Redescription of *Apostolepis albicollaris* Lema, 2002, with a Key for the Species Groups of the Genus *Apostolepis* (Serpentes: Dipsadidae: Elapomorphini)

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REDESCRIPTION OF *APOSTOLEPIS ALBICOLLARIS* LEMA, 2002, WITH A KEY FOR THE SPECIES GROUPS OF THE GENUS *APOSTOLEPIS* (SERPENTES: DIPSADIDAE: ELAPOMORPHINI)

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Abstract. Here we provide a detailed description and diagnosis of *Apostolepis albicollaris* Lema, 2002, a species known from Central Brazil. The species is easily diagnosable from all its congeners by the following combination of characters: a distinctive white nuchal collar (bordered by a narrow black collar), a very broad black lateral streak (from ventral border to 5th dorsal row), an almost entirely black ventral surface or black with lateral blotches, and 5th + 6th supralabials in contact with the parietal (temporals 0 + 0). *Apostolepis albicollaris* inhabits interfluvial savannas and appears to be the most abundant species of *Apostolepis* in the region of the type-locality, located within the core area of the Cerrado domain of Central Brazil. Detected patterns of character state distribution supports the inclusion of *A. albicollaris* in a distinct intrageneric assemblage, here named the *dimidiata* species-group, an inferred clade diagnosed by the following putative synapomorphies: prominent (to strongly pointed) rostral; slightly rounded terminal shield; snout mostly black with small (to indistinct) light spots; upper lip extensively white; and, in most species, absence of nuchal collars. Although superficially closest to *A. dimidiata,* no putative synapomorphy was found to support a sister-group relationship between these species. Instead, *A. albicollaris* seems to have retained putatively plesiomorphic features suggestive of an ancient divergence relative to other members of the *dimidiata* species group.

Key-Words. Serpentes; Dipsadidae; Elapomorphini; *Apostolepis albicollaris;* Cerrado; Central Brazil.

Introduction

Monophyly of the South American xenodontine tribe Elapomorphini, comprising the genera *Elapomorphus, Phalotris,* and *Apostolepis* (including *Parapostolepis*), is supported by a number of putative synapomorphies (Ferrarezzi, 1993, 1994a, b; Underwood and Kochva, 1993; Zaher, 1994, 1999). The genus *Apostolepis* Cope 1862 is the most diversified and morphologically distinct clade of elapomorphine snakes (Ferrarezzi, 1993, 1994a), currently including at least 27 valid species (Ferrarezzi, 1993; Giraudo and Scrocchi, 1998; Harvey, 1999; Harvey, *et al.* 2001; Ferrarezzi *et al.,* 2005; Bérnils and Costa, 2012).

The first taxonomic revision of *Apostolepis* (still considered as a subgroup of *Elapomorphus*) was conducted by Strauch (1885) and, since Boulenger's (1896) catalogue, it has been recognized as a full genus, for which several new species were described (Lema, 2002, 2003; Ferrarezzi *et al.,* 2005). However, most species are only known by their holotype or a few additional specimens, being poorly represented in collections. Proliferation of recorded new species that, for the most part lack information on individual and geographical variation, has led to an increasingly complex and intricate taxonomic history for the group (Vanzolini, 1986; Ferrarezzi, 1993).

Additionally, available keys to *Apostolepis* species have proven to be of limited reliability (Boulenger, 1896; Peters and Orejas-Miranda, 1970; Lema, 1978, 2001) and, apart from a number of easily diagnosable species (Rodrigues, 1992; Giraudo and Scrocchi, 1998; Harvey, 1999; Harvey *et al.,* 2001; Ferrarezzi *et al.,* 2005), most species of *Apostolepis* still depend on the obtention of additional material to support detailed comparative studies.

Recent sampling efforts in central Brazilian Cerrado (Nogueira, 2001; Valdujo and Nogueira, 2001; Nogueira and Rodrigues, 2006; Costa *et al.,* 2007, 2010; Recoder and Nogueira, 2007) revealed the presence of a significant number of previously unreported or poorly known reptile species, including several species of *Apostolepis*. The increase in taxonomic, distributional, and ecological knowledge of the rich central Brazilian snake fauna (Vanzolini, 1988) is especially relevant due to the rapid pace of destruction of original landscapes in the Cerrado, a region recently recognized as prioritary for biodiversity prospection and conservation programmes (Myers *et al.,* 2000).

While awaiting publication of a new species referred as *Apostolepis* sp. 7 by Ferrarezzi (1993), we were surprised with the description of the same taxon by Lema (2002). Since our original description and

comparisons of *A. albicollaris* differed substantially from Lema's (2002), we opted to present herein a redescription of the species.

Material and Methods

Specimens

We examined 14 additional museum specimens of *Apostolepis albicollaris*. We compared our sample of *A. albicollaris* species with representatives of most species of *Apostolepis*. Examined specimens were provided by the following institutions (institutional codes in parentheses): Laboratório de Herpetologia, Instituto Butantan, São Paulo (IBSP); Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ); Coleção Herpetológica da Universidade de Brasília (CHUNB); Museu de História Natural da Universidade Estadual de Campinas (ZUEC); Museu de Zoologia da Universidade de São Paulo (MZUSP); Muséum National d'Histoire Naturelle de Paris (MNHN).

Along with the redescription, we report the state observed for nearly all external characters currently thought informative in diagnosing its congeners, outlining those features proven to have some consistency in modern taxonomic studies (Ferrarezzi, 1993; Harvey, 1999; Harvey *et al.,* 2001; Ferrarezzi *et al.,* 2005). Hemipenes were mounted with agar jelly, following the procedures described by Pesantes (1994) for inverted or semi-everted organs from museum specimens, or Manzani and Abe (1988) for freshly killed ones. The nomenclature used for hemipenial structures was based on Dowling and Savage (1960) and Zaher (1999). Ventral shields were counted using Dowling's (1951) method. All statistical analyses were performed using the Statistica 6.0 package (StatSoft, 1998), according to procedures in Zar (1984). Significance levels were determined at $\alpha = 0.05$.

