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A NEW SPECIES OF *LIOTYPHLOPS* (SERPENTES: ANOMALEPIDIDAE) FROM THE ATLANTIC COASTAL FOREST IN SOUTHEASTERN BRAZIL

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ABSTRACT: We describe a new species of *Liotyphlops* (Serpentes: Anomalepididae) from Ilha de São Sebastião, municipality of Ilhabela, São Paulo state, southeastern Brazil. The new species represents the first record of the genus throughout most of the Atlantic Coastal Forest in São Paulo state. *Liotyphlops caissara* sp. nov. is related to *L. albirostris* and *L. wilderi*, but it can be distinguished from the first species by having a different number of body scales, and from the latter by having a distinct number of supralabials. The new species also differs markedly in color pattern by having continuous pale cream color throughout the venter.

RESUMO: Descrevemos uma nova espécie do gênero *Liotyphlops* (Serpentes: Anomalepididae) da Ilha de São Sebastião, município de Ilhabela, estado de São Paulo, sudeste do Brasil. A nova espécie representa o primeiro registro do gênero ao longo da maior parte da Mata Atlântica costeira no estado de São Paulo. *Liotyphlops caissara* sp. nov. é relacionada à *L. albirostris* e *L. wilderi*, mas pode ser diferenciada da primeira por apresentar diferença no número de escamas ao redor do corpo, e da última pela diferença no número de supralabiais. A nova espécie também difere marcadamente no padrão de coloração por apresentar o ventre de cor creme claro ao longo de todo o corpo.

Key words: Anomalepididae; Atlantic forest; Ilha de São Sebastião; Island; *Liotyphlops caissara* sp. nov.; Serpentes

THE NEOTROPICAL Atlantic Forest is characterized by a high biological diversity, with a large number of endemic species (Lino, 1992). It is among the most endangered biodiversity hotspots in the world (Myers et al., 2000). Despite this status, even basic information on its faunal composition is scarce or nonexistent. Several new species of amphibians and reptiles are described from this region every year.

Basic information on ecology and taxonomy of snakes in the Neotropical region is scarce, although a great diversity of snakes can be found in this region. Smaller taxa of the so-called primitive snakes, the Scolecophidia, have attracted even less attention (Webb and Shine, 1992). Information on the biology of these blind snakes can help to clarify the origin of ecological traits typical of the "higher snakes" (Webb et al., 2000). Among the scolecophidians, the family Anomalepididae is restricted to the Neotropics and includes the smallest snakes in this region (Kley, 2003). Because of their fossorial habits, they are usually very difficult to find in the wild. These snakes are very small and their scales are even smaller in proportion, which has made it difficult to obtain consistent and reliable taxonomic data for the species of *Liotyphlops* (Dixon and Kofron, 1984). One blind snake of that group, *Liotyphlops trefauti*, was recently described from the Atlantic Forest in northeastern Brazil (Freire et al., 2007). Here we describe another new species of *Liotyphlops* from the Atlantic Coastal Forest in southeastern Brazil.

MATERIALS AND METHODS

During a herpetofaunal sampling in Ilha de São Sebastião (Fig. 1) by means of pitfall traps, we collected one individual of *Liotyphlops* that we describe herein as a new species. The collection permit was provided by Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (045/06-RAN/IBAMA proc. no. 02027.003418/2005-19). The specimen was deposited in Coleção Herpetológica Alphonse Richard Hoge of the Instituto Butantan (IBSP). To compare the new species to its congeners, we examined the specimens deposited in IBSP and in the

