South American Journal of Herpetology, 5(2), 2010, 73-82
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VARIATION AND NATURAL HISTORY NOTES ON GIANT GROUNDSNAKE, *ATRACTUS GIGAS* (SERPENTES: DIPSADIDAE)

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Abstract. *Atractus gigas* was described based on a single specimen from western Andes of Ecuador. Although recently, a second specimen of *A. gigas* was reported close to the type locality just on the basis of photographic vouchers. During the examination of Ecuadorian and Peruvian collections, we found additional specimens of this poorly known snake. We also collected new individuals of *Atractus gigas* during fieldwork carried out on northeastern portion of the Peruvian Andes. In this paper, we report new specimens, localities, and data on meristic, morphometric and color pattern variation for the species. We associate the variation displayed by these character systems with sexual, geographic, and ontogenetic phenomena respectively. We provide detailed comparisons and diagnosed *Atractus gigas* from all others members of this highly diverse and complex genus, and comment on their natural history and ontogeny.

Keywords. Andes; *Atractus gigas;* Geographic, ontogenetic, and sexual variation; Natural history.

Introduction

The dipsadid snake genus *Atractus* Wagler comprises small to moderate-sized snakes, having secretive (semi-fossorial or cryptozoic) lifestyle and feeding on earthworms, arthropods, and mollusks (Martins and Oliveira, 1999; Cisneros-Heredia, 2005a). The genus is widely distributed in the Neotropical region, occurring from Panama to Argentina primarily on mainland portions, from sea level to 4,500 meters elevation, along almost all South American morphoclimatic domains (Passos *et al.,* 2010b). *Atractus* is a highly diverse and specious genus closely related to *Adelphicos* Jan and *Geophis* Wagler (Savage, 1960; Downs, 1961; Fernandes, 1995), comprising about 130 valid species, most of them known only from their type specimens (Passos and Fernandes, 2008; Prudente and Passos, 2008; Passos *et al.,* 2009a,b,c,d,e). Currently, the taxonomic status of several species remains unclear with most taxa misidentified or awaiting proper identification in herpetological collections (Passos *et al.,* 2005b; Passos *et al.,* 2007a,b; Passos and Arredondo, 2009; Passos *et al.,* 2009a,b,c,d,e).

The most serious problem in the *Atractus* taxonomy is that several species are still knows only from the type series or few specimens. As a result, geographical, ontogenetic, and sexual variation cannot be assessed (Passos *et al.,* 2010a,b). Another complexity is the large number of species descriptions in the last years, added to the fact that a comprehensive revision is still lacking to the genus (Passos *et al.,* 2009a,b). Although there taxonomic studies have been conducted on regional portions of Amazonia (Cunha and Nascimento, 1983; Martins and Oliveira, 1993; Silva, 2004) or restricted to country boundaries (Savage, 1960; Roze, 1961; Hoogmoed, 1980; Myers, 2003), morphoclimatic domains (Passos *et al.,* 2010b), or Andean Cordilleras (Passos *et al.,* 2009b,c,d), most species of *Atractus* has not been evaluated consistently since its original description (Passos *et al.,* 2010a).

Although several authors correlated the apparent rarity of most species of *Atractus* with its secretive habits or restricted endemism (Savage, 1960; Roze, 1961; Schargel and Garcia-Pérez, 2002; Myers, 2003; Myers and Schargel, 2006), recent studies based on museum specimen's or increasing fieldwork efforts revealed that some taxa are relatively common within certain geographical and/or altitudinal ranges of distribution (Cisneros-Heredia, 2005b; Zaher *et al.,* 2005; Passos *et al.,* 2007a; Loebmann *et al.,* 2009; Passos *et al.,* 2009a,e). Nevertheless, sometimes the scarcity of certain species really reflects lacking of regional samples due to logistic difficulties (Passos et al, 2009e), rapid habitats disturbance (Passos and Fernandes, 2008; Prudente and Passos, 2010), and narrow endemic taxa (Passos *et al.,* 2009c,e).

Myers and Schargel (2006) described *Atractus gigas* based on a single specimen from western portion

of the Andes of Ecuador. Recently, Tolhurst *et al.,* (2010) report another adult specimen (sex was not determined) of *A. gigas,* extending the species distribution about 50 kilometers from the type locality. However, this record is based on a photographic voucher and no meristic data were provided. During the examination of Ecuadorian and Peruvian collections, we found additional specimens of this poorly known snake. We also collected new individuals of *Atractus gigas* during fieldwork carried out on northeastern portion of the Peruvian Andes. Therefore, our aim in this study is to describe its variation reporting meristics, morphometrics, and color pattern characters. In addition, we provided a diagnosis and comparisons between *Atractus gigas* and similar congeners, and report on notes of natural history and notorious ontogenetic shift of coloration for the species.

Materials and Methods

Specimens examined are deposited in the following collections: Escuela Politécnica Nacional (EPN), Quito, Ecuador; Museo de Zoología, Pontificia Universidad Católica del Ecuador (QCAZ), Quito, Ecuador; Centro de Ornitología y Biodiversidad (CORBIDI), Lima, Peru; Zoologisches Forschngsmuseum Alexander Koening (ZFMK), Bonn, Germany. Additional trans-Andean specimens of *Atractus* examined are listed in Passos *et al.* (2007a), Passos *et al.* (2009b,c,d,e,f). Terminology for *Atractus* cephalic shields follows Savage (1960), while the method of counting ventral scales follows Dowling (1951). Terminology for the loreal scale conditions follows Passos *et al.* (2007b). Sex was determined by the presence or absence of hemipenes through a ventral incision at the base of the tail. We defined mature individuals through inspection of the flaccid oviducts, oviductal eggs, and ovarian follicles > 10 mm in the females (modified from Shine, 1988), and opaque and convoluted testicles in males (Shine, 1977). Measurements were taken with analogical caliper to the nearest 0.2 mm, except for snout-vent (SVL) and caudal lengths (CL), which were taken with a flexible ruler to the nearest 1.0 mm.

