

# Papéis Avulsos de Zoologia

Museu de Zoologia da Universidade de São Paulo

Volume 53(6):75-85, 2013

[www.mz.usp.br/publicacoes](http://www.mz.usp.br/publicacoes)  
<http://portal.revistasusp.sibi.usp.br>  
[www.scielo.br/paz](http://www.scielo.br/paz)

ISSN impresso: 0031-1049  
ISSN on-line: 1807-0205

## A NEW SPECIES OF *ATRACTUS* (SERPENTES: DIPSADIDAE) FROM SERRA DO CIPÓ, ESPINHAÇO RANGE, SOUTHEASTERN BRAZIL, WITH PROPOSITION OF A NEW SPECIES GROUP TO THE GENUS

PAULO PASSOS<sup>1,4</sup>  
MAURO TEIXEIRA JUNIOR<sup>2</sup>  
RENATO S. RECODER<sup>2</sup>  
MARCO AURÉLIO DE SENA<sup>2</sup>  
FRANCISCO DAL VECHIO<sup>2</sup>  
HUGO BONFIM DE A. PINTO<sup>3</sup>  
SÔNIA H.S.T. MENDONÇA<sup>3</sup>  
JOSÉ CASSIMIRO<sup>2</sup>  
MIGUEL TREFAUT RODRIGUES<sup>2</sup>

### ABSTRACT

*We describe a new species of Atractus from Serra do Cipó, at the southeastern versant of Serra do Espinhaço, an inland mountain range nearly parallel to the Brazilian Atlantic coast. The new species is morphologically similar to A. paraguayensis and A. potschi with which it shares: 15 dorsal scale rows; white occipital region in juvenile specimens; dorsal ground color reddish pink to red (in life) with alternate black transversal spots, blotches or transversal bands; seven upper and lower labial scales; ventrals and subcaudals creamish white; hemipenis slightly bilobed, semicapitate and semicalyculate. The new species differs from both taxa mainly on the basis of exclusive coloration characters (number and shape of transversal bands) and hemipenial morphology (median face of the lobes without ornamentation), besides punctual meristic (number of ventral scales and maxillary teeth) and morphometric (adult snout-vent length) differences. Finally, we provide a discussion regarding the potential affinities of the new species and we redefine some Atractus species groups in order to better accommodate species sharing unique combinations of morphological characters.*

KEY-WORDS: Atlantic Forest; Campos Rupestres; *Atractus* species groups; Hemipenial morphology.

1. Departamento de Vertebrados, Museu Nacional, Universidade Federal do Rio de Janeiro, Quinta da Boa Vista, CEP 20940-040, Rio de Janeiro, RJ, Brasil.
2. Departamento de Zoologia, Instituto de Biociências, Universidade de São Paulo, Caixa Postal 11.461, CEP 05508-090, São Paulo, SP, Brasil.
3. Centro Nacional de Pesquisa e Conservação de Répteis e Anfíbios, Instituto Chico Mendes de Conservação da Biodiversidade, Rua 229, nº 95, Leste Universitário, CEP 74605-090, Goiânia, GO, Brasil.
4. Corresponding author, e-mail: [atractus@gmail.com](mailto:atractus@gmail.com)

## INTRODUCTION

The cryptozoic snake *Atractus* Wagler, 1828 is widely distributed in the Neotropical region, occurring from Panama to Argentina (Giraud & Scrocchi, 2000; Myers, 2003). *Atractus* is the snake genus with higher species richness (with about 140 valid species; P. Passos *pers. observ.*) and represent one of the most morphologically diverse colubroids, having for example the adult body size ranging from 100 millimeters to more than one meter of snout-vent length (Passos *et al.*, 2010a,c). Despite of renewed interest on the taxonomy of the genus in the last years (see Passos *et al.*, 2012 and references therein), species delimitations of many taxa and/or species complex remain unclear in view of the complex variation phenomena (ontogenetic, sexual, and/or geographical) or by lacking proper comprehensive taxonomic studies. Therefore, taxonomic studies with explicit and comprehensive comparative approaches are still crucial to the understanding of the intriguing speciation rate as well as the phylogenetic and biogeographical patterns of the genus.

In a taxonomic revision of the *Atractus* populations from the Brazilian Atlantic Forest Passos *et al.* (2010c) recognized 13 valid species, 10 of which from core areas of the Atlantic Forest domain. The three remaining taxa represented range extensions from other biomes (*A. pantostictus* Fernandes & Puerto, 1993 and *A. reticulatus* Boulenger, 1885) or populations from naturally relictual humid forest close to the Brazilian coast (*A. ronnie* Passos, Fernandes & Borges-Nojosa, 2007), but formally included in the xerophytic Caatinga domain. In this monographic study, the authors provide comparable diagnoses and data on the morphological variation (meristic, morphometric, color pattern, maxillary bone, and hemipenis characters) for all recognized species. As a result, mostly based on hemipenial characters, Passos *et al.* (2010c) defined three species groups to accommodate the Atlantic Forest species of *Atractus*.

In the course of recent fieldwork in several localities along the Serra do Espinhaço mountain range we found *Atractus* specimens in the southern elevations of this mountain complex that we could not associate to any previously described species of the genus. In this paper we describe this new species and discuss its possible affinities with other congeners on the basis of shared morphological characters.

## MATERIALS AND METHODS

### Material Examined

Specimens examined are housed in the Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, state of São Paulo and Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ), Rio de Janeiro, state of Rio de Janeiro. Data from additional specimens of *Atractus* examined can be found in Passos *et al.* (2005), Passos *et al.* (2007a,b), Passos & Arredondo (2009), Passos & Fernandes (2008), Passos & Prudente (2012), Passos *et al.* (2009a,b,c,d), Passos *et al.* (2010a,b,c), Passos & Lynch (2011), Passos *et al.* (2012), Prudente & Passos (2008, 2010), Almeida *et al.* (in press), Passos *et al.* (in press a,b).

### Techniques and Characters

Terminology for cephalic shields follows Savage (1960), 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 to the nearest 0.1 mm, except for snout-vent length (SVL) and caudal length (CL), 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 dorsal marks (blotches or transversal bands) were also performed strictly on the right side because these marks are not always continuous: herein “blotch” refers to dorsal marks which are not continuous with marks from the opposite side, whereas “bands” refers to a transversal mark restricted to and transversally oriented throughout the dorsum. Sex was determined on the basis of presence/absence of hemipenes verified through a ventral incision at the base of the tail. Method for preparation of preserved hemipenis was modified from Pesantes (1994) in replacing KOH by distilled water, and observing the precautions highlighted by Zaher & Prudente (2003). Prior to the inflation with solution of paraffin and vaseline, the organs remained 30 minutes in an alcoholic solution of Alizarin Red in order to stain the ornamenting calcareous structures according to adaptations made by Nunes *et al.* (2012) from original procedures used by Uzzell (1973). We prepared fully everted and almost or maximally filled hemipenis respectively from the following specimens: MZUSP 20760 and MNRJ 23357. Terminology for hemipenial description follows Dowling & Savage (1960), modified by Zaher (1999). We follow Passos

*et al.* (2009) and Passos *et al.* (2010c) with respect to conditions of the morphological characters used in diagnosis and description.

