *A. schach*, *A. snethlageae*, *A. torquatus*, *A. univittatus*, and *A. zidoki* by having 15 dorsal scales rows (vs. 17). The new

species shares 15 dorsal scale rows with the following congeners found in these provinces: *A. albuquerquei*, *A. avernus*, *A. boettgeri*, *A. charitoae*, *A. edioi*, *A. elaps*, *A. emmeli*, *A. franciscopaivai*, *A. heliobelluomini*, *A. occipitoalbus*, *A. orcesi*, *A. paravertebralis*, *A. poeppigi*, *A. taeniatus*, and *A. trilineatus*. *Atractus tartarus* differs from all of them by having a pale brown dorsum with white-bordered dark brown spots or wide blotches, paraventral region with irregular black spots on the first three dorsal scale rows, and venter uniformly creamish white or with small brown dots laterally arranged (vs. dorsum variable but never with dorsal blotches, paraventral region with irregular spots, and belly creamish white with few dots arranged in lines).

Description of the holotype.—Adult male, SVL 322 mm, tail length 50 mm (15.5% SVL); head slightly distinct from body; head length 13.9 mm (4.3% SVL); head width 7.2 mm (52% head length); rostral–orbit distance 3.7 mm; nasal–orbit distance 2.8 mm; interorbital distance 4.7 mm; cervical constriction slightly evident; head flattened in lateral view; snout rounded in dorsal view, truncate in lateral view; canthus rostralis conspicuous; rostral subtriangular in frontal view, 2.2 mm width, 1.2 mm high, scarcely visible in dorsal view; internasal 1.1 mm long, 1.0 mm wide; internasal suture sinistral with respect to prefrontal suture; prefrontal 2.7 mm long, 2.4 mm wide; supraocular subtrapezoidal, 1.9 mm long, 1.3 mm wide at broadest point; frontal subtriangular, 3.7 mm long, 3.0 mm wide; parietal 5.3 mm long, 2.7 mm wide; nasal entirely divided, nostril restricted to prenasal; prenasal 1.0 mm high, 0.4 mm long; postnasal 1.0 mm high, 0.5 mm long; loreal 2.3 mm long, 0.9 mm high; second and third supralabials contacting loreal; eye diameter 2.0 mm; pupil rounded; two postoculars similar in size; upper postocular 1.0 mm long, 0.6 mm high; temporal formulae 1+2; first temporal 2.2 mm long, 1.5 mm high; upper posterior temporals not fused, 2.1 mm long, 0.9 mm wide; supralabials seven, third and fourth contacting eye; first two supralabials similar in height and slightly shorter than third (2.0 mm long, 1.3 mm high); sixth supralabial longer (2.3 mm) and higher (1.6 mm) than remaining supralabials; symphysial subtriangular, 1.3 mm wide, 0.4 mm long; first pair of infralabials preventing symphysual–chinshields contact; infralabials seven, first four contacting chinshields; chinshields 4.3 mm long, 1.3 mm wide; gular scale rows three; preventral one; ventrals 148; subcaudals 29/30 respectively from left to right side; moderately long, robust, and slightly acuminate caudal spine; 15/15/15 dorsal scale rows, lacking apical pits and supracloacal tubercles; midbody diameter 7.6 mm (2.4% SVL). Maxillary bone arched upward anteriorly in lateral view, ventral portion curved in anterior and nearly flattened in median to posterior portion; maxillary arch with ten (right) and nine (left) maxillary teeth; teeth angular in cross section, robust at base, narrower at apices, curved posteriorly; first two or three smaller and closely spaced; fourth to eighth (right side) or seventh (left side) teeth large, moderately spaced, similar in size; last two teeth gradually reduced in size and spacing; maxillary diastema absent or equivalent to interspaces between seventh and eight teeth; last two teeth smaller and less spaced than the anterior teeth; lateral process of maxilla little developed or absent.