Because segmental counts are known to be sexually dimorphic in *Atractus* (see Savage, 1960; Passos *et al.,* 2005b; Passos *et al.,* 2007a) we used Mann-Whitney *U*-test to test for statistical differences between sexes. A non-parametric test was used because the relatively small sample size violated the assumptions of univariate normality and homoscedaticity (Zar, 1999). This assumptions were evaluated using Kolmogorov-Smirnov`s test and the Levene's test, respectively (Zar, 1999). We performed the statistical analysis using the software STATISTICA 6.1 (StatSoft, 1998). The following characters were employed in the statistical analysis: number of ventral, subcaudal, supralabial, infralabial, preventrals, gular scale rows, maxillary teeth, and SVL/CL ratio.

Results

Atractus gigas showed significant sexual dimorphism in the number of ventral ($U_{2.46} = 0$, $p < 0.02$, $n = 11$), subcaudal ($U_{-2.45} = 0$, $p < 0.05$, $n = 11$) scales, and SVL/CL ($U_{-2,45} = 0$, $p < 0.05$, $n = 11$). Therefore, these data are presented separately for males and females. The color pattern of juvenile and subadult differ significantly from the adult specimens (Figures 1-5). The geographical variation observed in the sample was mainly correlated to the number of ventral and subcaudal scales (Table 1), while the variation ob coloration characters reflects the changes along it ontogeny (see below).

Atractus gigas Myers & Schargel, 2006
(Figures 1-5)

Atractus major – Savage, 1960; Misc. Publ. Mus. Zool. Univ. Michigan 112: 47. (part).
Atractus gigas Myers & Schargel, 2006; Amer. Mus. Novit. 3532: 8.

Holotype – Adult female, Fundación Herpetológica Gustavo Orcés (FHGO 194), from Bosque Protector, Río Guajalito, old road between Quito and Santo Domingo (00°14'S, 78°49'W, *ca.* 1900 m), Province of Pichincha, Ecuador, collected on January 1990 by V. Zak.

Referred specimens ($n = 11$) – Ecuador: Cotopaxi: Chiribogua: (QCAZ 01), Bosque Protector Río Guajalito (formerly Hacienda Palmeras), between San Francisco de Las Pampas and Quito: (QCAZ 2099, topotype), Bosque Integral Otonga: (QCAZ 3266), San Francisco de Las Pampas: (QCAZ 175, 179, 443, 647, 662); Provenance in error: Piso Tropical Oriental: without specific data: (EPN 8706). Peru: Cajamarca: San Ignacio, Santuario Nacional Tabaconas Namballe: Alto Lhuama: (CORBIDI 877), El Chaupe: (ZFMK 89147).

Diagnosis – *Atractus gigas* is distinguished from all congeners by combination of the following characters: (1) 17/17/17 smooth dorsal scale rows; (2) usually two postoculars; (3) moderately long loreal; (4) temporals 1+2; (5) five to nine supralabials, third and fourth or fourth and fifth contacting orbit; (6) usually seven infralabials, first three contacting chinshields; (7) seven or eight maxillary teeth; (8) three gular scale rows; (9) usually three pre-ventrals; (10) 166-177 ventrals in females and 155-164 in males; (11) 25-37 subcaudals in females and 42-46 in males; (12) dorsum brown with beige transverse bands in juvenile and subadults, and uniformly black or grayish black in adults; (13) venter cream with disperse squared dark brown blotches in juveniles and subadults, and uniform grayish brown or dark brown in adults; (14) large body size, with females reaching 1040 mm SVL, males 255 mm (subadult); (15) moderate tail in females (10.9-15.3% SVL), long in males (16.8-19.9% SVL); (16) hemipenis moderately bilobed, semicapitate, and semicalyculate.

Comparisons – Among all congeners, *Atractus gigas* shares maximum SVL above 600 mm (in females) only with *A. major, A. serranus, A. torquatus,* and *A. trihedrurus*. *Atractus gigas* differs from *A. serranus* and *A. trihedrurus* by having first three infralabials contacting chinshields and 31-37 subcaudals in females, 42-46 in males (vs. four infralabials contacting chinshields in both species and 18-23 subcaudals in females, 26-29 in males of *A. serranus,* and 16-22 in females 23-28 in males *A. trihedrurus*); from *A. torquatus* by having generally seven upper and lower labials, first three infralabials contacting chinshields, two postoculars, and dorsal ground color brown to dark brown (vs. generally eight upper and lower labials, first four infralabials contacting chinshields, single postocular, and dorsal ground color red to reddish brown); from *A. major* by having generally three preventrals, seven or eight maxillary teeth, generally with a single postdiastemal tooth, and dorsum light brown with distinct transverse cream bands in juveniles and nearly uniform dark brown to black in adults (vs. generally one or two preventrals, generally six maxillary teeth with a single postdiastemal tooth, and dorsum beige with wide irregular brown blotches). Refer to Table 1 to additional selected diagnostic characters for *Atractus* species larger than 500 SVL in both sexes.