Results

Apostolepis albicollaris Lema, 2002
(Figs. 1-2, Table 1)

Apostolepis dimidiata – Lema, 1993:43 (in part)
Apostolepis dimidita – Harvey 1999:408 (in part)

Material examined: IBSP 55142, adult female from Luziânia (16°25'S, 47°58'W; 950 m elevation), Goiás state, Brazil, unknown collector, May 1992; IBSP 20617 (adult) and IBSP 20618 (juvenile) males from Brasília (15°46'S, 47°03'W; 1100 m elevation), Distrito Federal, collected by the staff of Fundação Zoobotânica in 1960; IBSP 26760, adult male from Brasília, collected by P. C. Cuntim Filho (Fundação Zoobotânica), in 09 December 1966; IBSP 55143, adult female from Brasília, Distrito Federal, obtained from local collectors by O. Pesantes, around 1980; IBSP 26712, adult male from Cana Brava, Minaçu municipality (13°34'S, 48°13'W; 400 m elevation), Goiás state, collected by J. P. Milenski, Sociedade Anônima de Mineração de Amianto, in 10 November 1966; IBSP 62498, juvenile female from Santa Cruz de Goiás (17°19'S, 48°30'W), Goiás state, collected by J. Medau, in 17 November 2000; IBSP 63917 adult male from Brasília, Distrito Federal; IBSP 63913, adult female from Brasília, Distrito Federal; IBSP 63915, juvenile female, unknown locality; IBSP 63916, adult male from Fazenda Santa Rosa, Olhos d`Água (16°02'S, 48°35'W; 1000 m elevation), Alexânia municipality, Goiás state, obtained from local collectors by C. Nogueira in December 1999; CHUNB 23782, adult male from Brasília, Distrito Federal, collected by P. H. Valdujo and F. G. R. França, in 05 December 2000; CHUNB 23783, subadult male from Brasília, Distrito Federal, collected by C. Nogueira, in 02 January 2001.

Diagnosis: A medium-sized species of *Apostolepis* (up to 451 + 46 mm), differing from all other members of the genus by the following unique combination of characters: rostral moderately prominent to slightly pointed (portion visible from above more than ½ the length of its distance to frontal, equal to slightly longer than mental from below); nasal usually contacting preocular; temporals 0 + 0 (5^{th} and 6^{th} supralabials contacting parietal); four infralabials contacting anterior chinshields; ventrals 196-230; subcaudals 24-33; terminal shield short, white posteroventrally and usually rounded; white nuchal collar distinct (2-3 scales long), bordered by narrow black cervical collar (1-2 scales long, indistinct in CHUNB 23782); dorsal color red above, the sides black (below middle of dorsal row 5) with white edged scales; black vertebral stripe absent (just a faint anterior vestige); paravertebral stripe absent; venter heavily pigmented (at least laterally in ventral scales) to mostly black (posterior edges of ventrals white); prefrontal region mostly black, white snout spots usually restricted naso-rostrally; large white blotch covering most of 3^{rd} supralabial, all of 4^{th}, and (usually) most of 5^{th}; chin and infralabial region mostly white or just slightly spotted; black

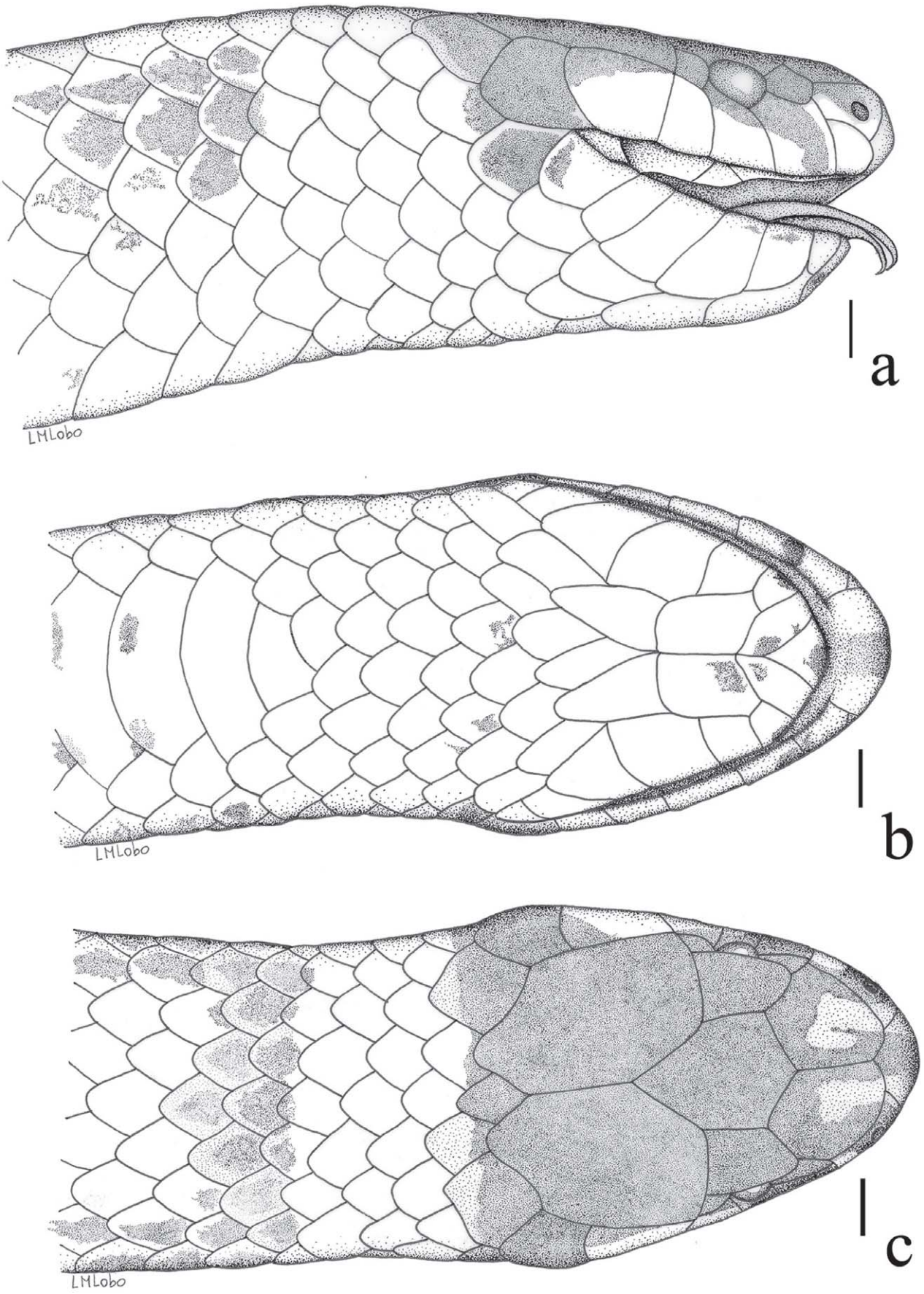

FIGURE 1. *Apostolepis albicollaris* (IBSP 55142, Luziânia, Goiás state). Head in (a) lateral, (b) ventral and (c) dorsal views. Scale = 1 mm.