Dorsum of head brown with some pale brown or beige spots covering internasal and prefrontal shields; background of head brown, extending ventrally to lower half of supralabials; lateral sides of head brown with creamish white spots on supralabials and anterior temporal scales; posterior temporal scales brown; occipital scales brown; supralabials brown with invasion of creamish white pigment at labial margin or on anterior region of seventh supralabial; posterior part of seventh supralabial brown, covering half of scale; symphysial and first pair of infralabials brown suffused with dispersed cream pigment; second and third infralabials creamish white with brown dots concentrated anteriorly; fourth to sixth infralabials creamish white with brown spots posteriorly; seventh infralabial creamish white with brown spots anteriorly; chinshields creamish white with brown dots concentrated anteriorly and isolated brown spots (two/one on right/left, respectively); gular region creamish white with few brown spots covering anterior portions of each scale; belly uniformly creamish white until fourth ventral scale; from fifth ventral to midbody region scales with brown dots concentrated at center and brown spots on lateral region of each scale; median dots forming barely defined midline; posterior region of body with dots dispersed along entire scales, forming irregular pattern; lateral spots nearly irregular along entire body axis, not forming conspicuous lateral stripes; ventral surface creamish white heavily marked with diffuse brown spots and dots; dorsal ground color brown with 41 (body) +7 (tail) irregular black blotches lighter bordered (cream pigment one scale wide); black blotches anteriorly (one or two scales long) almost forming bands, covering about 10 transverse dorsal rows of scales; blotches after midbody fragmented into smaller, paired blotches almost restricted to paravertebral region; paraventral region with black dots (half scale wide) lighter-bordered (cream), usually connected to lower portion of dorsal blotches; paraventral region with slight reticulation caused by extension of dorsal blotches and distribution of irregular dots; dots on paraventral region extending to adjacent lateral portion of ventral scales (Figs. 10–11).

Color pattern of juveniles.—Dorsum of head beige with few dispersed brown dots; temporal region creamish white with dispersed dark brown dots; occipital region beige; first four supralabials beige and fifth to seventh creamish white; infralabial creamish white with few brown dots on posterior region of fourth and fifth supralabials; symphysial and gular creamish white (MPEG 22991) except for two isolated brown dots on anterior portion of chinshields (CHUFC 1386, MPEG 238930); ventral surface of body (venter and tail) uniformly creamish white (MPEG 22991) or with a few brown punctations on most-lateral part of some ventral and subcaudal scales adjacent to first dorsal scale row (CHUFC 1386, MPEG 238930); dorsal ground color creamish brown to beige with spots (one scale long and two or three scales wide) on vertebral region and narrow transverse striations (one to half scale wide) formed by fusion of irregular brown dots at flanks (CHUFC 1386, MPEG 238930); occasionally spots connected laterally forming conspicuous bands along entire body (MPEG 22991); body and tail with about 38–41 striations + 10–13 spots, respectively; transverse striations more or less straight anteriorly and frequently connected to vertebral spots; posterior striations irregular and more fragmented (CHUFC 1386, MPEG 238930) or conspicuous along entire body (MPEG 22991); transverse striation extending from second to seventh dorsal scale rows; first dorsal scale rows almost uniformly cream with few brown

dots; dorsal surface of tail with pattern similar to that of body, with larger dots on vertebral and smaller dots on paraventral regions (Fig. 12).

Color pattern variation of adults in preservative.—Dorsum of head beige to dark brown; sometimes snout region and prefrontal shields broadly scattered with dark brown or black dots; snout region occasionally with beige to pale brown dots covering rostral and internasals; lateral sides of head beige with few brown dots or predominantly brown at level of upper margins of supralabials; supralabials mostly beige with brown pigmentation occasionally reaching labial border on third and fourth supralabials, and dark brown dots covering anterior region of sixth and posterior region of seventh supralabial; first four or five supralabials generally darker (by high concentration of dark brown dots) than other supralabials; background of head generally with cream dots on temporal region; occipital region varying from beige with a few brown dots to dark brown with a few beige dots; symphysial, first pair of infralabials, and anterior region of chinshields creamish white anteriorly scattered with brown irregular dots; venter varying from almost uniformly creamish white ($n = 4$), with a few brown dots on lateral portions of ventral scales to creamish white ($n = 3$) or with high concentration of brown dots restricted to lateral portions of ventrals ($n = 3$), forming irregular lateral stripes along the body axis; ventral surface of tail creamish white with or without brown dots; dots when present concentrated on lateral portions of subcaudals; dorsal ground color of body beige to brown, with 27–57 dark brown or black marks (blotches or spots) on vertebral region and, eventually, extending laterally on flanks; first dorsal mark rarely fused with others on vertebral region (MNRJ 24364) and then forming irregular vertebral line extending at level of 14th ventral scale; specimens with darker ground color (MNRJ 16511, 18039, MUFAL 10445) generally with irregular blotches conspicuously lighter-bordered, except for (MUFAL 10447 and MNRJ 24363) which has lighter ground color and less contrasting edges; most frequently individuals with lighter coloration (MNRJ 18035, 24364, and MUFAL 10462) with edges hardly distinguished from general ground color after preservation; flanks with narrow transverse brown striations (one to one-half scale wide) by fusion of irregular brown spots at flanks; paravertebral striations usually connected to dorsal marks; striations eventually isolated from blotches or spots or completely fragmented in irregular brown dots reaching paraventral region; generally dark brown dots on paraventral with ill-defined lighter border (beige); most rarely individuals with small spots (one scale wide and long) restricted to vertebral region and without any marks on flank (MUFAL 10462). Interestingly, all specimens with darker dorsum have distinct lateral irregular stripes on venter, whereas all individuals with lighter dorsum have almost immaculate venter (Fig. 13).