Description – Head rounded in dorsal view, flattened in lateral view, about twice as long as wide; snout rounded in dorsal view, truncate in lateral view; cervical constriction barely distinct; rostral subtriangular frontal view, wider than high, distinct in dorsal view; internasal as wide as long or wider than long; internasal occasionally limiting dorsal portion of naris; internasal suture sinistral with respect to prefrontal suture; prefrontal as long as wide; supraocular subtrapezoidal, about twice as long as wide; frontal subtriangular or pentagonal, as long as wide; parietal about twice as long as wide; nasal divided; nostril located between prenasal and postnasal; prenasal about twice as high as long; postnasal short than postnasal, higher than long; loreal moderately long, contacting second and third supralabials; pupil rounded; generally two postoculars similar in size; upper postocular sometimes slight higher than lower postocular; temporals 1+2; anterior temporal about twice as long as wide; upper posterior temporals generally fused, shield about three times as long as wide; six to seven supralabials, third and fourth contacting orbit; first two supralabials with similar height, slightly shorter than third; fifth or sixth higher and sixth or seventh longer than remaining supralabials; symphysial subtriangular, about three times wider than long; first pair of infralabials preventing symphysial/chinshields contact; generally seven infralabials, first three contacting chinshields; chinshields twice as long as wide; generally three gular scale rows; generally three preventrals; 17/17/17 smooth dorsal scale rows, lacking apical pits, supraanal tubercles, and keels; caudal spine large, conical, robust, and barely acuminate.

Maxillary arch – Maxilar arched in dorsal view, with five to six prediastemal and two postdiastemal teeth; prediastemal teeth large, angular in cross section, robust at base, slightly acuminate at apices, curved posteriorly, moderately spaced, gradually decreasing in size posteriorly; short diastema, equivalent to the spaces between prediastemal ones; postdiastemal teeth smaller than last prediastemal tooth; lateral process little developed, lacking posterior projection.

Juvenile and subadult color pattern in preservative – Dorsum of head brown; background of head grayish brown to dorsal margin of supralabials; upper and lower labials creamish yellow to grayish brown; mental region creamish yellow, with grayish brown blotches concentrated on symphysial, first infralabials, and anterior chinshields; gular and preventral region generally creamish yellow; venter cream with disperse squared grayish brown blotches; blotches alternated along all of body, forming an irregular chess

Table 1. Selected diagnostic characters for species of *Atractus,* from both sexes, larger than 500 mm SVL. Data for *Atractus depressiocellus* are based on Myers (2003). Data for *A. obesus* incorporate those from Marx (1960). Where appropriate values indicate range, mean ± standard deviation. Abbreviations for dorsal color pattern (DOP) are as follow: 1 = uniformly dark brown to black, occasionally with longitudinal lines due to color contrast between scale rows; 2 = beige to grayish or reddish brown ground color with irregular dark brown to black blotches or transverse tiny bands; 3 = red to reddish brown with conspicuous black diads separate from each other by tiny light ring; 4 = light brown to brown with wide transverse dark brown to black bands. Abbreviations for ventral color patter (VEP) are as follows: 1 = uniformly cream; 2 = mostly dark brown to black; 3 = cream ground color invaded by dorsal bands or rings; 4 = cream ground color with disperse or linearly arranged dark brown dots.