Table 1. Summary of variable features analyzed in the additional specimens of *Apostolepis albicollaris*. (abs.) absent, (comp.) complete, (IAC) infralabials-anterior chinshield, (incom.) incomplete, (IPC) infralabials-posteiror chinshield, (n.a.) non applicable; (*) scales long.

	IBSP											CHUNB	
	55142	55143	62498	63913	63915	20617	20618	26712	26760	63916	63917	23782	23783
Sexes	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂	♂	♂	♂
Locality	Luziânia	Brasília	Santa Cruz	Brasília	—	Brasília	Brasília	Cana Brava	Brasília	Alexânia	Brasília	Brasília	Brasília
SVL + TL (mm)	327 + 32	260 + 28	203 + 18	451 + 46	227 + 25	264 + 32	157 + 17	275 + 34	400 + 50	289 + 32	294 + 35	268 + 30	236 + 29
Tail/Total Lenght	0.089	0.097	0.081	0.093	0.099	0.108	0.098	0.11	0.111	0.1	0.106	0.101	0.109
Ventrals (+ paravertebrals)	230 + 1	219	229 + 1	211	206	208	205	197 + 2	203 + 2	208 + 1	201 + 1	205 + 1	196 + 1
Subcaudals	28/28	30/29	24/24	31/30	29/30	31/30	32/33	30/30	33/32	28/29	32/32	32/32	30/30
Rostral/prefrontal suture	≤ 2/3	1/2	1/2	2/3	–/–	2/3	1/2	1/2	2/3	1/2	1/2	1/2*	1/2
Nasal/preocular contact	broad	broad	broad	narrow	broad	narrow	absent	broad	narrow abs.	narrow	broad	n.a.	broad
Supralabials	6	6	6	5/6	6	6	6	6	6	6/5	6/5	6	6
IAC	1/4	1–4/1–3	1/4	1/4	1/4	1/4	1–3/1–4	1/4	1/4	1/4	1/4	1/4	1/4
IPC	4	4–5/3–4	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5
White collar*	3	2	3	3	3.5	3	3	3	3	3	2.5	2	3.5
Black collar*	2	2	2	2	1	2	2	2.5	2	2	2	0	1.5
Supralabial blotch	2/5	3/5	2/5	3/4	2/6	2/5	2/6	3/5	3/5	3/4	3–5/3–4	3/5	1/4
Black gular band	incom.	incom.	incom.	comp.	incom.	incom.	incom.	~ comp.	incom.	incom.	comp.	~ comp.	incom.
Vertebral line*	2	0	7	12	15	26	21	6	17	18	19	5	0
Paravertebral line*	0	0	8	0	0	0	0	0	7	0	6	0	0
Tail band (subcaudals long)	5/3	9/7	0	6/7	5/6	5	5/4	3/4	5/4	4	0	5/6	4
Black ventral pattern	lateral	lateral	lateral	comp.	lateral	lateral	lateral	lateral	comp.	comp.	comp.	lateral	lateral

occiput extended below rictus, sometimes completing a gular band.

Emended description: (based in an adult female IBSP 55142); tail short, 8.9% of total length; head short, 2% of total length, 61% as wide as long, not distinct from neck; snout moderately pointed (in dorsal and lateral views), prominent over the chin. Eye small, with sub-elliptical pupil. Measurements (mm, right side) of Snout-vent length 327, tail 32; head length 7.5, width 4.8; rostro-supralabial length 6.4; eye diameter 0.7; eye-nostril distance 1.6; oculabial distance 0.9; rostral length from above 0.7, from below 0.75; prefrontal length 1.7, prefrontal width 1.3; suture between prefrontals 1.3; frontal length 2.3; frontal width 1.7; parietal length 3.2; parietal width 1.9; suture between parietals 1.8; mental length 0.7; suture between first infralabials 0.4; chinshields ($1^{st} + 2^{nd}$) length 1.3 + 1.6; suture between chinshields 1.1 + 0.4.

Scalation: Rostral moderately large and prominent, its portion visible from above slightly longer than half of its distance to frontal (55% of interprefrontal suture); prefrontals longer than wide; length of suture between prefrontals 60% the length of hexagonal frontal, frontal anterior width 73% its length; length of suture between parietals 80% the length of frontal; parietal width 60% its length. Naris centrally placed in anterior half of the nasal and directed laterally; nasal entire, widely contacting preocular (loreal absent); preocular distinctly longer than high; about half length of nasal; supralabials 6/6, first and second contacting nasal, second and third entering orbit, third and fourth contacting postocular; fouth in slight contact with parietal only on left side; fifth and sixth contacting parietal; temporals absent (0 + 0); five occipitals; median occipital between caudal tips of parietals, smaller than following vertebral scales and than adjacent occipitals; one very large (same size as 6^{th} supralabial) lateral occipital shield on each side, filling space between last supralabial and parietal. Mental triangular, with convex anterior border, slightly wider than long and slightly longer than rostral in ventral view, well separated from chinshiels by median contact between first infralabials; mental groove distinct, length of suture between anterior chinshields 77% length of suture between prefrontals; 7/7 infralabials, the first four contacting anterior chinshields; fourth contacting posterior pair of chinshields and fifth slightly separated from posterior chinshiels; chinshiels elongate and well differentiated, the posterior pair longer and in short anteromedian contact, separated from ventrals by five gular rows and one preventral.