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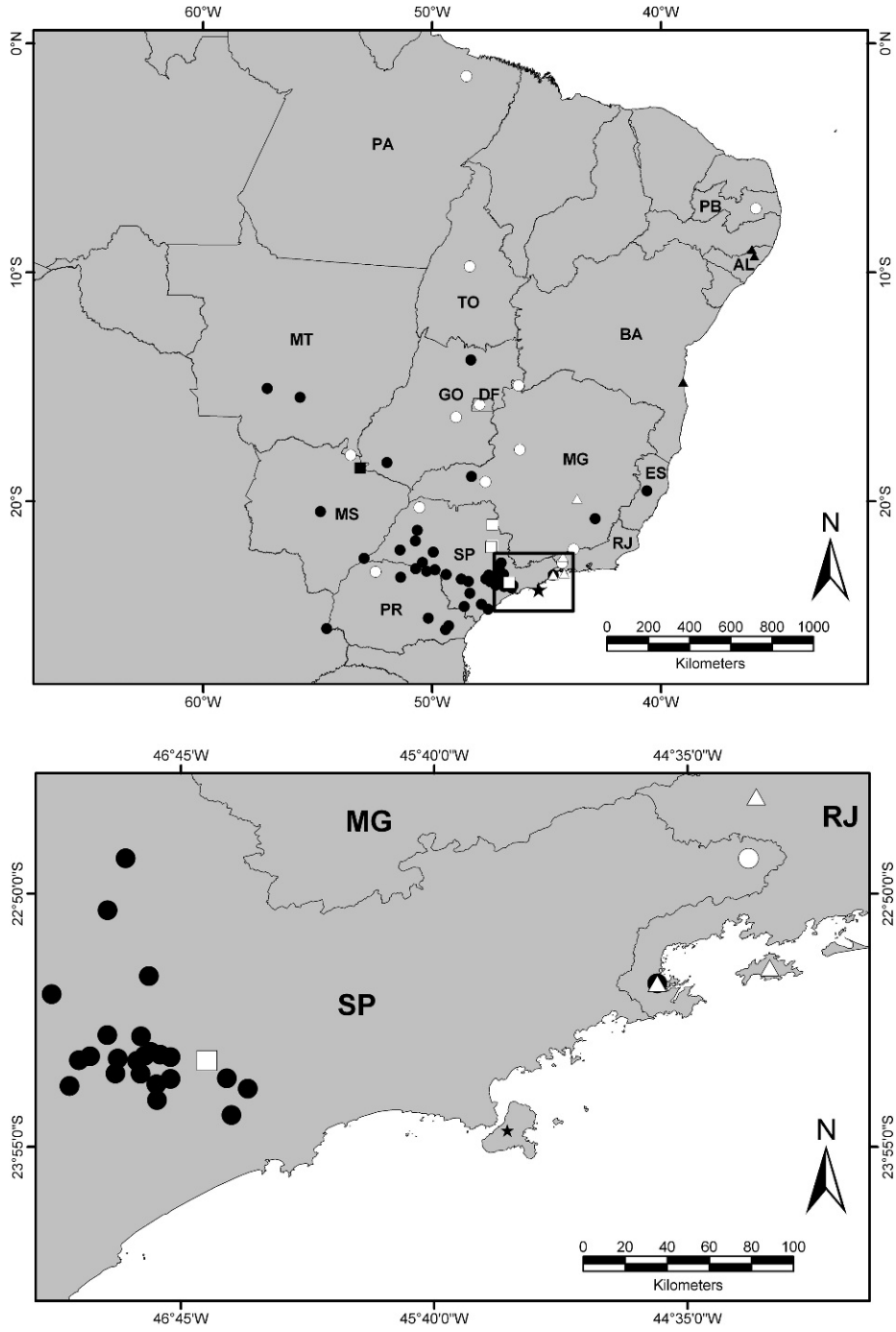

FIG. 1.—Distribution of *Liotyphlops* species in Brazil (upper): *L. beui* (full circle), *L. caissara* sp. nov. (star), *L. schubarti* (empty square), *L. ternetzii* (empty circle), *L. trefauti* (full triangle), *L.* cf. *wilderi* (full square), and *L. wilderi* (empty triangle). Location of type locality (lower) of *L. caissara* sp. nov. (star) in Ilha de São Sebastião, São Paulo state, southeastern Brazil.