Species	Sex	Dorsals	Ventrals	Subcaudals	CL/SVL	Supralabials	Infralabials	Chinshields	Postoculars
A. albuquerquei	♂ (3)	15	172-182 $\bar{X}$ = 176 ± 5	37-42 $\bar{X}$ = 39 ± 3	14-16 $\bar{X}$ = 15 ± 1	6-7 $\bar{X}$ = 6 ± 0.2	5-6 $\bar{X}$ = 5.1 ± 0.3	1-3	1-2 $\bar{X}$ = 2 ± 0.2
	♀ (10)		192-211 $\bar{X}$ = 205 ± 8	27-37 $\bar{X}$ = 33 ± 3	9.5-12 $\bar{X}$ = 11 ± 1				
A. depressiocellus	♀ (1)	17	167	30	11.4	7	7	1-3	2
A. elaps	♂ (61)	15	142-158 $\bar{X}$ = 149 ± 4	26-37 $\bar{X}$ = 32 ± 2	14-17 $\bar{X}$ = 14 ± 0	6	7	1-4	1
	♀ (36)		152-172 $\bar{X}$ = 159 ± 5	19-27 $\bar{X}$ = 22 ± 5	9-11 $\bar{X}$ = 9 ± 1				
A. gigas	♂ (3)	17	159-164 $\bar{X}$ = 161 ± 2	42-46 $\bar{X}$ = 44 ± 2	17-20 $\bar{X}$ = 18.5 ± 1	5-9 $\bar{X}$ = 6.5 ± 0.8	7-8 $\bar{X}$ = 7 ± 0.1	1-3	2
	♀ (7)		167-177 $\bar{X}$ = 172 ± 4	30-37 $\bar{X}$ = 34 ± 2	11.5-15 $\bar{X}$ = 13 ± 2				
A. major	♂ (24)	17	144-173 $\bar{X}$ = 163 ± 4	29-46 $\bar{X}$ = 37.5 ± 5	12-20 $\bar{X}$ = 16 ± 2	6-7 $\bar{X}$ = 6.9 ± 0.2	6-8 $\bar{X}$ = 6.9 ± 0.3	1-3	1-2 $\bar{X}$ = 2 ± 0.2
	♀ (26)		155-185 $\bar{X}$ = 169 ± 7	24-37 $\bar{X}$ = 31 ± 4	10.5-15 $\bar{X}$ = 13 ± 1				
A. obesus	♂ (1)	17	152	35	17	7	7	1-3	2
	♀ (2)		171-183	26-30	11-13.5				
A. serranus	♂ (6)	17	141-147 $\bar{X}$ = 146 ± 2	26-29 $\bar{X}$ = 27.5 ± 1	9.2-14.3 $\bar{X}$ = 12.6 ± 2	6-8 $\bar{X}$ = 7 ± 0.1	6-8 $\bar{X}$ = 7 ± 0.1	1-4	2
	♀ (20)		150-163 $\bar{X}$ = 156 ± 3	18-23 $\bar{X}$ = 20 ± 1	8-10 $\bar{X}$ = 9 ± 1				
A. titanicus	♂ (3)	17	152-157 $\bar{X}$ = 155 ± 2	21-30 $\bar{X}$ = 26 ± 4	11-15 $\bar{X}$ = 13 ± 2	7	7	1-4	2
	♀ (2)		16-162	18-19	7.8-9.2				
A. torquatus	♂ (7)	17	155-162 $\bar{X}$ = 155 ± 5	41-51 $\bar{X}$ = 45.5 ± 5	16-22.5 $\bar{X}$ = 18 ± 1	7-8 $\bar{X}$ = 8	7-8 $\bar{X}$ = ± 0.2	1-4	1-2 $\bar{X}$ = 1.1 ± 0.4
	♀ (6)		151-172 $\bar{X}$ = 158 ± 7	34-47 $\bar{X}$ = 39 ± 4	12-17.5 $\bar{X}$ = 15 ± 1				
A. trihedrurus	♂ (29)	17	136-150 $\bar{X}$ = 144 ± 4	23-29 $\bar{X}$ = 25 ± 1	9.6-15.5 $\bar{X}$ = 12.2 ± 1	6-8 $\bar{X}$ = 7 ± 0.3	7	1 = 4	2
	♀ (20)		146-159 $\bar{X}$ = 151 ± 3	16-23 $\bar{X}$ = 19 ± 2	7-11 $\bar{X}$ = 9 ± 1				
A. vittatus	♂ (3)	15	136-148 $\bar{X}$ = 141 ± 4	24-30 $\bar{X}$ = 26 ± 5	10-18.5 $\bar{X}$ = 15 ± 5	7-8 $\bar{X}$ = 7.9 ± 0.3	7-8 $\bar{X}$ = 7.8 ± 0.4	1-4	2
	♀ (5)		147-153 $\bar{X}$ = 150 ± 3	18-20 $\bar{X}$ = 19 ± 1	5-11 $\bar{X}$ = 9 ± 3				
A. zebrinus	♂ (52)	17	136-153 $\bar{X}$ = 145 ± 4	20-32 $\bar{X}$ = 25 ± 3	8.3-16.5 $\bar{X}$ = 12 ± 1.7	6-7 $\bar{X}$ = 7 ± 0.1	6-7 $\bar{X}$ = 7 ± 0.1	1-4	2
	♀ (61)		149-170 $\bar{X}$ = 156 ± 4	15-27 $\bar{X}$ = 18 ± 2.3	6.8-12 $\bar{X}$ =				

TABLE 1 (CONTINUED). Selected diagnostic characters for species of *Atractus,* from both sexes, larger than 500 mm SVL. Data for *Atractus depressiocellus* are based on Myers (2003). Data for *A. obesus* incorporate those from Marx (1960). Where appropriate values indicate range, mean ± standard deviation. Abbreviations for dorsal color pattern (DOP) are as follow: 1 = uniformly dark brown to black, occasionally with longitudinal lines due to color contrast between scale rows; 2 = beige to grayish or reddish brown ground color with irregular dark brown to black blotches or transverse tiny bands; 3 = red to reddish brown with conspicuous black diads separate from each other by tiny light ring; 4 = light brown to brown with wide transverse dark brown to black bands. Abbreviations for ventral color patter (VEP) are as follows: 1 = uniformly cream; 2 = mostly dark brown to black; 3 = cream ground color invaded by dorsal bands or rings; 4 = cream ground color with disperse or linearly arranged dark brown dots.