FIGURE 2. Live specimen of *Apostolepis albicollaris* (CHUNB 23782, sub-adult male, TL = 263 + 30 mm) from Brasilia, DF, collected in a pit-fall trap in *cerrado sensu-stricto.* This specimen is unusual in lacking a black border of the white nuchal collar and by its unique head scalation (see text).

Color pattern: Head black above and around the eye, to the occipital scale row, downwards around the corner of mouth, last infralabial and adjacent gular scales, forming an incomplete (vestigial) black gular band; a light spot from part of second to most of fifth supralabial, with a convex posterodorsal border; an irregular brown blotch along each prefrontal, continuous with a distinct white blotch covering the rostral border, first supralabial and most of nasal except centrally. Ventral surface of head white, with minute black spots in mental region; median gulars with small dark spots (isolated from black gular band, which is thus incomplete); white nuchal collar relatively broad (3 scales long), followed by a narrow black cervical collar (1.5-2 scales long). Dorsal coloration of the paravertebral zone (between 5th longitudinal scale rows) faded to yellowish after preservation; lateral surface with a wide longitudinal black strip, from the cervical collar to the tip of tail, covering from the first to half the fifth longitudinal scale rows; the posterior margin of the lateral black scales is white, conferring a reticulated pattern to the pleural stripe; at the tail, the black lateral strip has a width of 2.5 (proximal) to 1.5 (distal) longitudinal scale rows; the white border of the lateral scales are slightly more extensive in the anterior and lowest scale rows. Ventral surface with a pair of large latero-ventral black spots in each ventral shield, forming two series somewhat confluent midventrally at midbody region but usually interrupted by an irregular midventral white strip; ventral surface of tail similar to ventral pattern, each subcaudal with a lateral black spot, forming two longitudinal series, decreasing in size and becoming unconspicuous distally. Tip of tail black dorso-ventrally, covering 6/8 dorsals, and 3/4 subcaudals; terminal shield white, except for black proximal dorsal surface.

Color in life: (from CHUNB 23782, Fig. 2) Dorso-ventral pattern as described above, except for the absence of a black cervical collar (only absent in this specimen), a more heavily pigmented ventral and lateral surfaces, and the presence of a nearly complete dark gular band. Dorsal coloration is coral red, with dorsal sales covered by melanophores except in anterior region. Such pigmentation is denser on the free edges of the scales, giving the impression of a dark reticulum. This subtle pattern is lost in preserved specimens. The reticulated pattern is also formed by the white margins of lateral dorsal scales, in the black lateral stripes.

Variation: Measurements and relevant morphological variation observed in some specimens are summarized in Table 1. Most of them are in general agreement with characters described for the holotype, although exceptions were noted. Remarkable polymorphism in meristic characters was detected, even in a relatively small sample, obtained mostly within a restricted geographical range. One sub-adult male (CHUNB 23782, Fig. 2) from Brasília, is unusual in lacking a black border of the white nuchal collar and in its unique head scalation, showing loreal scales on both sides and a pair of internasals, both features absent in all elapomorphine snakes.

The largest specimen (451 + 46 mm) is a female, the next one, a male (400 + 50 mm). The smallest specimen is a juvenile female (203 + 18 mm). Ventrals ranged from 196-208 in males (mean = 205.5 ± 9.1) and 206-230 in females (mean = 217 ± 9.1). Subcaudals ranged from 24-30 in females (mean = 28.4 ± 2.7) and 28-33 (mean = 30.6 ± 1.8) in males. Tail-length (TL)/ Total-length (TTL) ratios ranged from 0.098-0.111 (mean = 0.105 ± 0.005) in males and from 0.081-0.099 (mean = 0.092 ± 0.007) in females. Sexual dimophism is evident, with females showing significantly lower TL/TTL ratios (Kruskal-Wallis Anova, $H_{(1;14)} = 8.28$; $p < 0.01$) and higher ventral counts (Kruskal-Wallis Anova, $H_{(1;14)} = 4.87$; $p = 0.03$). Although males tended to have higher subcaudal counts, no significant differences were observed in this character (Kruskal-Wallis Anova, $H_{(1;14)} = 2.63$; $p = 0.10$).

Nasal generally in broad contact with preocular, although some specimens show these scales in narrow contact or even separated; supralabiais generally six, although some specimens show a reduced fourth scale or even 5 scales on one side; generally the first four infralabiais contact anterior chinshields, although in two specimens one of the anterior chinshields contacts only the first three infralabials; in most cases fourth and fifth infralabials contact posterior pair of chinshields, but in one specimen one of the posterior chinshields contacts the third and fourth infralabial (see Table 1).

The dorsal pattern exhibits little variation. Snout whitish spots are usually small and mostly restricted to rostral sides, first labial, and nasal, with narrow obscured extentions to prefrontals, but a single specimen differs in having a pair of large white blotches covering most of prefrontals. The white supralabial blotch varies from moderate to very large, and althought always discretely defined, in some specimens a narrow continuity betweeen the white snout spot and the lower margin of second supralabial are observed. Chinshields and infralabials always mostly white, immaculate or with a few small irregular dark spots

(usually restricted anteriorly). Extention of the white nuchal collar moderately variable, 2-3.5 scales long. A very faint vestige of vertebral vertebral stripe, from cervical collar along 2-25 vertebral scales was reported for most specimens. In a few specimens an even narrower vestige of paravertebral dark line is visible along 3-8 scales of row 6. The extent of ventral pigmentation is variable, beggining as paired black spots on the sides of each ventral plate, gradually increasing in size and median extention towards midbody. In some specimens only the free edges of ventrals and scales of lower dorsal rows remain white, conferring a nearly uniform black dorsolateral-ventral pattern. The black band is usually complete arround the end of tail, but its dorso-ventral extension is variable, even at the sides of a single specimen, covering the last 5-11 transverse dorsal rows and 0-7 subcaudals, but the postero-ventral portion of the terminal scute is always white.