Color in life.—Dorsum of head brown with temporal region suffused with yellow or red pigment; supralabials yellow, marked with brown dots on third and fourth and on fifth to seventh supralabials; mental region and venter creamish yellow; venter occasionally marked with linearly arranged brown dots on lateral portion of ventral scales, or not; ventral surface of tail creamish yellow with brown dots on lateral portions of subcaudals; dorsal ground color of body brown to reddish brown with black marks (blotches or spots) lighter bordered (brownish yellow). Specimens with brown ground color having dorsal marks conspicuously light bordered, whereas reddish individuals has less-evident pale edges (Fig. 8B).

Hemipenial morphology.—Organs in situ (retracted) extend at level of sixth to ninth subcaudal and bifurcate at level of sixth to eighth subcaudal ($n = 4$). Fully everted and maximally expanded hemipenes moderately bilobed, semicapitate, and semicalyculate; lobular region wider than hemipenial body; lobes conical and centrifugally oriented; lobes symmetrical (MNRJ 18035) or most frequently with the right (MNRJ 24363, IBSP 47078) or the left (MUFAL 10462, MNRJ 16511) lobe slightly longer; lobes uniformly covered with spinulate calyces on both sides of hemipenis; calyces on distal region of lobes sometimes ornamented with few and disperse spinules (MNRJ 24363); spinules gradually replaced by papillae toward apices of lobes; papillae occasionally restricted to tips of lobes (MNRJ 24364) or replacing papillae from base of each lobe (MNRJ 16511); basal and lateral regions of capitulum with irregular flounces apparently originated from connection of horizontal walls of calyces but lacking their vertical walls; calyces eventually with reduced thickness but maintaining with high concentration (MUFAL 10462, MNRJ 24363); calyculated flounces more conspicuous on lateral region and asulcate side of hemipenis; flounces sometimes extending laterally to base of lobes; occasionally, high concentration of deep calyces on asulcate side of organ generates median and lobular crests (MNRJ 18035, IBSP 47078); sometimes hemipenis having asulcate side densely concentrated with calyces lacking flounces and crests (MNRJ 16511); capitular groove well defined on asulcate side and less evident on sulcate side of hemipenis; capitulum varying from 30–40% length of hemipenial body; hemipenial body elliptical and scattered with large hooked spines; hemipenial body scattered with few large spine rows intercalated with small spines and nude areas (MUFAL 10462, MNRJ 24363) or densely covered with large spines without nude areas (MNRJ 16511, 18035, IBSP 47078); larger spines generally located laterally below sulcus spermaticus bifurcation; distal region of hemipenial body on maximally expanded organs sometimes forming prominent rows of spines similar to second capitulation; sulcus bifurcates for about half of organ with each branch centrifugally oriented, running to tip of lobes; sulcus spermaticus margins relatively narrow at level of division and expanded above capitular crotch; sulcus spermaticus bordered by spinules from base of organ to apices of lobes; concentration of spinules increasing on proximal region of organs with fewer large spines and nude areas (MUFAL 10462, MNRJ 24363); basal naked pocket restricted to most-basal region of hemipenial body; proximal region of hemipenis with longitudinal plicae and dispersed spinules (Fig. 14).