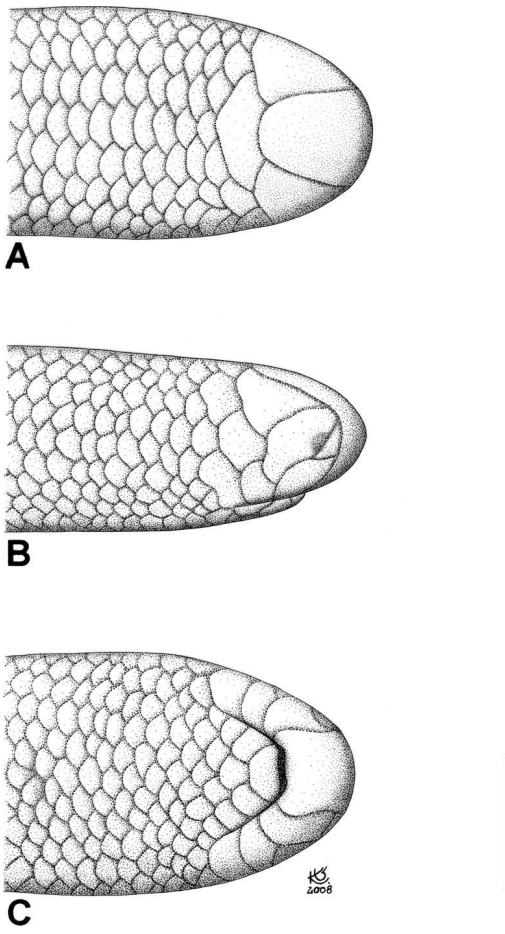

FIG. 2.—Dorsal, lateral, and ventral views of the head of *Liotyphlops caissara* sp. nov. (IBSP76774, holotype). Vertical line = 2 mm.

herpetological collection of the Museu de Zoologia, Universidade de São Paulo (MZUSP; Appendix I). The terminology used for the head scalation and scale counts follows Amaral (1954) and Dixon and Kofron (1984).

SPECIES DESCRIPTION

Liotyphlops **caissara** *sp. nov.* (Fig. 2A–C)

Holotype.—IBSP76774 (Fig. 3), juvenile female, collected at Trilha da Água Branca in Ilha de São Sebastião (23° 50′ 45″ S, 45° 21′ 12″ W; Fig. 1), municipality of Ilhabela, São Paulo state, southeastern Brazil, 300 m above sea level, on 17 January 2007 by FCC and Kelly R. Zamudio.

FIG. 3.—Preserved specimen of *Liotyphlops caissara* sp. nov. (IBSP76774, holotype, female), snout–vent length 191 mm and tail length 4 mm, from Ilha de São Sebastião, municipality of Ilhabela, São Paulo state, southeastern Brazil, showing the anterior portion of the venter and posterior portion of the dorsum. Note the continuous pale cream coloration throughout the venter, and the uniform dark brown coloration on the dorsum.

Diagnosis.—*Liotyphlops caissara* is readily distinguished from all other species of the genus by its pale cream ventral color pattern (Fig. 3) and the three supralabial scales (Table 1). Additional differences among *L. caissara* and other members of the genus are summarized in Table 1.