Hemipenis: Prepared from sub-adult individual CHUNB 23783. The everted organ (seven subcaudals long) is nearly clavate in overall form, showing three well-differentiated regions. The basal region consists of a relatively slender naked peduncle without a lateral naked pocket, similar in length to the body region. The body region is subcylindrical, surrounded by longitudinal rows of well developed spines, smaller proximally and increasing in size towards apex, leading to a distal pair of distinctly larger spines on the sides of asulcate surface. The apex region is virtually single (perhaps very slightly bilobed), with a length of ¼ length of the organ, entirely covered by papillate calyces, and on the asulcate surface the calyces become broader and differentiated in pocket-like structures. The calyculate area clearly defines a capitular structure to the apex, outlined by an incomplete capitation ring (organ apparently semicapitate), without a transitional zone from calycular to spinous ornamentation. The *sulcus spermaticus* is forked for about half of its length (slighty above mid-body level), with centrolineal branches running in gradual divergence towards the apex.

Remarks: Literature records (Lema, 1993: Table 1) of white-collared *A. dimidiata* specimens from Goiás (Goiânia IBSP 32738; Ipameri IBSP 1822) and western Minas Gerais (Monte Alegre, UFU 257; Uberlândia, UFU 757; UFU 831; UFU 883) probably refer to *A. albicollaris*. One of these specimens from Uberlândia was positively identified as *A. albicollaris* by one of us (HF). Although Harvey (1999) cites *A. dimidiata* from Brasília, Distrito Federal, one of his specimens (USNM 148789) was reidentified as *A. albicollaris* by R. Reynolds (*pers. comm.*) upon our request.

A single isolated specimen (adult male, IBSP 63914) from Ilha do Germoplasma, Tucuruí dam, eastern Pará state, below 200 m (Fig. 3), obtained from local collectors by Giuseppe Puorto in 1984, differs from the remaining samples due its unusually high ventral counts for a male. It may represent another undescribed species, being referred here as *Apostolepis* cf. *albicollaris*. This northernmost record was obtained in a forested region, with isolated savannic vegetation enclaves (within the Amazonian equatorial forest, see map in Hüeck and Siebert, 1972). However, the conclusion on the status of these probably isolated savanna populations, known from a single specimen, must await further collections and natural history data.

Natural History: Two specimens were collected in interfluvial savannas, in the Brasília region, close to type locality, where it is probably the most common *Apostolepis* species. One adult male (CHUNB 23782) was obtained from a pit-fall trap in typical cerrado arboreal savanna (*cerrado sensu-stricto*) in Brasília, Distrito Federal. In this same locality a subadult male (CHUNB 23783) was collected while active on an unpaved road, in late afternoon (17:30 h), in a mosaic of sparse cerrado savannas (*campo cerrado*) and disturbed areas, on January 2001.

Although other habitat types such as gallery forests and wet grasslands were sampled in the Brasilia region, *A. albicollaris* was found only in open, interfluvial savannas with dense grassy cover, well developed shrub layer and a sparse to moderate arboreal stratum, the dominant and characteristical vegetation type in tablelands of the Cerrado domain (see Eiten, 1972; Vitt, 1991).

A partially digested amphisbaenian was found in the stomach of an adult specimen (IBSP 63914). Uncertain date of capture of most specimens precludes inferences about reproductive cycle. A mature female (IBSP 55142) bears one elongate, cylindrical, shelled egg. The largest female (IBSP 63913) bears three ovarian follicles.

Distribution: The known localities of occurrence of this species and the approximate range of *A. dimidiata,* according to literature records (Lema, 1978; Giraudo and Scrocchi, 1998) and specimens analyzed in this study are presented in Fig. 3. The entire known range of

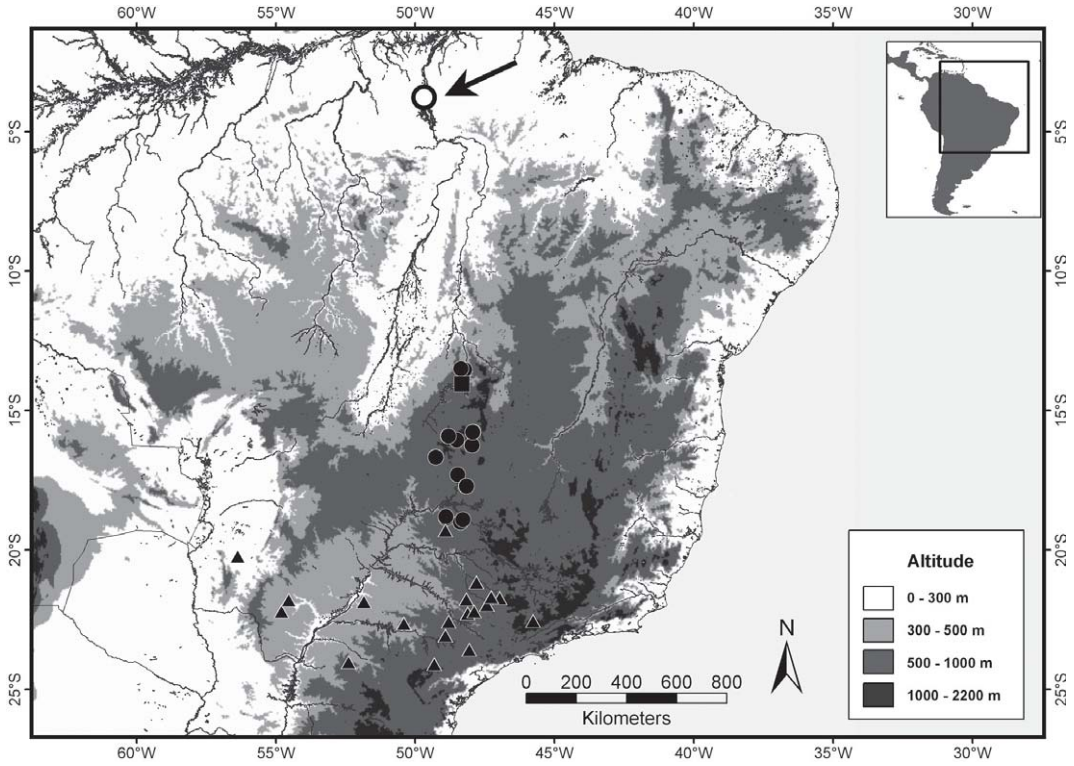

FIGURE 3. Distribution of *Apostolepis albicollaris.* Black dots represent specimens analyzed in this study, plus localities referring to specimens analyzed by Lema, 2002. Black triangles represent localities of *A. dimidiata.* White dot represent the locality of specimen referred here as *Apostolepis* cf. *albicollaris.*

A. albicollaris falls within the Cerrado region of Central Brazil (Ab'Saber, 1977; Eiten, 1972). The range of this species is interpreted as a component of the "Central Plateau" biotic element of Cerrado endemic squamates (Nogueira *et al.* 2011). This region comprises the interfluves between the upper Paraná river system and the Tocantins drainage mostly on tabletop, gently sloping plateaus ranging from 400 to 1150 m.