Species	Lorial	Gulars	Preventrals	Maxillary teeth	Hemipenis	DOP	VEP
A. albuquerquei	Moderate	3	3	7-8 $\bar{X}$ = 7 ± 0.2	Moderately bilobed, semicapitate, semicalyculate	1	1
A. depressiocellus	Long	4	4	7	—	2	2
A. elaps	Short	2-4 $\bar{X}$ = 3.3 ± 0.5	2-5 $\bar{X}$ = 3.4 ± 0.6	6-10 $\bar{X}$ = 7.6 ± 0.6	Slightly bilobed, non-capitate, non-calyculate	3	3
A. gigas	Moderate	3	2-5 $\bar{X}$ = 4.2 ± 1.3	7-8 $\bar{X}$ = 7.2 ± 0.3	—	1, 4	1, 2
A. major	Long	2-4 $\bar{X}$ = 3 ± 0.2	1-3 $\bar{X}$ = 2 ± 0.5	5-8 $\bar{X}$ = 6.1 ± 0.5	Moderately bilobed, semicapitate, semicalyculate	2	1, 4
A. obesus	Moderate	4	4	7	Moderately bilobed, non-capitate, non-calyculate	3	3
A. serranus	Moderate to long	3-4 $\bar{X}$ = 3 ± 0.2	1-4 $\bar{X}$ = 2.9 ± 0.5	8-10 $\bar{X}$ = 9 ± 0.3	Moderately bilobed, semicapitate, semicalyculate	1, 4	1, 2
A. titanicus	Long	3-4 $\bar{X}$ = 3.7 ± 0.3	4	7-8 $\bar{X}$ = 7.7 ± 0.6	—	4	3
A. torquatus	Long	3-4 $\bar{X}$ = 3.7 ± 0.4	3-4 $\bar{X}$ = 3.6 ± 0.5	8-9 $\bar{X}$ = 8.1 ± 0.3	Moderately bilobed, semicapitate, semicalyculate	1, 2	4
A. trihedrurus	Moderate to long	3-4 $\bar{X}$ = 3.2 ± 0.3	2-4 $\bar{X}$ = 3.3 ± 0.6	8-10 $\bar{X}$ = 9 ± 0.3	Moderately bilobed, semicapitate, semicalyculate	1, 4	1, 2
A. vittatus	Long	3-4 $\bar{X}$ = 3.5 ± 0.5	3-5 $\bar{X}$ = 3.9 ± 0.6	13-14 $\bar{X}$ = 13.2 ± 30.4	Moderately bilobed, semicapitate, semicalyculate	1	2
A. zebrinus	Moderate	2-4 $\bar{X}$ = 3 ± 0.3	2-4 $\bar{X}$ = 3 ± 0.4	7-10 $\bar{X}$ = 8 ± 0.4	Moderately bilobed, semicapitate, semicalyculate	2	1

pattern; undersides of tail brown, with cream pigment concentrated on median suture between subcaudals; dorsal ground color of body brown, with wide conspicuous bands (one to three scales wide); alternate bands occasionally connected above vertebral region, forming conspicuous and incomplete (ventrally) rings (Figure 1).

Juvenile and subadult color in life – Dorsum and background of head dark brown, with few disperse yellowish dots or blotches; supralabials mostly dark brown with small invasion of cream pigment; temporal region and posterior supralabials covered with transverse cream blotch; mental region cream, with dark brown dots concentrated on symphisial, anterior supralabials, and chinshields; venter cream with irregularly distributed dark brown squared blotches; underside of tail mostly dark brown with few cream disperse dots; dorsal ground color of body dark brown, with tiny transverse yellow bands (one scale long and three to five scales wide); transverse bands alternated on flanks, occasionally connected above paravertebral region; paraventral region dark brown with disperse yellow dots (one scale wide and long) (Figure 2).

Figure 2. General view in life of juvenile specimen of the *Atractus gigas* (ZFMK 89147). SVL 154 mm, CL 21 mm.

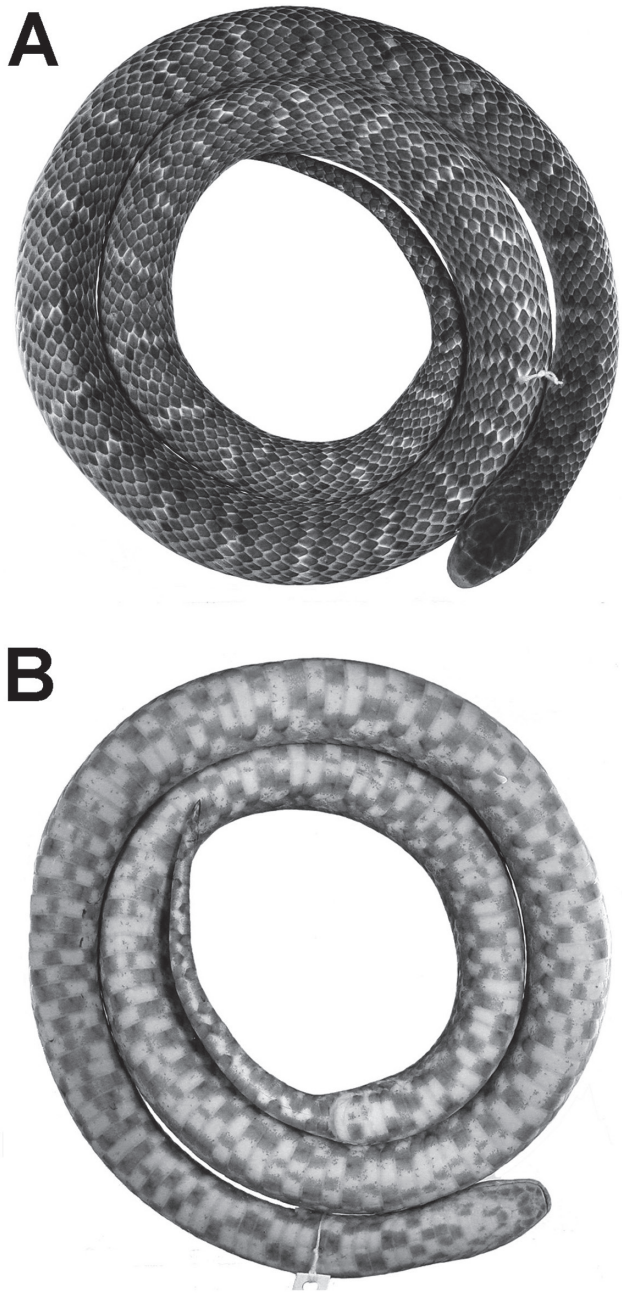

Figure 1. Dorsal (A) and ventral (B) views of subadult specimen of *Atractus* (QCAZ 3266) *gigas.* SVL 565 mm, CL 61 mm.