In other species of *Liotyphlops*, such as *L. beui*, when the light color is present on the venter, it is observed only at the anterior and posterior ends of the body, not in the middle of the body. *Liotyphlops caissara* shows a different arrangement in certain head scales, and different numbers of body scales. *Liotyphlops caissara* is distinguished from *L. anops*, *L. argaleus*, and *L. trefauti* by having three scales contacting the posterior edge of prefrontal (four in other species; Table 1). *Liotyphlops caissara* differs from *L. beui*, *L. schubarti*, and *L. ternetzii* by having one scale in contact with the posterior edge of nasal between second supralabial and prefrontal (two in other species; Table 1). *Liotyphlops caissara* may be closely related to *L. albirostris* and *L. wilderi* (see Table 1). However, *L. caissara* shows a different number of scale rows around the body (22/20/20 in anterior/middle/posterior) and a smaller number of dorsal scale rows (326) when compared with *L. albirostris* (number of scale rows 23–26/20–22/20–23; dorsal scale rows 370–520), and one less supralabial scale (3–3) than *L. wilderi* (4–4). Additionally, the eye spot in *L. caissara* is poorly visible, whereas it is not visible in *L. wilderi*.

Description of holotype.—Juvenile female; snout–vent length 191 mm; tail length 4 mm;

TABLE 1.—Characters of *Liotyphlops* species from preserved specimens (Appendix 1), from Dixon and Kofron (1984) for *L. anops*, *L. argaleus*, *L. albirostris*, *L. wilderi*, *L. beui*, *L. schubarti*, and *L. ternetzii*, and from Freire et al. (2007) for *L. trefauti*. Species group arrangement based on Dixon and Kofron (1984). Scales PEP = number of scales contacting posterior edge of prefrontal; scales PEN = number of scales contacting posterior edge of nasal between second supralabial and prefrontal; scales FVRD = number of scales in the first vertical row of dorsals; supralabials = number of supralabial scales; infralabials = number of infralabial scales; anterior scale rows = number of anterior scale rows around body; midbody scale rows = number of scale rows around the midbody; posterior scale rows = number of posterior scale rows around body; dorsal scale rows = number of dorsal scale rows; *n* = number of specimens examined in this work; *n* Dixon and Kofron (1984) = number of specimens examined by Dixon and Kofron (1984); *n* Freire et al. (2007) = number of specimens examined by Freire et al. (2007).

	Group 1			Group 2			Group 3		
	L. anops	*L. argaleus*	*L. trefauti*	*L. albirostris*	*L. wilderi*	*L. caissara*	*L. beui*	*L. schubarti*	*L. ternetzii*
n	1	0	0	1	3	1	127	1	6
Scales PEP	4	4	4	3	3	3	3	3	3
Scales PEN	2	1	1	1	1	1	2	2	2
Scales FVRD	6	5	5	4	4	4	5	5	5
Supralabials	4	4	4	4	4	3	4	4	4
Infralabials	4	4	4	4	4	3	4	4	4
Anterior scale rows	24–28	26–28	22	23–26	22–24	22	22–26	22	23–26
Midbody scale rows	24	22–24	22	20–22	20–22	20	20–24	20–21	22–24
Posterior scale rows	22–24	22	22	20–23	20	20	20	20	22
Dorsal scale rows	547–589	482–533	520–543	370–520	304–358	326	384–464	372–387	463–510
n Dixon and Kofron (1984)	11	4	0	127	8	0	65	4	13
n Freire et al. (2007)	0	0	3	1	3	0	9	1	5

head length 4.46 mm; head width 2.78 mm. Rostral large, longer than wide, contacting nasals anterolaterally, prefrontals laterally, and frontal posteriorly (Fig. 2A,B). A pair of triangular prefrontals, bordered anterolaterally by the rostral, ventrally by the large divided nasal, and dorsoposteriorly by the single frontal (Fig. 2A,B). Posterior edge of prefrontals passing the posterior edge of rostral (Fig. 2A). Divided nasal scale bordered anteriorly by the rostral, dorsally by the prefrontal, ventrally by the first and second supralabials, and posteriorly by a scale that lies between the prefrontal and the second supralabial (Fig. 2B). Eye spot poorly visible. Supralabials 3–3 (an additional small scale following the third supralabial is behind the angle of the jaw), and four scales in the first vertical row of lateral head scales (Fig. 2B), infralabials 3–3 (Fig. 2C). Scales around the body 22–20–20, smooth; 326 dorsal scales; 308 ventral scales; and 10 subcaudal scales.