## RESULTS

### *Atractus spinalis* sp. nov.

#### Figures 1-3

**Holotype:** An adult male (MZUSP 20760) collected by M.T. Rodrigues and collaborators (all authors except the senior one) on March 26, 2011 (field number MTR 20280) at Alto do Palácio (19°15'35.5"S, 43°31'55.2"W; 1357 m above sea level = asl), Parque Nacional da Serra do Cipó, municipality of Morro do Pilar, state of Minas Gerais, Southeastern Brazil.

**Paratypes:** Five specimens all collected by M.T. Rodrigues and collaborators (all authors except the senior one) in the Parque Nacional da Serra do Cipó, state of Minas Gerais, Southeastern Brazil: an adult female (MZUSP 20763), two adult males (MNRJ 23357 and MZUSP 20764) and a juvenile male (MZUSP 20762), collected on November 14, 2011 (field numbers MTR 21778, 21779, 21780 and 21777, respectively) at Currais (19°27'5.00"S, 43°29'43.78"W, 1430 m asl), municipality of Jaboticatubas; and an adult male (MZUSP 20761), collected on April 2, 2011 (field number MTR 20378) at the roadside (19°13'42.9"S, 43°30'24.4"W, 1354 m asl), in the limit between the municipalities of Morro do Pilar and Santana do Riacho.

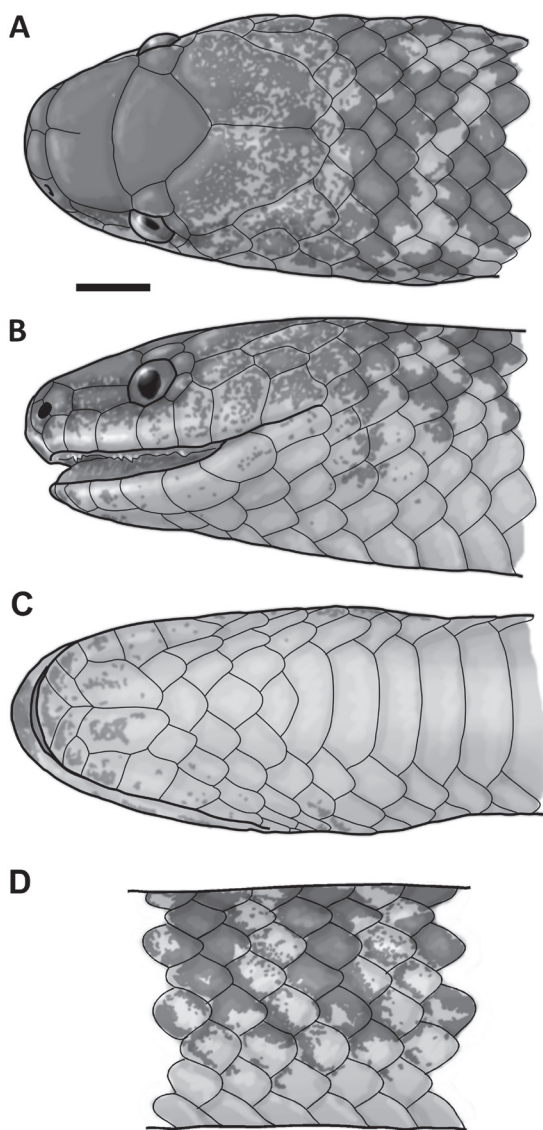
**Diagnosis:** *Atractus spinalis* is distinguished from all congeners by the following combination of characters: (1) 15-15-15 smooth dorsal scale rows; (2) two postoculars; (3) moderate loreal; (4) temporals 1+2; (5) seven supralabials, third and fourth contacting orbit; (6) seven infralabials, first four contacting chin shields; (7) usually nine maxillary teeth; (8) usually three gular scale rows; (9) three or four prefrontals; (10) 149 ventrals in the single female, 136-142 in males; (11) 24 subcaudals in the female, 27-33 in males; (12) dorsum red, except for first dorsal scale rows that is red on its upper area, becoming lighter towards venter, occasionally forming conspicuous dorsolateral lines along body; (13) ventral ground color creamish white; (14) small body size, females (199 mm SVL) and males (268 mm maximum SVL); (15) moderate tail in the female (11.6%) and moderate to long in males (13.6-16.6% SVL); (16) hemipenis slightly bilobed, semicapitate, and semicalyculate.

**Comparisons:** Among all congeners, *Atractus spinalis* shares 15 dorsal scale rows, white occipital region in juvenile specimens, dorsal ground color reddish pink to red with alternate black transversal spots, blotches or transversal bands in live individuals, seven upper and lower labial scales, ventrals and subcaudals creamish white and slightly bilobed, semicapitate, and semicalyculate hemipenis only with some individuals of *A. paraguayensis* Werner, 1924 and *A. potschi* Fernandes, 1995 presenting transversal black bands (both are polychromatic species; see Passos *et al.*, 2010c). *Atractus spinalis* differs from banded specimens of *A. paraguayensis* (characters in parenthesis) in having conspicuous transversal bands along the body as long as or longer than interspaces, retracted hemipenis extending to the level of seventh subcaudal, everted hemipenis without calcareous ornamentation in the median side of the lobes and average body size of 211 mm SVL in males (*vs.* blotches/bands and interspaces similar in length anteriorly with the former becoming gradually shorter than interspaces posteriorly, retracted hemipenis extending to the level of 10<sup>th</sup> subcaudal, conspicuous spinulate calyces on the medial side of lobes and average body size 304 mm SVL; Martins, 2012); it differs from banded specimens of *A. potschi* (characters in parenthesis) in having eight to nine maxillary teeth and 136-142 ventral scales in males (*vs.* seven maxillary teeth and 153-165 ventral scales in males). As far as we know there is no sympatry between the new species and any other congeners. The only other *Atractus* species with closer geographical distribution, *A. zebrinus* Jan, 1862 (found at Serra do Caraça located about 70 km far from the southern record of the *A. spinalis*; see Passos *et al.*, 2010c), can be easily distinguished from the new species by having 17 dorsal scale rows (*vs.* 15 in *A. spinalis*).