The Cerrado region is covered by seasonally dry, arboreal savannas, with an ancient and highly endemic flora, well adapted to fire and acid, deep and dystrophic soils, on gently sloping, well-drained terrains (Eiten, 1972).

Discussion

To justify the diagnosis of *A. albicollaris,* we provide a key to the species groups within *Apostolepis* (modified from Ferrarezzi, 1993). This key further diagnoses each one of the species included in the *dimidiata* species group.

The species groups proposed below appear to be useful for further taxonomic comparisons, although the proposed taxonomic arrangement has not been tested properly with a phylogenetic analysis. So, we do not expect such arrangement to have much predictive power regarding both the allocation of new discovered species and the acquisition of new comparative data. A complete cladistic analysis is necessary in this regard. A number of species were lumped just for convenience, especially within the *nigroterminata* assemblage, while others were, at best, just tentatively ascribed to one or another group (as in the case of *A. polylepis* and *A. breviceps*). Lack of proper knowledge on intraspecific variation is also a source of limitation for the proposed key and taxonomical arrangement, as a good number of species included in the comparisons are represented by few preserved specimens.

Throughout the key, length of nucho-cervical collars is expressed in number dorsal scales covered along paravertebral row (white-nuchal + black-cervical). Key characters are described in relative order of importance; in case of ambiguities first characters must have priority; additional features within brackets are not unique, but if discordant suggest a wrong entry.

Key to *Apostolepis* species and species groups:

1. White nuchal collar, if present, narrow to moderate (1-3 scales long), followed or not by a shorter black cervical collar (1-2 scales long) ending anterior to or at least on the sixth scale of vertebral row (counting from medial occipital, except when neck extensively black from occiput) [if collars 3 + 2 scales long (reaching sixth vertebral), then nasal contacts preocular (at least slightly)]; snout not uniformly light (yellowish blotches, if distinct, often tainted and irregularly extended on prefrontals); terminal shield mostly white (posteroventrally) and/or rostral longer than its distance to frontal 2
   White nuchal collar broad (3-5 scales long), followed by a moderate to broad black cervical collar (2-6 scales long) ending posterior to sixth scale of vertebral row (counting from median occipital), always combined with nasal well separated from preocular (by prefrontal); snout often fully and clear-cut light (pure white or reddish), from the whole of rostral through prefrontals to part of frontals/supraoculars); terminal shield black and/or uniform dorsal pattern..... *dorbignyi* group
2. Rostral shortly rounded, convex (not enlarged nor prominent), as long as or shorter than 1/2 of its distance to frontal (if not so from above, visibly shorter or just visible from below); naris piercing nasal almost centrally (to just anterior); terminal shield bluntly pointed or slightly compressed laterally; supralabial not bending into oral border; white supralabial blotch often restricted to labials 3 and 4 (if larger not extending beyond second); light snout blotches often distinct on prefrontals (if not so, then subcaudals > 40 or vertebral stripe confined to body); frontal narrower than 1/2 of interocular distance..... 3
   Rostral prominently enlarged, at least slightly pointed (to acutely projected), longer than 1/2 of this distance to frontal (if just slightly projected from above, longer and largely visible from below); terminal shield broadly rounded (mainly in adults); naris placed in anterior part of nasal; anterior supralabials bent into the oral border; head narrowing towards snout; light snout blotches confined anteriorly, obscured to indistinct on prefrontal; white supralabial blotch elongated continuously throughout labial margin, from rostral to labial 5 or 6 (if not so, then head or body lateroventrally blackish)..... *dimidiata* group … 5
3. Supralabial contacting postocular from below (the fourth of a series of six), not in contact with parietal (but occasionally just touching this plate), fourth supralabial sometimes reduced to absent (then only five supralabials); black occiput more or less extended around and below corner of mouth, like sideburns or completing a black gular band; mental at least slightly longer than wide; white supralabial blotch not oblique, reaching oral border along its extension (at least on fourth labial); without light marks on last supralabial; small (up to 400 mm) and gracile; median occipital inserted between tips of parietal and not contacting lateral occipital 4
   Supralabial contacting postocular from below (the fourth one), and also in effective contact with parietal, through nearly the same extent as of contact with postocular; black occiput not extended below corner of mouth (last infralabials and gulars uniformly white); white labial blotch obliquely oval, posteriorly excluded from oral border (of fourth labial); mental short, usually wider than long; usually some light marks/spots on last supralabial; relatively large (up to 450-850 mm) and heavy bodied; head broad, rather depressed, grooved between parietals and bulky at temporal region ..... *flavotorquata* group
4. Subcaudals 23-33 (< 27 in females); last supralabial smaller than its preceding; subcaudal/ventral ratio < 0.13 in females, < 0.16 in males ..... *nigroterminata* group
   Subcaudals 36-53 (> 40 in males); last supralabial larger than its preceding; subcaudal/ventral ratio > 0.13 in females, > 0.17 in males; head not speckled nor marbled above ..... *longicaudata* group
5. White and black nucho-cervical collars absent (but sometimes the black occiput extended to neck); snout pointed; rostral enlarged and pointed; its length ≥ 2/3 of interprefrontal suture (from above), usually equal or longer than its distance to chinshields (from below)..... 7
   White and black nucho-cervical collars present (1-3 + 1-2 scales long); rostral not enlarged (just prominent to slightly pointed), its length ≤ 2/3 of prefrontal suture (from above), equal or shorter than its distance to chinshields (from below); [frontal not enlarged; ventrals 196-230]..... 6
6. Ventrals predominantly black or with conspicuous black lateral blotches, dorsum uniformly red above, with a wide black lateral streak from first to lower half of fifth dorsal scale row; vertebral and paravertebral stripes absent; white blotch on supralabials 2-3 to 5; nasal usually contacting preocular..... ..... *A. albicollaris* Lema, 2002