Adult color pattern in preservative – Dorsum of head brown, grayish brown to black; background of head grayish brown to black; upper and lower labials light brown, grayish brown or black; mental portion creamish yellow, with grayish brown blotches concentrated on symphysial, first infralabials, and anterior chinshields; gular and preventral region generally creamish yellow; occasionally mental and gular regions uniformly black; venter and tail generally grayish brown to black, occasionally with few light (beige) dots or spots; belly and underside of tail occasionally beige; dorsum of body uniformly dark brown to black; dorsum occasionally with barely distinct wide transverse bands (one or two scales wide); many times bands distinct only after alcohol immersion (Figures 3 and 4).

Adult color in life – Dorsum and background of head mostly dark brown, with yellowish pigment concentrated on snout region; supralabials light brown with

small invasion of cream pigment; mental and gular regions most dark brown, with few cream dots; venter light to dark brown, with few cream to grayish brown disperse dots; underside of tail dark brown; dorsal ground color of body brown, with few yellow dots or barely distinct transverse bands; each dorsal scale with anterior portion beige to light brown and posterior region brown, forming a reticulate pattern (Figure 5).

Variation – Largest male (subadult) 255 mm SVL, 43 mm CL; largest female 1040 mm SVL, 120 mm CL; tail 16.8-19.9% SVL ($\overline{X}$ = 18.6; SD = 1.6; n = 3) in males, 10.9-15.3% SVL ($\overline{X}$ = 13; SD = 1.6; n = 7) in females; 159-164 ($\overline{X}$ = 162; SD = 2.6; n = 3) ventrals in males, 166-177 ($\overline{X}$ = 171; SD = 4.2; n = 7) in females; 42-46 ($\overline{X}$ = 44.2; SD = 2.0; n = 3) subcaudals in males, 25-37 ($\overline{X}$ = 32.4; SD = 3.6; n = 7) in females; 5 (n = 1 side), 6 (n = 11 sides), 7 (n = 6 sides), 8 (n = 1 side) or 9 (n = 1 side) supralabials; 7 (n = 20 sides) or 8 (n = 1 side) infralabial; 0+2 (n = 1 side), 1+1 (n = 1 side) or 1+2 (n = 19) temporals; 3 (n = 21 sides) or 4 (n = 1 side) gular scale rows; 2 (n = 2), 3 (n = 7) or 5 (n = 1) preventrals; 8-10 ($\overline{X}$ = 8.7; SD = 0.6; n = 20 sides) dorsal scale rows in the level of second subcaudal; 7 (n = 13 sides) or 8 (n = 5 sides) maxillary teeth; 8.0-30 mm body diameter.

Natural history – Live specimens were collected at Santuario Nacional Tabaconas Namballe, San

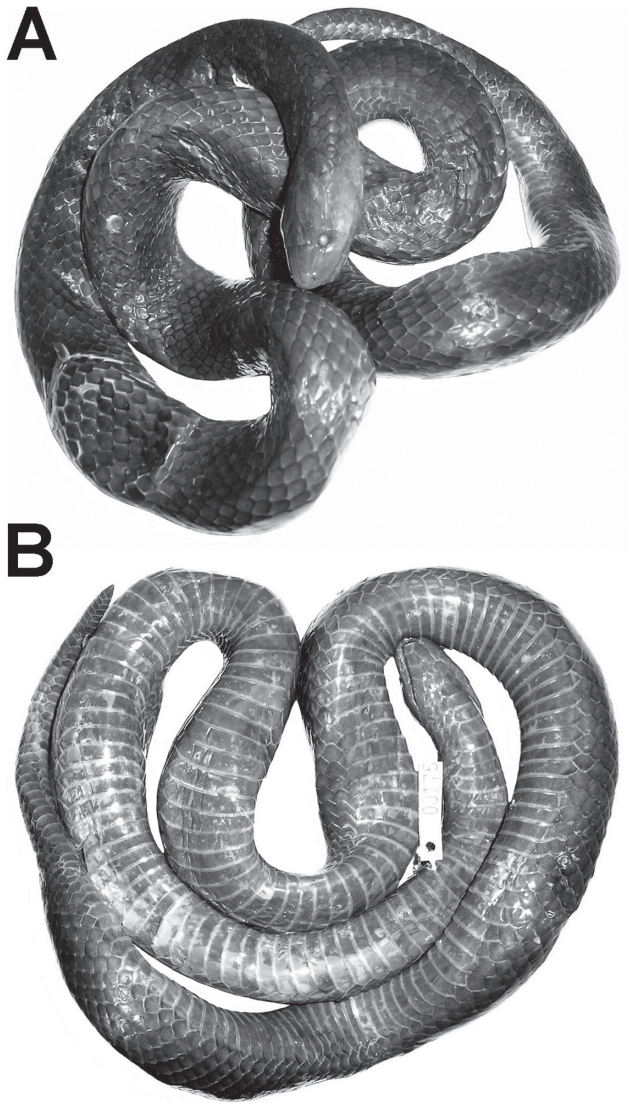

Figure 3. Dorsal (A) and ventral (B) views of adult specimen of *Atractus gigas* (QCAZ 175). SVL ± 1000 mm, CL 120 mm.