**Description of the holotype (Fig. 1):** Adult male, 236 mm SVL, 38 mm CL (16.1% SVL); head rounded in dorsal view, slightly flattened in lateral view, 11.0 mm long (4.7% SVL), 5.7 mm wide (52% head length); cervical constriction poorly distinct; snout rounded in dorsal view, truncated in lateral view; rostrum-orbit distance 3.3 mm (30% head length); nasal-orbit distance 2.3 mm (20.9% head length); intra-orbital distance 4.5 mm (78.9% head width); body subcylindrical, body diameter 7.3 mm (3.1% SVL); belly flattened; tail moderately long, with terminal spine moderately long and acuminate; rostral subtriangular in frontal view, wider (2.4 mm) than high (1.7 mm), visible from above; internasal slightly longer (1.0 mm) than wide (0.8 mm); internasal suture (1.0 mm long) sinistral to prefrontal median suture;

prefrontal as wide (2.2 mm) as long (2.1 mm); prefrontals fused mesoposteriorly; frontal triangular, wider (3.4 mm) than long (2.9 mm); supraocular subretangular, about twice as long (1.3 mm) as wide (0.7 mm); parietal about twice as long (4.6 mm) as wide (2.5 mm); nasal divided; prenasal about twice as high (0.8 mm) as long (0.5 mm), contacting rostral, internasal, first supralabial, and postnasal; postnasal about as high (0.8 mm) as long (0.9 mm), contacting prenasal, prefrontals, loreal, and second supralabial; long loreal (1.6 mm long, 0.5 mm high); loreal contacting eyes, prefrontals, nasals, and second to third supralabials; eye diameter 1.5 mm; pupil round; two

postoculars, upper postocular as high (0.6 mm) and longer (0.6 mm) than lower postocular (0.6 mm high, 0.4 mm long); upper postocular contacting eye, supraocular, parietal and anterior temporal; lower postocular, contacting eye, fourth and fifth supralabial, and anterior temporal; 1+2 temporals; anterior temporal twice as long (1.4 mm) as high (0.7 mm), contacting parietal, fifth to sixth supralabials, postoculars, and posterior temporals; upper posterior temporal elongate (2.8 mm long, 0.9 mm high), almost three times as long as high; seven supralabials, third and fourth contacting orbit; second supralabial higher than first and lower than third; sixth supralabial (1.6 mm long, 1.6 mm high) higher and longer than remaining supralabials; symphyseal triangular, almost twice as wide (1.9 mm) as long (1.1 mm); seven infralabials, first four pairs contacting chin shields; first pair of infralabials in contact behind symphyseal, preventing symphyseal/chin shield contact; chin shields about three times as long (2.7 mm) as wide (1.1 mm); 15-15-15 smooth dorsal scale rows, lacking apical pits and supra-anal tubercles; three gular scale rows between last supralabial and preventral; three preventral scales; 142 ventral scales; anal plate single; 31/31 subcaudal scales. Maxillary bone arched upward anteriorly in lateral view, ventral portion curved on anterior and nearly flattened on median to posterior portion; maxillary arch with nine teeth; teeth angular in cross section, robust at base, narrower at apices, curved posteriorly; first five teeth large, moderately spaced, similar in size (even offsetting the level of curvature of the maxillary); sixth to ninth teeth gradually reduced in size and spacing; maxillary diastema absent or indistinct from interspaces between sixth and seventh teeth; last two teeth (topographically homologous to postdiastemal tooth) smaller and less spaced than the anterior teeth; lateral process of maxilla moderately developed.



**FIGURE 1:** Dorsal (A), lateral (B) and ventral (C) views of head and lateral view of body (D) of the holotype of *Atractus spinalis* (MZUSP 20760). Scale bar = 2 mm.

*Color in preservative of the holotype (Fig. 2):* Dorsum of head dark brown, with pale brown spots dispersed on internasals, anterolateral area of prefrontals, supraoculars, anterolateral and mesodorsal regions of parietal; parietals mostly dark brown with two ill defined black round blotches (about equivalent to nostril size) positioned above each side of the posterior end of interparietal suture; lateral surface of head dark brown until dorsal edges of supralabials, ventral area of loreal and temporal region invaded with dispersed pale brown pigment; lateral sides of head with dark brown pigments concentrated around orbit (supraocular, posterior area of loreal, upper margins of third and fourth supralabials and postoculars); first four supralabials



mostly creamish white, with irregular brown dots not attaining ventral border of each scale; fifth to seventh supralabials mostly pale brown, with disperse brown dots reaching ventral border of scales; anterior temporal pale brown scattered with cream pigment; posterior temporal and occipital series pale brown with fuzzy cream pigmentation; symphyseal, first three infralabials and anterior chin shields creamish white dotted with brown concentrated on dorsolateral margins of the scales; last four infralabials, gulars, preventrals

and posterior chin shields creamish white with few disperse brown dots; ventral ground color uniformly creamish white; ventral surface of tail creamish white suffused with few dark brown dots concentrated on suture regions of posterior subcaudals; dorsal ground color of body beige, with 56 well-defined transversal black blotches (two scale long in dorsal view and up to three in lateral view) on the body and 14 on the tail; beige interspaces one scale long dorsally and possibly two scales long laterally; black blotches on

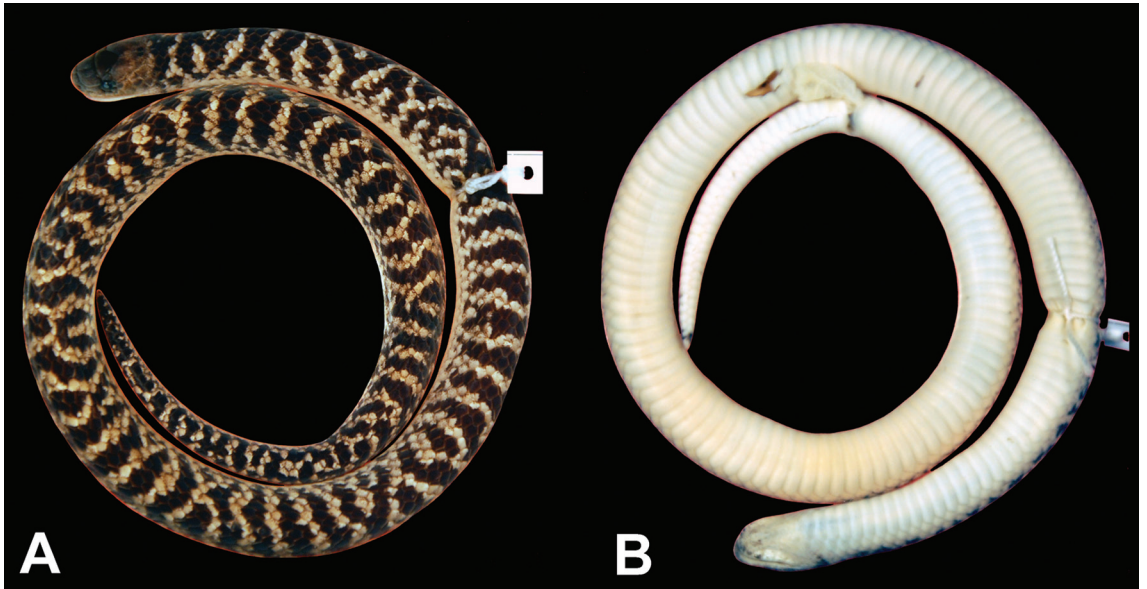


FIGURE 2: Dorsal (A) and ventral (B) views of the holotype of *Atractus spinalis* (MZUSP 20760).