Ventrals white (or just grading into grayish posteriorly); dorsum tan and pentalineate; black vertebral and paravertebral stripes present; black lateral stripe evident on third and fourth dorsal rows, becoming faint towards the first row, white supralabial blotch continuous along upper lip; nasal separated from preocular ..... *A. phillipsi* Harvey, 1999 (E Bolivia/W Brazil boundary, upper Guaporé/upper Paraguay basin)

7. Four infralabials contacting anterior chinshields 10
   Three infralabials contacting anterior chinshields 8
8. Five supralabials; rostral extremely enlarged, longer than interprefrontal suture (from above) and than its distance to chinshields (from below) 9
   Six supralabials; rostral moderately enlarged, shorter than interprefrontal suture (from above) and than its distance to chinshields (from below); [combining pentalineate dorsal pattern with nasal separated from preocular] ..... *A. intermedia* Koslowski, 1898 (W Cerrado)
9. Nasal well separated from preocular; naris semilunar, located in the middle of anterior portion of nasal; black occiput extended along 6-7 cervical scale rows; white supralabial blotch small; ventral surface of head mostly blackish ..... *A. breviceps* Harvey, Gonzales and Scrocchi, 2001 (Bañados, Izozog: N Chaco).
   Nasal contacting preocular (at least slightly); naris not semilunar, close to the anteroventral corner of nasal; black occiput extended along 2-3 nuchal scale rows; white supralabial blotch extensive, ventral surface of head mostly white ..... *A. vittata* (Cope, 1887) (upper Paraguay basin and CE Bolivia).
10. Rostral moderately enlarged, equall or shorter than interprefrontal suture (from above); black occiput not extended beyound 1-2 nuchal rows 12
    Rostral much enlarged and strongly projected, longer than interprefrontal suture (from above), longer than its distance from chinshields (from below); black occiput extended 3-5 scale rows on neck 11
11. Fifteen dorsal scale rows; only anterior supralabials curved inwards; elongate with supralabial blotch present, chishields and infralabials mostly white; dorsal pattern uniformly red..... ..... *A. ambiniger* (Peters, 1869) (E midcourse Paraguay basin; E Chaco
    Seventeen dorsal scale rows; all supralabials strongly folded inwards; head uniformly black dorsoventrally; dorsal pattern red above (lower rows cream), with 4.5 black stripes (the paravertebrals broader)..... ..... *A. polylepis* Amaral, 1921 (NE Cerrado)
12. Dorsum with a pair of black lateral streaks, wider than two scales rows (usually on part of rows 1-2 to 4-5); ventrals mostly black or with black lateral blotches (occasionally uniform white) ....*A. dimidiata* (Jan, 1862) (upper Paraná Basin, except extreme N, to the E limits of Paraguay basin)
    Dorsal pattern with 3-5 black stripes; lateral stripe narrow to moderate (1-2 scales wide); ventrals mostly white; [vertebral line always present] 13
13. Supralabials usually five; rostral distinctly enlarged and pointed, its length about 2/3 of the interprefrontal suture (from above); paravertebral stripes absent; black lateral line mostly restricted on dorsal row 4 .... *A. goiasensis* Prado, 1942 (NW upper Paraná basin: CW Cerrado)
    Supralabials six; rostral just moderately enlarged and prominent; dark paravertebral line present, but sometimes faint to indistinct; black lateral stripe on dorsal rows 3-4; [nasal contacting preocular] .... *A. lineata* Cope, 1887 (N upper Paraguay basin: W Cerrado)

Resumo

Apostolepis albicollaris Lema, 2002 foi descrita para o Brasil Central e é facilmente diagnosticável das demais espécies do gênero por apresentar colar nucal branco bem definido (delimitado por um colar negro estreito), faixas laterais negras (da borda da ventral até a 5ª fileira dorsal), ventre predominantemente negro ou com manchas negras laterais, e contato da 5ª e 6ª supralabial com a parietal (temporais 0 + 0). Essa espécie é a mais abundante do gênero na região da localidade-tipo, na área nuclear do domínio do Cerrado no Brasil Central, onde ocorre em savanas de interflúvio. São feitas comparações com as demais espécies do gênero e hipóteses sobre suas possíveis relações filogenéticas são discutidas. Padrões de distribuição de estados de caracteres indicam a inclusão de *Apostolepis albicollaris* no conjunto de espécies aqui denominado grupo *dimidiata,* linhagem hipotética caracterizada por apresentar as seguintes supostas sinapomorfias: rostral proeminente (ou até fortemente projetada); escudo terminal ligeiramente arredondado; região rostral predominantemente negra com pequenas (ou indistintas) manchas claras;

supralabiais com mancha branca extensa e, na maioria das espécies, ausência de colares nucais. Embora superficialmente similares, *Apostolepis dimidiata* e *A. albicollaris* não compartilham nenhuma sinapomorfia que justifique sua união como espécies-irmãs. A espécie aqui redescrita aparentemente reteve caracteres plesiomórficos, que sugerem uma divergência antiga em relação aos demais membros do grupo *dimidiata*.

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Appendix

Apostolepis ambiniger (Peters 1869): PARAGUAY: Baía de Assunción, (IBSP 10005); *Assunción* (MNRJ 9435-7).

Apostolepis arenaria Rodrigues, 1993 [dated 1992]. BRAZIL: Bahia: *Alagoado* (MZUSP 10027-30); *Queimadas* (MZUSP 10547).

Apostolepis ammodites Ferrarezzi, Barbo and Albuquerque, 2005. BRAZIL: Bahia: *Cocos* (IBSP 61525); *Correntina* (CHUNB s/nº); Distrito Federal (IBSP 49363); Goiás: (IBSP 15723); *Minaçu,* Cana Brava, Rio Cana Brava (IBSP 40478; MZUSP 8007); *São Domingos* (IBSP 62593, IBSP 67392); Mato Grosso: *São Felix, Lago Itacy* (IBSP 15723); Minas Gerais: *Betim* (FUNED 003); *Curvelo* (IBSP 22410); *Serra do Cipó* (MZUSP 7595); *Três Marias* (FUNED s/nº); *Vazante* (IBSP 48041); Tocantins: *Lajeado* (IBSP 64533-34, IBSP 64571, IBSP 64613, IBSP 65680-81); *Palmas* (IBSP 65261-66, IBSP 65268-69, IBSP 65664, IBSP 65688); *Porto Nacional* (IBSP 65682-83, IBSP 66166); *Santa Isabel, Ilha do Bananal* (IBSP 12324); unspecified locality: (IBSP 71470-71).