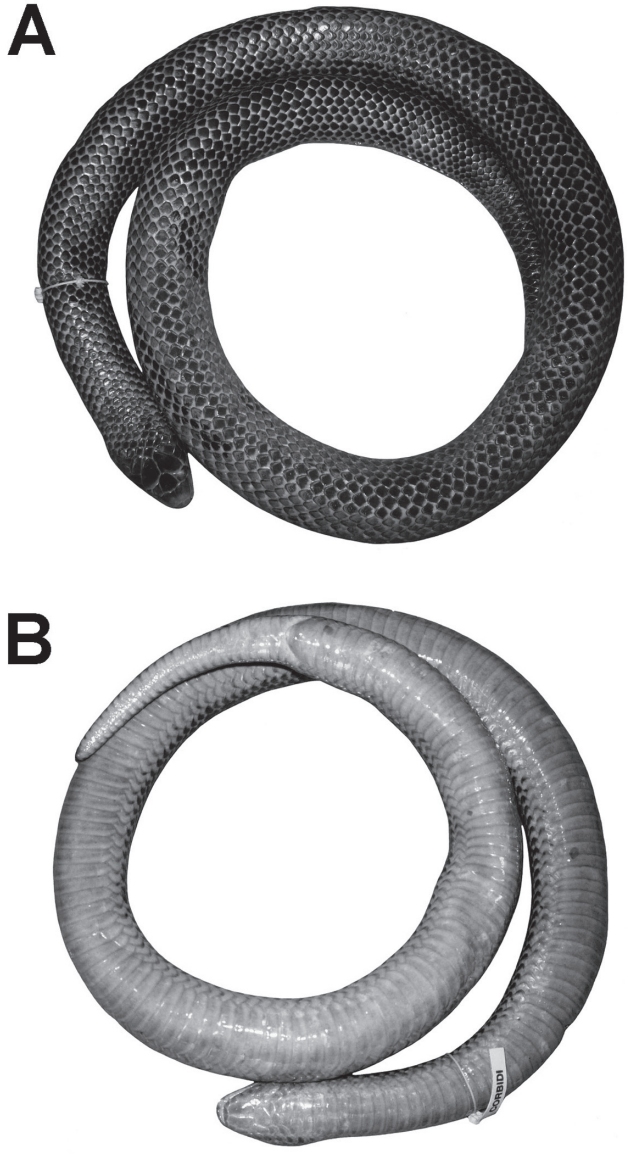

Figure 4. Dorsal (A) and ventral (B) views of adult specimen of *Atractus gigas* (CORBIDI 877). SVL 760 mm, CL 83 mm.

FIGURE 5. General view in life of adult specimen of the *Atractus gigas* (CORBIDI 877).

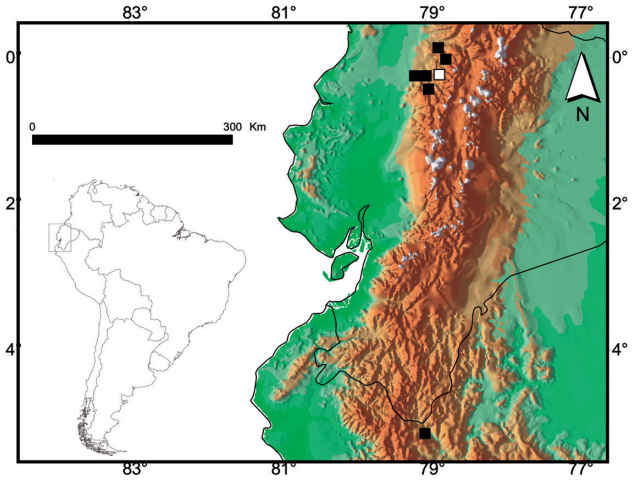

FIGURE 6. Geographic distribution of *Atractus gigas.*

Ignacio (05°09'S, 79°01'W, *ca.* 1132 m), Peru, on trails during the day at December 2008. An adult female (CORBIDI 877, 760 mm SVL, 83 mm CL), was active above the ground, crossing a trail in secondary vegetation (in an early stage of regeneration, still lacking a structured leaf litter); although the snake was found at the forest edge in an open area, the vegetation around the collection site had well developed layer of leaf litter. This female contained 12 eggs in the oviduct, measuring 30.4-36.3 mm ($\overline{X}$ = 33.7 mm) length and 14.5-16.3 mm ($\overline{X}$ = 15.5 mm) width. A juvenile (ZFMK 89147, 134 mm SVL, 20 mm CL), was resting under a tree log, close to a coffee plantation (*Coffea arabica* spp.). The general habitat in this area is humid montane forest, at 1500-1900 m above sea level. Many additional individuals were regularly observed in this site at early morning to late afternoon on trails cutting secondary vegetation or plantations near a waterfall.

Distribution – Northwestern Ecuador to northeastern portions of the Andes of Peru; Pacific versant of Andes, from Cordillera of Intag (00°08'N, 78°50'W, *ca.* 600 m), Province of Imbabura, southwestern to Santo Domingo de Los Colorados (00°15'S, 79°09'W, *ca.* 600 m), Province of Pichincha, and southeastern to San Francisco de Las Pampas (00°26'S, 78°58'W, *ca.* 1280 m), Province of Cotopaxi, Ecuador; Amazon versant of Andes, southeastern to San Ignacio (05°09'S, 79°01'W, 600 m), Region of Cajamarca, Peru. *Atractus gigas* inhabits primary or secondary cloud mountain forest or coffee plantations on high elevation on both sides of the Andes, between 600-2300 m (Figure 6).