FIGURE 3: General view in life of the holotype of *Atractus spinalis* (MZUSP 20760).

**TABLE 1:** Summary of quantitative morphological variation (meristic and morphometric characters) for the known specimens of *Atractus spinalis*. We use “|” when the counts were different on both sides of the body, otherwise this character is represented by a single value. The expression “+ *n*” refers to posterior region of tail with collapsed blotches/bands. The institutional number of the holotype is marked in italic style and all others represent paratypes.

Variables	<i>MZUSP 20760</i>	<i>MZUSP 20764</i>	<i>MZUSP 20761</i>	<i>MNRJ 23357</i>	<i>MZUSP 20763</i>	<i>MZUSP 20762</i>
Sex	Male	Male	Male	Male	Female	Male
Tail dorsal rows	6   7	8	8	8	8   7	8
Ventral scales	142	139	136	141	149	141
Subcaudal scales	31	30	33	27   28	24	31
Gular scale rows	3	3   4	3	3	3	3   4
Preventrals	3	4	3	3	3	4
Snout-vent length (mm)	236	268	210	230	199	110
Tail length (mm)	38	40	35	38	23	15
Mid-body diameter (mm)	7.3	6.9	6.4	7.1	6.1	3.5
Maxillary teeth	9	9	9	9	8   9	9
Body blotches/bands	56	43	47	47	40	54
Tail blotches/bands	14+ <i>n</i>	11+ <i>n</i>	10+ <i>n</i>	11	9	14

the anterior region of body with variegated pattern when each blotch connects to adjacent blotch in inverted “Y” shape and not to the opposite one; at the level 30<sup>th</sup> ventral scale dorsal marks become almost a regular transversal band; blotches or bands on body flanks usually reaching second scale row; body flanks (second and third scale rows) with dispersed irregular spots generally connected to transversal blotches or bands; paraventral region scattered with brown dots; sometimes bands are not symmetrically connected to the band on the other side along body and tail; first dorsal scale rows with brown pigment restricted to dorsal scale margins.

*Color in life of the holotype (Fig. 3):* Dorsal and lateral surfaces of head brown with invasion of scattered red pigment; supralabials reddish cream with dispersed brown dots; infralabials and mental region mostly creamish white discretely invaded by reddish brown pigment; ventrals and subcaudals uniformly creamish white; dorsal ground color red scattered with alternate black blotches or conspicuous transversal bands; first dorsal scales rows almost entirely red.

*Juvenile color in preservative (Fig. 4A):* Conspicuous white nuchal collar covering occipital and temporal regions, entirely separating the black cephalic cap from the first black transversal body band.

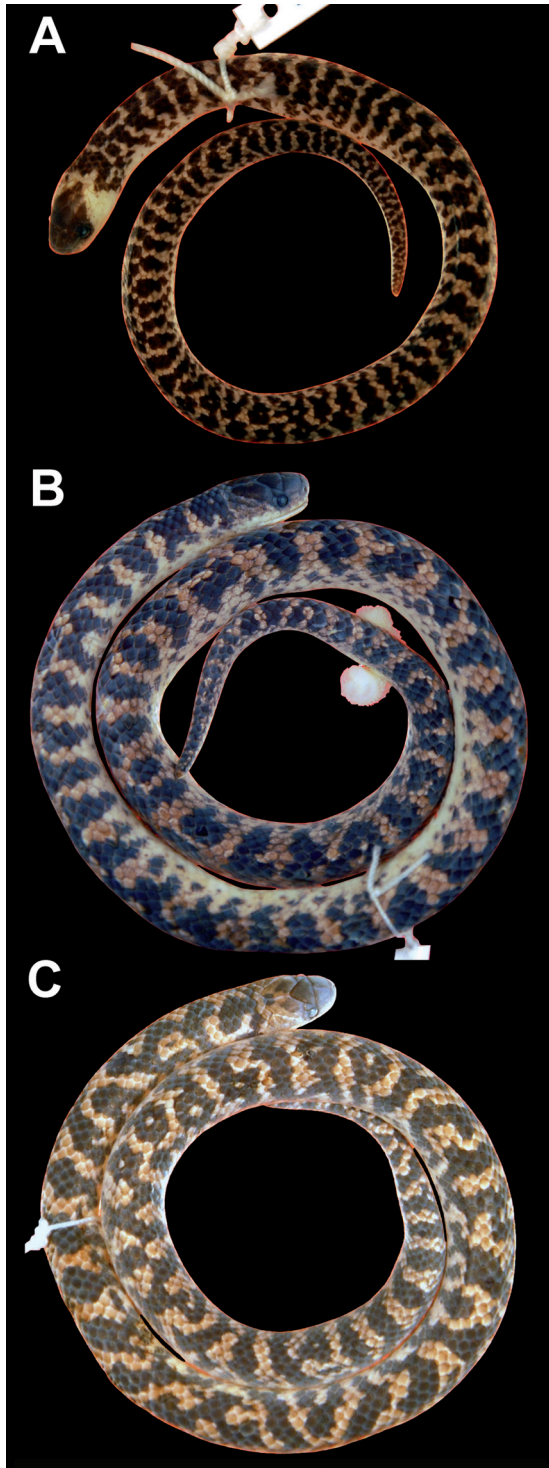
*Color variation in preservative (Fig. 4B-C):* Dorsum of head with cephalic cap region brown with a few pale brown to uniformly dark brown dots or spots; temporal and occipital regions become darker along species ontogeny; supralabials creamish white variably

invaded by disperse brown dots; ventrals and subcaudals immaculate creamish white or with few brown dots; dorsal ground color of body beige to pale brown with 43-56 ( $\bar{x} = 49.4$ ;  $SD = 5.4$ ;  $n = 5$ ) body blotches or transversal bands in males and 40 in the only known female; dorsal marks comprising alternate black blotches (2-3 scales long), sometimes connected to posterior or anterior blotch on vertebral region; laterally, blotches sometimes displaying an inverted “Y” shape laterally with ventral ramification; ventral ramification occurs in blotches as well as in posterior transversal bands (*MZUSP 20761*); dorsum with irregular marks displays a barely variegated pattern (*MZUSP 20763*, *MZUSP 20764*, *MNRJ 23357*); sometimes specimens show irregular blotches restricted to anterior portion of body and posteriorly there are conspicuous transversal bands (*MZUSP 20760* and *20761*); body flanks with interspaces ranging from one to three scales long.