Meristic and morphometric variation.—Largest male 365 mm SVL, tail length 66 mm; largest female 570 mm SVL, tail length 71 mm; tail 15.5–18.1% SVL (mean = 16.9, SD = 0.8, $n = 9$) in males, 9.7–13.6% (mean = 11.8, SD = 1.7, $n = 7$) in females; body diameter 4.5–9.6 (mean = 6.9, SD = 1.9, $n = 9$) in males, 6.6–14.8 (mean = 9.6, SD = 3.0, $n = 5$) in females; ventrals 146–157 (mean = 152, SD = 3.8, $n = 9$) in males, 154–169 (mean = 160.6, SD = 6.0, $n = 6$) in females; subcaudals 29–38 (mean = 34.2, SD = 2.7, $n = 9$)

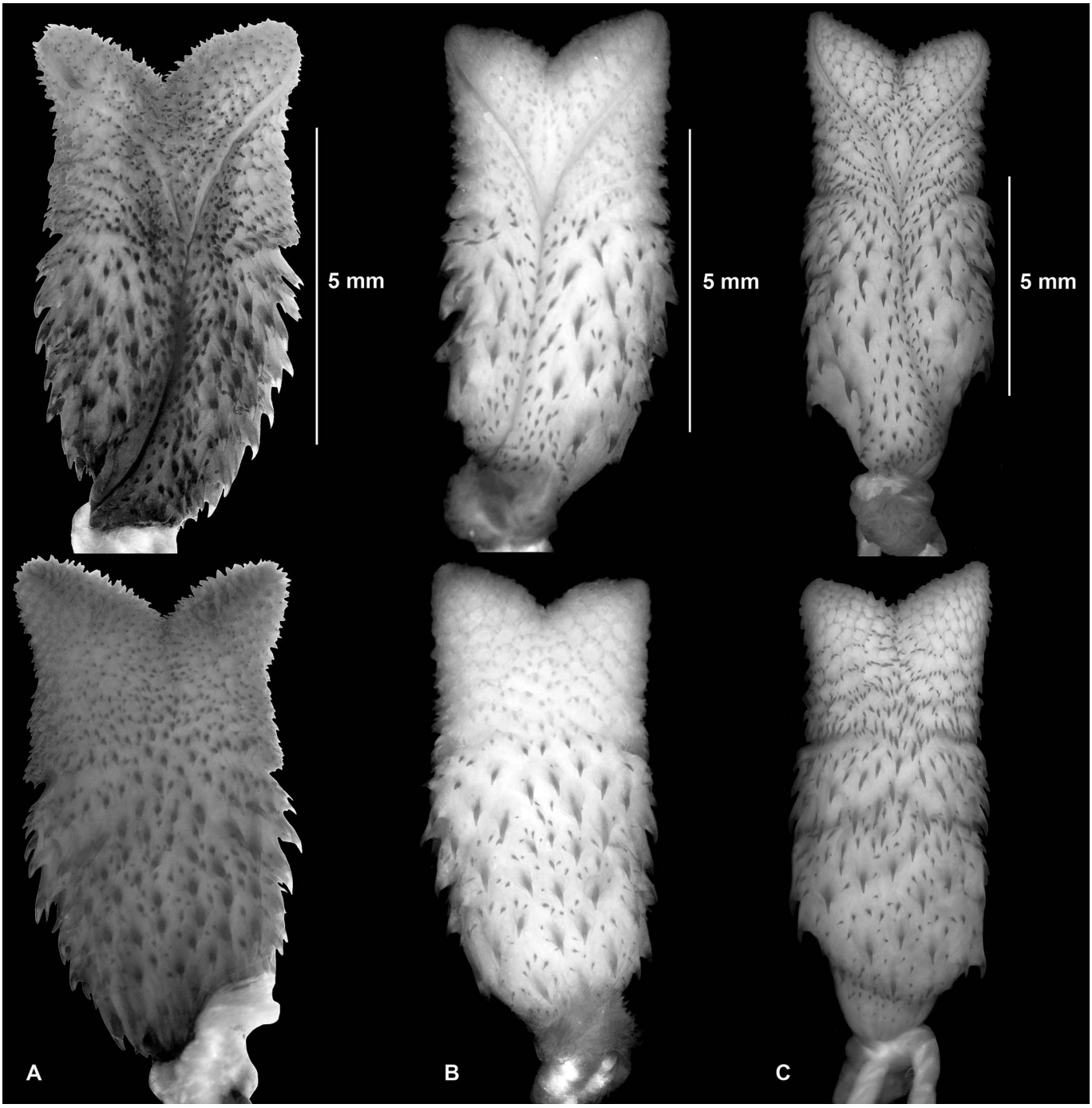

Fig. 14.—Hemipenial morphology variation of *Atractus tartarus* in sulcate (upper) and asulcate (lower) sides from Rondon do Pará (A = MNRJ 16511; holotype), Parauapébas (B = MUFAL 10462), and Altamira (C = MNRJ 24363), Pará, Brazil.