Apostolepis assimilis (Reinhardt, 1861): BRAZIL: Distrito Federal: *Brasília* (IBSP 20566, IBSP 28734, CHUNB 24456, CHUNB 24474). Goiás: *Mineiros* (IBSP 55495). Mato Grosso: *Buriti, Chapada dos Guimarães* (MZUSP 5346). Mato Grosso do Sul: *Campo Grande* (IBSP 57222); *Ponta Porã* (IBSP 44065). Minas Gerais: *Conceição dos Ouros* (IBSP 33206). Paraná: *Londrina* (IBSP 37462). São Paulo: *Icém/Fronteira* (IBSP 40008); *Santana de Parnaíba* (IBSP 61761); *São Paulo* (IBSP 27598, IBSP 31716, IBSP 33316).

Apostolepis cearensis Gomes 1915: BRAZIL: Ceará: (IBSP 0882 holotype, 0910, 0911); *Crato* (IBSP 20385); *Fortaleza* (IBSP 12106, IBSP 20020). Paraíba: *Cabaceiras* (MZUSP 9013); *João Pessoa* (MZUSP 7975). Piauí: *Teresina* (IBSP 49743). Rio Grande do Norte: *Natal* (IBSP 43960, IBSP 55064-67).

Apostolepis dimidiata (Jan, 1862): BRAZIL: Mato Grosso do Sul: *Dourados* (IBSP 40425); *Miranda* (IBSP 5626); *Rio Brilhante* (IBSP 42721). Minas Gerais: *Paraisópolis* (IBSP 20359), *Prata* (ZUEC 2492). Paraná: *Campo Mourão* (IBSP 49624). São Paulo: *Araraquara* (IBSP 19790, IBSP 23363, IBSP 48992, IBSP 53110), *Araraquara,* Fazenda Severino (IBSP 46535); *Assis* (IBSP 23226, IBSP 25291, IBSP 30861, IBSP 44471, IBSP 48102, IBSP 49205, IBSP 49688, IBSP 55135); *Avaré* (IBSP 22895, IBSP 52285, IBSP 53772); *Botucatu* (IBSP 54227, MZUSP 4166); *Brotas, Fazenda Elba* (IBSP 40520, IBSP 42264), *Brotas, Sítio Gramado* (IBSP 32759); *Campinas* (IBSP 4447, IBSP 55038); *Corumbataí* (IBSP 425); *Ibitinga* (IBSP 62144); *Indaiatuba* (IBSP 45198); *Ipeúna* (IBSP 65827); *Itapetininga* (IBSP 9507, IBSP 29640, IBSP 41354); *Itararé* (IBSP 9349, IBSP 49007); *Itirapina,* Estação Ecológica (IBSP 65826); *Itobi* (IBSP 7335, IBSP 7607); *Lençóis Paulista* (IBSP 1362); *Lins* (IBSP 43894); *Matão* (IBSP 4747, IBSP 5773); *Olímpia* (IBSP 9340, IBSP 40413); *Parapuã* (IBSP 16733, IBSP 32483); *Piracicaba* (IBSP 42123, IBSP 42128); *Pirassununga* (IBSP 9479, IBSP 8986, IBSP 50279); *Presidente Venceslau* (IBSP 34279); *Ribeirão Preto* (IBSP 117, IBSP 10322, IBSP 25604); *Santa Cruz do Rio Pardo* (IBSP 51410); *Sarapuí* (IBSP 44296); *Tambaú* (IBSP 4817, IBSP 32112); *Torrinha* (IBSP 32447); *Valinhos* (IBSP 4494); *Votuporanga* (IBSP 41048).

Apostolepis flavotorquata (Duméril, Bibrón and Duméril, 1854). BRAZIL: Goiás: (MNHN 3665 holotype); *Anápolis* (IBSP 18851); *Minaçu, Serra da Mesa* (MZUSP 11044); *Santo Antônio do Descoberto* (CHUNB 23780). Mato Grosso: *Barra do Tapirapés* (MNRJ 0759). São Paulo: *Ilha Solteira* (IBSP 36449, IBSP 36450).

Apostolepis gaboi Rodrigues, 1993 [dated 1992]. BRAZIL: Bahia: *Queimadas* (MZUSP 10290 – holotype).

Apostolepis goiasensis (Prado, 1942) Brazil: Goiás: *Rio Verde* (IBSP 10260 holotype).

Apostolepis intermedia Koslowsky, 1898 – MNRJ uncatalogued specimen.

Apostolepis longicaudata Gomes 1921. BRAZIL: Piauí: *Engenheiro Dodt, Santa Filomena* (IBSP 1684 – holotype).

Apostolepis polylepis Amaral 1921. BRAZIL: Piauí: *Engenheiro Dodt, Santa Filomena* (IBSP 1680-83, type series).

Apostolepis pymi Boulenger, 1903. BRAZIL: Pará: *Belém* (IBSP 3033-34); *Curuá-Una* (IBSP 8011); *Fordlândia* (IBSP 5126); *Mangabeira* (IBSP 48502); *Mosqueiro* (IBSP 54152); *Uruá, P.N. Amazônia* (IBSP 7285).

Apostolepis quinquelineata Boulenger, 1896. BRAZIL: Amapá: *Macapá* (IBSP 25514); Roraima: *Alto Alegre,* Serra dos Surucucus (MZUSP 10365).

Apostolepis rondoni Amaral, 1925. BRAZIL: Mato Grosso: *Aripuanã* (MZUSP 11391). Rondônia: *Ji-Paraná, Nova Colina* (MZUSP 8513).

Apostolepis vittata (Cope, 1887) – Brazil: Mato Grosso: *Chapada dos Guimarães* (IBSP 55144).