*Meristic and morphometric variation (Table 1):* Largest male 268 mm SVL, 40 mm CL, female 199 mm SVL, 23 mm CL; tail 13.6-16.6% SVL ( $\bar{x} = 15.5$ ;  $SD = 1.3$ ;  $n = 5$ ) in males, 11.6% SVL in the single female; 136-142 ( $\bar{x} = 139.8$ ;  $SD = 2.4$ ;  $n = 5$ ) ventrals in males, 149 in the female; 26-33 ( $\bar{x} = 30.5$ ;  $SD = 2.0$ ;  $n = 5$ ) subcaudals in males, 24 in the female; 3-4 ( $\bar{x} = 3.3$ ;  $SD = 0.5$ ;  $n = 6$ ) preventrals; 3-4 ( $\bar{x} = 3.2$ ;  $SD = 0.3$ ;  $n = 12$  sides) gular series; 6-8 ( $\bar{x} = 7.7$ ;  $SD = 0.6$ ;  $n = 6$ ) dorsal scale rows around tail at the level of second subcaudal; 8-9 ( $\bar{x} = 8.9$ ;  $SD = 0.2$ ;  $n = 11$  sides) maxillary teeth; 6.4-7.5 mm ( $\bar{x} = 7.0$ ;  $SD = 0.4$ ;  $n = 4$ ) adult body diameter; retracted hemipenis bifurcated and extends to the level of seventh subcaudal ( $n = 6$  sides from three specimens).

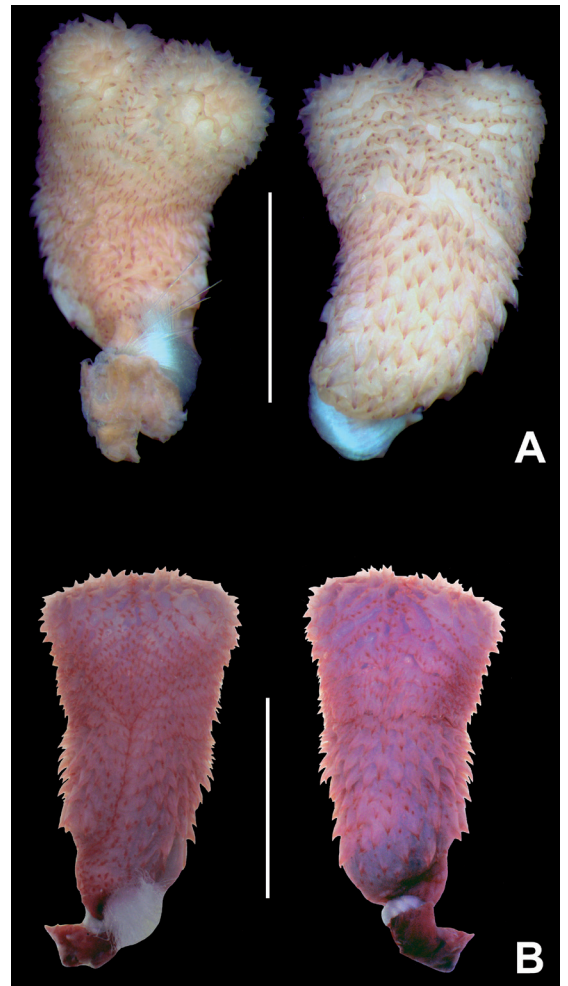


*Hemipenis morphology (entirely everted organs n = 2)* (Fig. 5): Fully everted and almost maximally expanded hemipenis (MZUSP 20760; Fig. 5A) renders a



**FIGURE 4:** Color variation of the type-series of *Atractus spinalis*: (A) juvenile male (MZUSP 20762), (B) adult male (MZUSP 20764), and (C) adult female (MZUSP 20763).

slightly bilobed, semicapitate and semicalyculate organ; lobular branches almost indistinct in frontal view and restricted to distal portion of capitulum; lobes nearly flattened on the apices and with a median and relatively shallow invagination separating each lobular ramus; lobes uniformly covered by well-defined spinulate calyces on the sulcate, lateral and asulcate sides of capitulum; calyces large with conspicuous vertical walls on the sulcate and lateral sides of the capitulum; calyces on the asulcate side lacking vertical walls and horizontal walls connected forming regular spinulate flounces; from above lobular branches are medially delimited by vertical (= longitudinal) calyculate flounces; medial surface of both lobes almost indistinct due to median contact of lobular ramus; median-distal (= internal surface) of lobes only



**FIGURE 5:** Sulcate (left) and asulcate (right) sides of hemipenis of the holotype (A) (MZUSP 20760) and paratype (B) (MNRJ 23357) of *Atractus spinalis*. Scale bar = 5 mm. The hemipenis of the holotype is entirely everted but not maximally filled, whereas the organ of paratype is fully everted and filled by full.

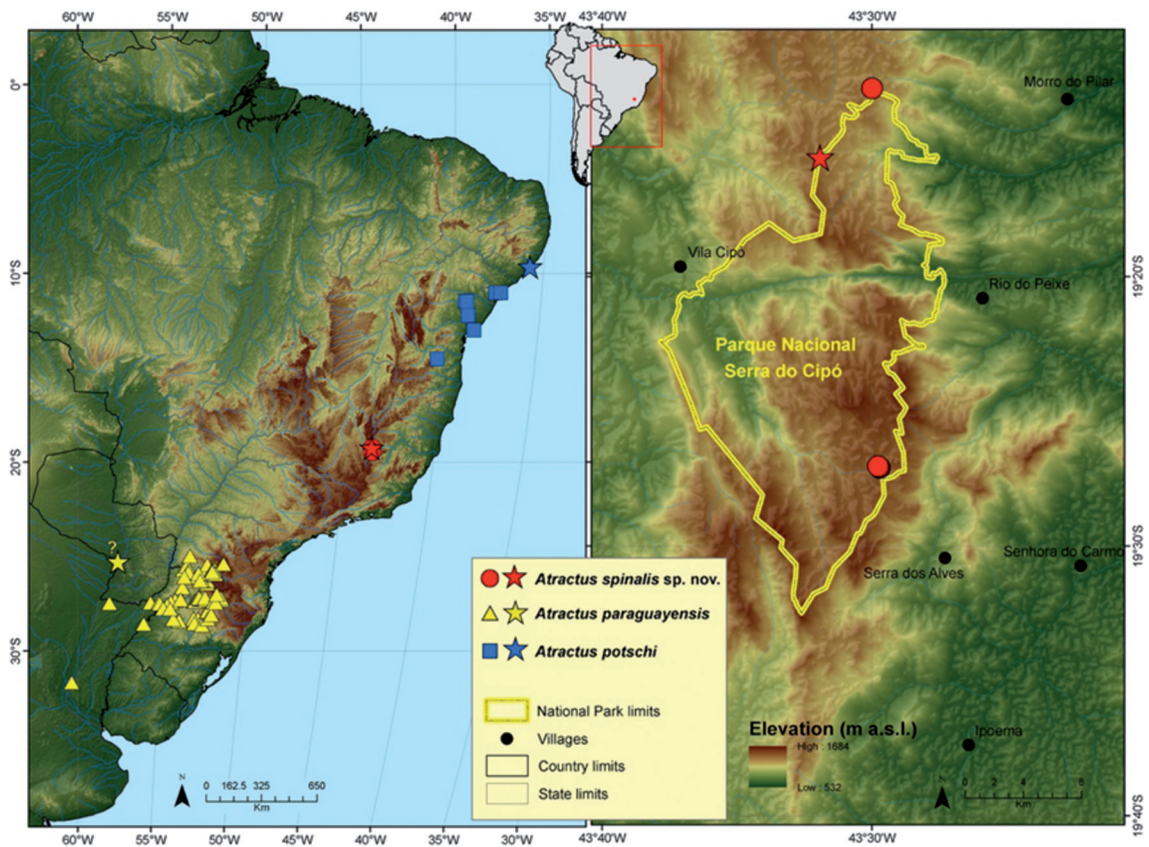


FIGURE 6: Geographical distribution of *Atractus paraguayensis*, *A. potschi*, and *A. spinalis*. Stars indicate type locality.