in males, 23–31 (mean = 27.4, SD = 3.0, $n = 7$) in females; preventrals 1 ($n = 5$) or 2 ($n = 7$); dorsal scales rows at level of second subcaudal 6–10 (mean = 7.5, SD = 0.9, $n = 28$ sides); maxillary teeth 9 ($n = 11$ sides), 10 ($n = 4$ sides), or 11 ($n = 3$ sides).

Etymology.—The specific epithet "*tartarus*" is a Latin substantive derived from the Greek word Tartaro (Ταρταρο). According to some Greek legends, Tartaros is a primordial god born from original Chaos. His relations with Gaia (one of the primordial deities, the personification of Earth in ancient Greek myths) generated the most-terrible beasts from Greek mythology. From another literary source, in the historical novel Iliad, Homer refers to *Tartarus* (Latin spelling) as an underground prison "as below Hades (Lord of the Netherworld) as the earth is from heaven" Homer (2008:137). This word is used here in reference to the massive mining activity in the distributional area of *A. tartarus* and also to the putative secretive habits of this species.

Distribution.—Eastern portion of Brazilian Amazonia, from the municipality of Vitória do Xingú, Pará, southeastern to the municipality of Carolina, Maranhão in the Tocantins-

Araguaia drainage. *Atractus tartarus* occurs in Amazon rainforest between 15–400 m elevation (Fig. 4).

Remarks.—*Atractus tartarus* shares some meristic, morphometric, and coloration features with *A. edioi* (i.e., 15 dorsal scale rows, similar number of ventral, subcaudal and gular scales rows, caudal length, and belly creamish white with brown spots on lateral regions of ventral scales). However, besides color pattern differences highlighted in the comparisons, *A. tartarus* differs from *A. edioi* by having the loreal scale and seven supralabials, third and fourth supralabials contacting orbit, seven infralabials, first four contacting chinshields, one or two preventral scales, and nine to eleven maxillary teeth (vs. lacking loreal scale and having five supralabials, second and third contacting orbit, six infralabials, first three contacting chinshields, three preventrals, and six maxillary teeth). *Atractus tartarus* also differs from the Pantepui species *A. insipidus*, with which it was previously confused (see Passos et al. 2013a), by having one or two preventrals, caudal length in males 15.5–18.1% SVL, dorsum with paraventral irregular spots on first three dorsal scale rows, and venter usually with dark brown spots dispersed or longitudinally arranged (vs. caudal length 13.6% SVL in the single male, and dorsum lacking paraventral brown spots).

The fact that *Atractus tartarus* is known so far from a region with intensive mining activity or much impacted by the construction of several hydroelectric plants is worrisome for its conservation status.

Discussion

We redescribe the holotype of *Atractus punctiventris* and report on the first additional specimens collected 80 yr after its original description. This large time lapse is not very surprising because the taxonomy of the genus is currently in a state of flux. Despite the high species richness in Colombia, the scientific collections of the country have been neglected until recently (Passos et al. 2009a,d,e; Passos and Prudente 2012; Passos et al. 2013b). Paradoxically, the number of snake samples from cis-Andean lowland regions of Colombia (i.e., Amazon and Llanos) is low as compared with the amount of specimens in collections from Andean highland or trans-Andean lowland areas of the country. This phenomenon has three main causes: (1) the logistic difficulties to access remote areas of the Amazon and Llanos; (2) security problems in certain areas; and (3) availability of many other attractive areas for field inventories of snakes in other regions of the country. Only in recent times have massive collections of snakes from cis-Andean lowlands of Colombia been gathered regularly through a standardized methodology (see Lynch 2015). However, based on its chorology and the aforementioned obstacles for collecting in some lowland regions of the country, we suspect that *A. punctiventris* may be restricted to the Andean piedmont in the region located between the highland sub-Andean forest and Llanos (Fig. 4).