DISCUSSION

Savage (1960) pointed out those two specimens, tentatively identified by him as *Atractus major,* from Intag (paralectotype of *A. major,* BMNH 78.1.25.50) and Santo Domingo de Los Colorados (OV 768), had distinct characteristics of its remaining sample of the species. According to Savage (1960), both specimens shared eight maxillary teeth and "D" color pattern recognized by the author for *A. major.* Savage (1960) suspected of label error of the Intag specimen due to the know provenance problems with the Buckley's collection housed at Natural History Museum of London (see Savage, 1960). Even so, Savage (1960) foresees that if the Buckley's locality was correct, both species might represent an undescribed species distributed west from Ecuadorian Andes apparently closely related to *A. major.*

Myers and Schargel (2006) named *Atractus gigas* on the basis of a single specimen from a natural reserve between Quito and Santo Domingo in the western Andes of Ecuador. Myers and Schargel (2006) promptly distinguished *A. gigas* from the other congeners by its large size (exceeding 1000 mm of total length), comparing *A. gigas* with species having SVL above 700 mm (*A. depressiocellus, A. major, A. obesus,* and *A. torquatus*). Although the authors did not compare *A. gigas* with *A. serranus* and *A. trihedrurus* – the other two species attaining largest size in the genus (Passos *et al.,* 2010b) – the former species can be easily distinguished from them (Table 1). Myers and Schargel (2006) suspect that juveniles and subadults of *A. gigas* could have transverse bands on dorsum, but the authors did not associate the Savage's banded specimens of *A. major* with *A. gigas.*

We herein considered the two Savage's specimens mentioned above as *A. gigas* and report 11 additional individuals from western Andes of Ecuador and Peru. These species perfectly agrees with species description, except for lacking the azygous frontonasal scale (but see below) like the specimen recently reported by Tolhurst *et al.* (2010). As really noted by Myers and Schargel (2006) the cephalic plate arrangements of the snout region in *Atractus* is variable (see also Savage, 1960). According to our sample, the occurrence of frontonasal did not constitute a diagnostic character of *A. gigas.* Most likely, the occurrence of frontonasal in *Atractus* is due to change in the timing of cephalic shields subdivisions during embryogenesis, rather than showing any structured phylogenetic signal (Passos, 2008). Until where we known, the azygous frontonasal is observed in very low frequency along the genus and occurs on species distantly related as such *A. caxiuana* and *A. snethlageae* (Passos, 2008; Prudente and Passos, 2008).

The juvenile and adult females from San Ignacio, Cajamarca, on Amazonian versant of the Peruvian Andes have a smaller number of subcaudals (25-26) than Ecuadorian specimens of *Atractus gigas* (31-37). The specimen CORBIDI 877 has nine supralabials in the right and eight in the left side and eight infralabials in the right and seven in the left side, with first four infralabials contacting chinshields (vs. fifth to seventh supralabials, seven infralabials, and first two or three infralabials contacting chinshields in the Ecuadorian specimens).

Although the occurrence of a single species on both sides of Andes is unexpected in the genus *Atractus* (Passos, 2008), all other meristic, morphometric, and color pattern characters displayed by Peruvian specimens are similar to Ecuadorian sample and also match the holotype of *A. gigas*. Moreover, as a general rule in snakes, samples from warmer and humid places (closer to the Equator) have an increased number of segmental counts (Fox, 1948; Passos *et al.,* 2005a; Passos and Fernandes, 2009). Even if it is not the case considering altitudinal variation of temperature along the Andes, there is at least one species with increased number of ventral and subcaudal scales on southern Andes of Ecuador compared with northern populations (*A. dunni,* P. Passos unpubl. data). Since Peruvian individuals come 360 Km distant from the southern record of the species, we interpret such phenomena as geographical variation on extremes of distribution preferentially that evidence of a distinct taxon from Peru.

Resumen

Atractus gigas fue descrita en base a solo un espécimen del oeste de los Andes de Ecuador. Aunque recientemente, se reporto, solo a través de fotografías, el segundo espécimen de *A. gigas* cerca a localidad tipo. Durante la revisión de las colecciones de Ecuador y Perú se encontraron especímenes adicionales de esta especie poco conocida. También colectamos nuevos individuos de *Atractus gigas* a lo largo del trabajo de campo conducido en la porción noreste de los Andes peruanos. En este artículo, se reportan nuevos especimenes, localidades y datos de variación merística, morfométrica y del patrón de coloración para la especie. Además asociamos el patrón de variación demostrado en estos sistemas de caracteres a los fenómenos sexuales, geográficos y ontogenéticos. Proveemos comparaciones detalladas y diagnosticamos *Atractus gigas* de todos los otros miembros de esto género tan diverso y complejo, y comentamos sobre su historia natural y ontogenia.

Acknowledgments

The senior author thanks A. Almendáriz (EPN) and L. Coloma (QCAZ) for allowing the examination of the specimens under their care. We are grateful to M. Martins (USP) for helpful comments on early version of the manuscript. We thank F. L. Franco (IB), A. R. Giraudo (INALI), and C. Nogueira (UNB) for helpful comments on the manuscript. Financial support P. Passos was provided by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), and Fundação Carlos Chagas Filho de Amparo à Ciência do Estado do Rio de Janeiro (FAPERJ).

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Submitted 11 February 2010
Accepted 29 June 2010