visible in frontal view through mechanical separation of lobes, revealing irregular large fringes without calcareous ornamentation (without red pigmentation); capitulum positioned immediately above sulcus spermaticus bifurcation, similar in size to hemipenial body; sulcate side of capitulum scattered with small spinulate calyces laterally connected, forming four irregular flounces on the intrasulcar region; caputular groove slightly evident on sulcate and well defined on the lateral and asulcate sides of the organ; lateral portion of capitulum (below the lobular region), with calyces forming barely defined spinulate flounces; caputular crotch with a “M-shaped” notch on median region of asulcate side of organ; non-lobular region of capitulum with four irregular spinulate flounces on the asulcate side of the hemipenis; sulcus spermaticus divides on distal portion of hemipenial body (nearly half the length of organ); branches of sulcus spermaticus centrifugally orientated, running towards tips of lobes; margins of the sulcus spermaticus narrow and stout, bordered by spinules on the base and papillae directed upwards on the extreme tip of lobes; hemipenial body subcylindrical, narrower than capitulum densely covered by moderate to relatively large



FIGURE 7: Habitat where specimens of *Atractus spinalis* were found: (A) general view of the landscape at the eastern versant of Serra do Cipó from Serra dos Alves village (see Fig. 6); (B) Grasslands at Alto do Palácio region, at the top of mountain range (1350 m asl), where the holotype was found; and (C) Campos Rupestres at Currais region (1430 m asl).



hooked-shaped spines; largest spines located on lateral portion of sulcate side and basal region of the asulcate side; naked pocket restricted left side of proximal region of hemipenial, attaining nearly half the length of hemipenial body; basal portion of hemipenial body part nude, part ornamented by longitudinal plicae or disperse spinules (Fig. 5A). The hemipenis of the holotype (MZUSP 20760) was not filled by full in order to observed the median-distal face of the lobes. The organ of the paratype (MNRJ 23357), fully everted and filled by full, is very similar to holotype's organ, differing from it by nearly straight capitular crotch on median region of asulcate side of hemipenis (Fig. 5B).

*Etymology:* The specific epithet “*spinalis*” is a Latin adjective derived from *Spina*, meaning the vertebrate backbone. The use of *spina* referring to backbone dates back to the Roman poet Virgil (70-19 before Christ). This name is herein used in reference to the Espinhaço Mountains Range (= Cadeia do Espinhaço), where the type series of *Atractus spinalis* was collected and the species appears to be endemic.

*Distribution and natural history (Fig. 6):* Currently known only from a few localities, *Atractus spinalis* seems to be endemic to the Serra do Cipó mountains, the local name for the southern section of the meridional segment of Espinhaço Range, an extensive quartzitic sandstone mountainous range stretching from central Minas Gerais state to northern Bahia. This section comprises elevated mountain ranges reaching up to 1660 m asl, where the habitats are dominated by rocky meadows (Campos Rupestres), interspersed with grasslands and a characteristic open vegetation with many endemic elements. The slopes and lower areas at its eastern versant and western side respectively contact the Atlantic Forest and the Cerrados (= savannas) (Chemale Jr. *et al.*, 2011). All specimens of *Atractus spinalis* were found in typical Campos Rupestres, inside termite nests or under rocks, between 1340 and 1430 m asl (Fig. 7).

*Remarks:* Although suggestive, we do not anticipate the possible inverted sexual dimorphism in *Atractus spinalis*, since the only female has the smallest SVL (considering adult specimens) and, as consequence, fewer dorsal marks (Table 1). We cannot establish if the only female represents an outlier, but its presents the high number of ventral scales which is usually correlated with snakes body size (see Lindell, 1994). Otherwise, *A. spinalis* will be the only congener exhibiting inverted sexual dimorphism (males longer than females), but this need to be confirmed by more representative samples.

## DISCUSSION

*Atractus spinalis* is similar to *A. paraguayensis* and *A. potschi* regarding the morphological character complexes analyzed (color pattern, meristic and some hemipenial features). In fact, according to the key for Atlantic Forest *Atractus* provided by Passos *et al.* (2010c) *A. spinalis* falls at the third key step, representing the dichotomy between *A. paraguayensis* and *A. potschi*. Nevertheless, *A. spinalis* differs from the latter species in certain coloration and hemipenis characteristics and in having small body size and/or higher counts in meristic characters (see comparisons for details). Despite of juvenile color pattern may be symplesiomorphic and some morphometric characters are likely homoplastic along the entire genus (Passos *et al.*, 2012), at least some hemipenial characters (*e.g.*, extreme reduction of bilobation) are exclusive of the *A. paraguayensis* and *A. spinalis* and species from *A. pantostictus* species group (see below) in the cis-Andean congeners (Passos, 2008). Passos *et al.* (2010c) defined three species groups on the basis of shared unique combinations of morphological characters, mainly referring to hemipenial morphology. *Atractus paraguayensis* was tentatively assigned to the *A. emmeli* Boettger, 1888 species group, but the authors had highlighted its uniqueness with respect to the much reduced hemipenis bilobation. In the same study, the group comprising *A. maculatus* Günther, 1858 has been defined but, analogously, the more divergent taxon was precisely *A. potschi*, a fact that led the authors to consider the slightly bilobed organ for the group definition. With the availability of larger samples, mainly related to *A. potschi* (P. Passos unpubl. data), as well as the discovery of new species, it seems appropriate to establish a new definition of groups in order to better accommodate the diversity of species sharing unique combinations of morphological characters. Given the specious nature and the current problems with species delimitation, restriction of the comparative universe to similar and putative sister taxa can improve the taxonomic routine within the genus *Atractus* (Passos *et al.*, in press a). Besides, such procedure results in hypotheses that can be tested in the future, when a robust phylogeny is available for the genus (Passos *et al.*, in press b).