Passos and Fernandes (2008) suggested putative affinities of *A. insipidus* and *A. punctiventris* with other cis-Andean congeners (*A. altagratiae*, *A. pantostictus* Fernandes and Puorto 1993, and *Atractus ronnie* Passos, Fernandes, and Borges-Nojosa 2007). Passos et al. (2010b) assigned the last three species to the *A. pantostictus* species group. However, the everted conditions of the hemipenes for *A. insipidus* is so far unknown (Passos et al. 2013a), and the association made by Passos and Fernandes (2008) was based on specimens identified tentatively as *A. insipidus* by Silva (1993) and Silva et al. (2005; now *A. boimirim*). Given our misunderstanding of the phylogenetic relationship of *Atractus* and its impressive diversity of species and forms, restriction of the comparative universe to morphologically similar taxa can improve significantly the taxonomic routine (= identifications) within the genus (Passos et al. 2013b,c,d). Thus new group proposals or species reallocations, as data gradually become available, represent a realistic approach to achieve and accommodate the real species diversity in the genus. Besides, such procedure results in hypotheses that can be tested in the future when a robust phylogeny is available for *Atractus* (Passos et al. 2013b,c,d).

Savage (1960) proposed the *Atractus badius* group for taxa which shared mainly the differentiated condition of the hemipenis (i.e., calyculate organs). However, Savage's observations were based on examination of retracted hemipenis, and the descriptions made using in situ organs may not reveal certain features (e.g., calyces; Schargel and Castoe 2003; Prudente and Passos 2010; Passos et al. 2013b). In fact, Hoogmoed (1980) pointed out that the hemipenis of *A. badius* is undifferentiated, contradicting the main group definition proposed by Savage (1960). As highlighted by Hoogmoed (1980), the previously widespread concept of *A. badius* differed from that based on the rediscovery of the types and resulted in the reappraisal of his taxonomic status. Nonetheless, we must interpret Hoogmoed's statement with certain precautions because the hemipenes descriptions were also based on the retracted organs only. Unfortunately, without a detailed description of its everted hemipenis, we cannot accurately infer the relationships of *A. badius* because the combination of morphological characters of the species is unique for the genus (i.e., coral pattern without complete rings; eight upper and lower labial scales; six or seven maxillary teeth; strongly bilobed hemipenis apparently lacking capitular groove and calyces). The only other species of *Atractus* with strict coralsnake mimetic patterns are those members of the *Atractus elaps* group and the Colombian giant species, *Atractus obesus* Marx 1960 and *Atractus titanicus* Passos, Arredondo, Fernandes and Lynch 2009. While the *A. elaps* group has aposematic coloration and likely represents a well-supported monophyletic group with unique maxillary dentition and cephalic plates arrangement (Savage 1960; Dixon et al. 1976; Passos 2008), the last two taxa are putative sister species closely related to other Colombian *Atractus* from the Cauca Valley (Vanegas-Guerrero et al. 2014).

The specimens examined and identified as *A. badius* by Savage (1960) refer to other banded–blotched Amazonian species of *Atractus* with 17 dorsal scale rows (e.g., *A. flammigerus*, *A. schach*, and *A. snethlageae*; see Schargel et al. 2013). Considering the old and new discoveries, the *A. badius* group at the moment only contains the nominal species and *A. major*, after Passos et al. (2009e) assigned *Atractus multicinctus* to its own group. Hence, some species included in Savage's concept of *A. badius* and having semicapitate and semicalyculate hemipenis (= differentiated condition of Savage 1960) have no formal group attribution (e.g., *A. flammigerus* and *A. schach*). Therefore, we here propose a new group to be named the *Atractus flammigerus*

Group, including the following species: *Actractus atratus* Passos and Lynch 2011, *A. flammigerus*, *A. fuliginosus*, *A. major*, *A. punctiventris*, *A. schach*, *A. snethlageae*, *A. tartarus*, and *A. univittatus*. This group shares the following exclusive combination of morphological characters: dorsal scales rows 17/17/17 (except *A. punctiventris* and *A. tartarus* having 15/15/15); maxillary bone with lateral process poorly developed or absent and without posterior projection; six to eleven maxillary teeth; dorsal ground color variable (lighter or darker), with wide irregular blotches or bands; dorsum with light marks alternating over darker ground color or dark marks alternating over lighter ground color; dorsum occasionally with vertebral line and irregular paravertebral spots (*A. univittatus*); belly creamish white with dark brown dots or spots usually restricted to median (except in *A. atratus* entirely dark brown; Passos and Lynch 2011) or lateral (*A. tartarus*) regions of the ventral scales, forming usually conspicuous midlines or lateral lines (*A. tartarus*); hemipenis moderately bilobed, semicapitate, and semicalyculate; hemipenis with prominent capitulum and usually having conspicuous medial and lobular crests (Passos and Lynch 2011). The hemipenes of *A. punctiventris* and *A. tartarus* exhibit the more widespread hemipenial condition in *Atractus* (i.e., semicapitate and semicalyculate organs; Passos et al. 2013c). Although these features are uninformative to inferring putative relationships to less-inclusive clusters of species, the occurrence of median and lobular crests on the asulcate side of the capitulum appears to be more restricted in the genus, although not unique to *A. flammigerus* and allied species (see Passos et al. 2013a). Nevertheless, *A. punctiventris* and *A. tartarus* share many other morphological characters with members of that group, and their allocation within the *A. flammigerus* group represents the best hypothesis while a robust phylogeny remains unavailable for the genus *Atractus*.

The hemipenis of *A. boimirim* is noncapitate, barely calyculate, and has the hemipenial body uniformly scattered with alary spines (Fig. 9), as found in the members of *A. pantostictus* group (Passos et al. 2010b). Passos et al. (2013d) highlighted that the alary spines mentioned in the description of *A. ronnie* (Passos et al. 2007b) and *A. altagratiae* (Passos and Fernandes 2008) likely represent a particular condition for the development of transverse walls of the calyces. In other words, this structure may be homologous to the calyces, having extreme reduction of their horizontal fringe and the complete loss of the vertical walls. Besides alary spines, *A. boimirim* shares with members of the *A. pantostictus* group other unusual hemipenial features such as the presence of a median projection on the distal region of the organ, an intrasulcar region somewhat projected upward, and reduction or loss of the capitulum and distal calyces (Fig. 9). Apparently, the median projection on the distal region of the hemipenis represents an exclusive feature of this group (Passos et al. 2010b). Moreover, all evidence suggests that the loss of capitation structures and calyces are also derived-state characters in the Subfamily Dipsadinae Bonaparte 1838 (sensu Grazziotin et al. 2012). We find these hemipenial conditions in four phenetic groups of *Atractus* and also in a single species not clustered to date: (1) in the *A. pantostictus* group (Passos et al. 2010b); (2) in the *A. collaris* group (Passos et al. 2013b); (3) in the *A. paucidens* Despax 1910 group (Passos et al. 2009e); (4) in the *A. elaps* group (Savage 1960); and (5) in *Atractus steyermarki* Roze 1958 (Passos et al. 2013a). Although none of these groups has been tested within a phylogenetic framework, they all have unique morphologies, and the loss of the capitulum may have evolved independently in each of them. The hemipenis of *A. boimirim* differs from those members of the *A. pantostictus* group in having the central area of the capitulum almost nude on the asulcate side of the hemipenis and by the lateral lobes projection being more developed (Fig. 9). However, both characteristics appear to be distinct conditions from reduction of the calyculate capitulum and lobes lateralization and are presumably homologous to the states displayed by group members. Therefore, we place *A. boimirim* in the *A. pantostictus* group on the basis of sharing similar unique hemipenial features for the genus.

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Resumo: Redescrevemos *Atractus punctiventris* baseado no exame de seu holótipo, dois topótipos e dois exemplares adicionais recentemente coletados. Descrevemos duas novas espécies de *Atractus* com 15 séries de escamas dorsais, previamente confundidas com *Atractus insipidus*, respectivamente para as porções leste e oeste da Amazonia brasileira. As novas espécies são reconhecidas com base em combinações únicas de caracteres morfológicos. Comparamos *Atractus punctiventris* e as duas novas espécies com os congêneres da maior parte das províncias de terras baixas da América do Sul cis-Andina. Discutimos as afinidades das três espécie, sobretudo por compartilharem feições exclusivas em relação a morfologia hemipeniana com congêneres alocados em diferentes grupos fenéticos, e designamos estas espécies para distintos grupos de espécies de *Atractus*.

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