*Atractus paraguayensis*, *A. potschi*, and *A. spinalis* shares 15 dorsal scale rows, white occipital region in juvenile specimens, dorsal ground color reddish pink to red with alternate black transversal spots, blotches or transversal bands in some individuals, seven upper and lower labial scales, ventral and subcaudals creamish white and reduced hemipenial bilobation. Based on the evidences above, we propose to transfer *A. paraguayensis* and *A. potschi* to a new group to be named *A. paraguayensis*, which should also include

*A. spinalis*. The extreme reduced hemipenis bilobation in the *A. paraguayensis* members occurs also in the species of the *A. pantostictus* group (see Passos *et al.*, 2010c); however, the *A. pantostictus* members present alary spines on both sides of the capitulum and a median projection on the distal region of capitulum (*vs.* absence of capitular alary spines and presence of a shallow invagination on the distal region of capitulum). In fact, the “alary spines” mentioned in the description of *A. ronnie* (Passos *et al.*, 2007b) and *A. altagratiae* (Passos & Fernandes, 2008) represents a particular condition for the development of transversal walls of the calyces having single and large spines, sometime laterally forming a transversal flounce, as showed by *A. ronnie* (Passos *et al.*, 2007b, 2010c). In the other hand, calyces from members of the *A. paraguayensis* group are small and present a series of spinules, resulting in narrowed and long spinulate flounces (*vs.* broad and short spinulate calyces and/or flounces in the *A. pantostictus* group). Although we cannot determine at this time if the lobular reduction is homologous in both groups, the current arrangement improves the definition of all groups of cis-Andean *Atractus* previously proposed.

*Atractus spinalis* is known only from Serra do Cipó in the Meridional Espinhaço Range (“Serra do Espinhaço Meridional”), which also harbors several endemic species of lizards, snakes and frogs (Cunha, 1966; Rodrigues, 1981; Eterovick & Sazima, 2004; Curcio *et al.*, 2012; Pinto & Fernandes, 2012). Nonetheless, despite being reported only from a few localities, *A. spinalis* qualifies as another endemic candidate for this area. As most of these endemics species of Serra do Cipó, it is also restricted to the Campos Rupestres, a very distinct habitat from the surrounding environments (forests and savannas), which act as barriers to the dispersal of habitat-specialist species. The lizards *Eurolophosaurus nanuzae* and *Placosoma cipoense*, and the snakes *Trilepida jani* and *Tropidophis preciosus* are examples of such species, restricted to the southern Espinhaço Range and not found at other adjacent mountains (M. Rodrigues unpubl. data). This new finding shows that although the Serra do Cipó region has been intensively inventoried since the early naturalists had stepped on its highlands, it is far from being completely known, and may harbor an even higher diversity with more endemic taxa than previously thought.

## RESUMO

*Descrevemos uma nova espécie de Atractus da Serra do Cipó, na vertente sudeste da Serra do Espinhaço, uma cadeia montanhosa continental aproximadamente paralela*

*à costa Atlântica brasileira. A nova espécie é morfologicamente similar a A. paraguayensis e A. potschi com as quais compartilha: 15 séries de escamas dorsais; região occipital branca em espécimes jovens; coloração dorsal de fundo variando de rosa avermelhado a vermelho (em vida) com pontuações, manchas e/ou bandas transversais pretas; sete supralabiais e infralabiais; ventrais e subcaudais creme esbranquiçado; hemipênis levemente bilobado, semicapitulado e semicaliculado. A nova espécie difere de ambos os táxons principalmente a partir de caracteres exclusivos de coloração (número e forma das bandas transversais), da morfologia hemipeniana (face mediana dos lobos sem ornamentação) além de diferenças merísticas (número de escamas ventrais e dentes maxilares) e morfométricas (comprimento rostro-cloacal dos adultos). Apresenta-se uma discussão sobre as possíveis afinidades da nova espécie e redefinem-se alguns grupos de espécies de Atractus no sentido de acomodar melhor as espécies que compartilham combinações únicas de caracteres morfológicos.*

**PALAVRAS-CHAVE:** Floresta Atlântica; Campos Rupestres; Grupos de espécies de *Atractus*; Morfologia hemipeniana.

## ACKNOWLEDGMENTS

Financial support was provided by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ), Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), and Fundação Grupo Boticário de Proteção à Natureza. We also wish to thank Henri Collet, Fábio Veloso, Celso do Lago Paiva and all officers at Parque Nacional da Serra do Cipó for help and support during field work. We are deeply indebted with Daniel S. Fernandes and Felipe F. Curcio for helpful comments on the manuscript.

## REFERENCES

- ALMEIDA, P.C.; PRUDENTE, A.L.C.; FEITOSA, D.T. & PASSOS, P. [IN PRESS]. Morphological variation and taxonomy of the *Atractus latifrons* (Günther, 1868) (Serpentes: Dipsadidae). *Zootaxa*.
- CHEMALE JR., F.; DUSSIN, I.A.; MARTINS, M. & DOS SANTOS, M.N. 2011. Nova abordagem tectono-estratigráfica do Supergrupo Espinhaço em sua porção meridional (MG). *Geonomos*, 19:173-179.
- CUNHA, O.R. 1966. Sobre uma nova espécie de lagarto do estado de Minas Gerais *Placosoma cipoense* sp. n. (Lacertilia, Teiidae). *Boletim do Museu Paraense Emílio Goeldi, Série Zoologia*, 61:1-9.

- CURCIO, F.F.; NUNES, P.M.S.; ARGÔLO, A.J.S.; SKUK, G. & RODRIGUES, M.T. 2012. Taxonomy of the South American Dwarf boas of the genus *Tropidophis* Bibron, 1840, with description of two new species from the Atlantic Forest. *Herpetological Monographs*, 26:80-121.
- DOWLING, H.G. 1951. A proposed standard system of counting ventrals in snakes. *British Journal of Herpetology*, 1:97-99.
- DOWLING, H.G. & SAVAGE, J.M. 1960. A guide to the snake hemipenis: a survey of basic structure and systematic characters. *Zoologica*, 45:17-28.
- ETEROVICK, P.C. & SAZIMA, I. 2004. *Anfíbios da Serra do Cipó, Minas Gerais – Brasil*. Editora PUC Minas, Belo Horizonte. 152 p.
- GIRAUDO, A.R. & SCROCCHI, G.J. 2000. The genus *Atractus* (Serpentes: Colubridae) in Northeastern Argentina. *Herpetological Journal*, 10:81-90.
- LINDELL, L.E. 1994. The evolution of vertebral number and body size in snakes. *Functional Ecology*, 8:708-719.
- MARTINS, A.R. 2012. *Variação morfológica de Atractus paraguayensis Werner, 1924 (Serpentes, Dipsadidae, Dipsadinae)*. M.Sc. Dissertation, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brasil, 130 p.
- MYERS, C.W. 2003. Rare snakes—Five new species from Eastern Panama: reviews of Northern *Atractus* and Southern *Geophis* (Colubridae: Dipsadinae). *American Museum Novitates*, 3391:1-47.
- NUNES, P.M.S.; FOUQUET, A.; CURCIO, F.F.; KOK, P.J.R. & RODRIGUES, M.T. 2012. Cryptic species in *Iphisa elegans* Gray, 1851 (Squamata: Gymnophthalmidae) revealed by hemipenial morphology and molecular data. *Zoological Journal of the Linnean Society*, 166:361-376.
- PASSOS, P. 2008. *Revisão taxonômica do gênero Atractus Wagler, 1828 (Serpentes: Colubridae: Dipsadinae)*. Ph.D. Thesis, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro. 671 p.
- PASSOS, P. & ARREDONDO, J.C. 2009. Rediscovery and redescription of the Andean earth-snake *Atractus wagleri* (Reptilia: Serpentes: Colubridae). *Zootaxa*, 1969:59-68.
- PASSOS, P. & FERNANDES, R. 2008. A new species of the colubrid snake genus *Atractus* (Reptilia: Serpentes) from the central Amazon of Brazil. *Zootaxa*, 1849:59-66.
- PASSOS, P. & LYNCH, J.D. 2011. Revision of *Atractus* (Serpentes: Dipsadidae) from middle and upper Magdalena drainage of Colombia. *Herpetological Monographs*, 24:149-173, 2010.
- PASSOS, P. & PRUDENTE, A.L.C. 2012. Morphological variation, polymorphism and taxonomy of the *Atractus torquatus* complex (Serpentes: Dipsadidae). *Zootaxa*, 3407:1-21.
- PASSOS, P.; AGUAYO, R. & SCROCCHI, G. 2009a. Rediscovery of the rare *Atractus bocki*, with assessment of the taxonomic status of *Atractus canedii* (Serpentes: Colubridae: Dipsadidae). *Journal of Herpetology*, 43:710-715.
- PASSOS, P.; CISNEROS-HEREDIA, D.F. & SALAZAR-V. D. 2007a. Rediscovery and redescription of the rare Andean snake *Atractus modestus*. *Herpetological Journal*, 17:1-6.
- PASSOS, P.; DOBIEY, M. & VENEGAS, P.J. 2010a. Variation and natural history notes on giant groundsnake, *Atractus gigas* (Serpentes: Dipsadidae). *South American Journal of Herpetology*, 5:73-82.
- PASSOS, P.; ECHEVARRÍA, L.Y. & VENEGAS, P.J. [IN PRESS A]. Morphological variation and natural history notes on *Atractus carrioni* (Serpentes: Dipsadidae). *South American Journal of Herpetology*.
- PASSOS, P.; FERNANDES, D.S. & BORGES-NOJOSA, D.M. 2007b. A new species of *Atractus* (Serpentes: Dipsadinae) from a relictual forest in Northeastern Brazil. *Copeia*, 2007:788-797.
- PASSOS, P.; FERNANDES, R. & ZANELLA, N. 2005. A new species of *Atractus* (Serpentes: Colubridae) from Southern Brazil. *Herpetologica*, 61:209-218.
- PASSOS, P.; FUENMAYOR, G.R. & BARRIO-AMORÓS, C. 2009b. Description of two new species from Venezuela in the highly diverse dipsadine genus *Atractus* (Serpentes: Colubridae). *Amphibia-Reptilia*, 30:233-243.
- PASSOS, P.; LYNCH, J.D. & FERNANDES, R. 2009c. Taxonomic status of *Atractus sanctaemartae* and *Atractus nebularis*, and description of a new *Atractus* from Atlantic coast of Colombia. *Herpetological Journal*, 18:175-186, 2008.
- PASSOS, P.; ARREDONDO, J.C.; FERNANDES, R. & LYNCH, J.D. 2009d. Three new *Atractus* (Serpentes: Dipsadidae) from the Andes of Colombia. *Copeia*, 2009:425-438.
- PASSOS, P.; CHIESSE, A.; TORRES-CARVAJAL, O. & SAVAGE, J.M. 2010b. Testing species boundaries within the *Atractus occipitoalbus* complex (Serpentes: Dipsadidae). *Herpetologica*, 65:384-403, 2009.
- PASSOS, P.; FERNANDES, R.; BERNILS, R.S. & MOURA-LEITE, J.C. 2010c. Taxonomic revision of the Brazilian Atlantic Forest *Atractus* (Reptilia: Serpentes: Dipsadidae). *Zootaxa*, 2364:1-63.
- PASSOS, P.; MUESES-CISNEROS, J.J.; LYNCH, J.D. & FERNANDES, R. 2009. Pacific lowland snakes of the genus *Atractus* (Serpentes: Dipsadidae), with description of three new species. *Zootaxa*, 2293:1-34.
- PASSOS, P.; RAMOS, L.O.; PINNA, P.H. & PRUDENTE, A.L.C. [IN PRESS B]. Morphological variation and putative phylogenetic affinity of the poorly known *Atractus caxiuana* (Serpentes: Dipsadidae), with proposition of a new species group to the genus. *Zootaxa*.
- PASSOS, P.; CISNEROS-HEREDIA, D.; RIVERA, D.E.; AGUILAR, C. & SCHARGEL, W.E. 2012. Rediscovery of *Atractus microrhynchus* and reappraisal of the taxonomic status of *A. emersoni* and *A. natans* (Serpentes: Dipsadidae). *Herpetologica*, 68:375-392.
- PESANTES, O.S. 1994. A method for preparing hemipenis of preserved snakes. *Journal of Herpetology*, 28:93-95.
- PINTO, R.R. & FERNANDES, R. 2012. A new blind snake species of the genus *Tricheilostoma* from Espinhaço range, Brazil and taxonomic status of *Reina dimidiata* (Jan, 1861) (Serpentes: Epictinae: Leptotyphlopidae). *Copeia*, 2012:37-48.
- PRUDENTE, A.L.C. & PASSOS, P. 2008. New species of *Atractus* Wagler, 1828 (Serpentes: Dipsadinae) from Guyana Plateau in Northern Brazil. *Journal of Herpetology*, 42:723-732.
- PRUDENTE, A.L.C. & PASSOS, P. 2010. New cryptic species of *Atractus* (Serpentes: Dipsadidae) from Brazilian Amazonia. *Copeia*, 2010:397-404.
- RODRIGUES, M.T. 1981. Uma nova espécie de *Tropidurus* do Brasil (Sauria, Iguanidae). *Papéis Avulsos de Zoologia*, 34:145-149.
- SAVAGE, J.M. 1960. A revision of the Ecuadorian snakes of the colubrid genus *Atractus*. *Miscellaneous Publications, Museum of Zoology, University of Michigan*, 112:1-86.
- UZZELL, T. 1973. A revision of lizards of the genus *Prionodactylus*, with a new genus for *P. leucostictus* and notes on the genus *Euspondylus* (Sauria, Teiidae). *Posilla*, 159:1-67.
- ZAHER, H. 1999. Hemipenial morphology of the South American Xenodontine snakes, with a proposal for a monophyletic Xenodontinae and a reappraisal of Colubroid hemipenes. *Bulletin of the American Museum of Natural History*, 240:1-168.
- ZAHER, H. & PRUDENTE, A.L.C. 2003. Hemipenes of *Siphlophis* (Serpentes, Xenodontinae) and techniques of hemipenial preparation in snakes: a response to Dowling. *Herpetological Review*, 34:302-307.

Aceito em: 01/03/2013

Publicado em: 31/03/2013