Coloration of holotype.—In life, dorsal color uniform dark brown, and continuous pale cream color throughout the venter (Fig. 3). In preservative (70% ethanol), the specimen shows a pattern similar to the color in life.

Distribution and habitat.—The new species is known only from the type locality. It was collected at Trilha da Água Branca, in Ilha de São Sebastião, municipality of Ilhabela. The area is covered by a dense secondary Atlantic Coastal Forest, has a rocky substrate, and is located ca. 100 m from the stream named Rio Perequê (ca. 5 to 20 m wide). The specimen was collected in a 100-L plastic bucket in a 45-m line of pitfall traps. The Ilha de São Sebastião, in the municipality of Ilhabela, is the largest coastal island in Brazil (ca. 336 km^2) and is located on the north coast of São Paulo state (23° 43′ 30″ to 23° 57′ 56″ S, 45° 13′ 47″ to 45° 27′ 32″ W, datum SAD69; Fig. 1). The island is located within the Atlantic Forest domain (Müller, 1968), and is protected by a state reserve, the Parque Estadual de Ilhabela (PEIB), which includes approximately 80% of the island (ca. 270 km^2).

Etymology.—A noun in apposition, the specific epithet "caissara" (from the word "caiçara") is used in allusion to the region in which the new species was found. Caiçara is a term from the Tupi native Brazilian ancient language, and has been strictly used to describe traditional coastal communities throughout São Paulo state.

Discussion

The genus *Liotyphlops* is the most speciose in the family (Freire et al., 2007) and is currently composed of eight species, including the recently described species *L. trefauti*. The members of this genus are difficult to recognize because of their variable characters (Dixon and Kofron, 1984).

The species of *Liotyphlops* have been arranged into three groups on the basis of similarities in head scale arrangements (cf. Dixon and Kofron, 1984; Table 1). Group 1 is composed of *L. argaleus* and *L. anops*, which share four scales bordering the posterior edge of the prefrontal scale. Group 2 includes *L. albirostris* and *L. wilderi*, which share one scale contacting the posterior edge of the nasal between the second supralabial and the prefrontal scale. Group 3 contains *L. beui*, *L. schubarti*, and *L. ternetzii*, which share two scales contacting the posterior edge of the nasal between the second supralabial and prefrontal. *Liotyphlops caissara* can be tentatively assigned to group 2 (*L. albirostris* and *L. wilderi*) on the basis of its head scale arrangement and counts (see Table 1). However, more detailed studies on the morphology of the *Liotyphlops* species are needed to better delimit its species groups.

The amount of variation exhibited by various species of *Liotyphlops* makes the description of a species on the basis of one specimen inadvisable (Dixon and Kofron, 1984). However, we describe this new species on the basis of only one specimen because, in addition to the difficulty in the collection of these animals, it represents the first record of an insular and Atlantic Coastal Forest species in São Paulo state (see Fig. 1).

We based the description of *L. caissara* strictly on morphological characters. However, because of its apparently isolated occurrence on one island, we are using the evolutionary species concept of Simpson (1961) and Wiley (1978) and assume that this species represents a lineage that is evolving separately from others and that has its own evolutionary history (for further discussion of this species concept, see Frost and Hillis, 1990). To better understand the identity of populations and species of *Liotyphlops*, studies including additional morphological characters, molecular data, and a phylogenetic hypothesis for the genus would be very useful.

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Appendix I

Specimens Examined

Liotyphlops albirostris.—VENEZUELA: *Caracas:* IBSP25802. ***Liotyphlops anops.***—COLÔMBIA: *Villavicencio:* IBSP10132. ***Liotyphlops beui.***—BRAZIL: *Espírito Santo:* Colatina: MZUSP5255–5256. *Goiás:* Serra da Mesa: MZUSP11042–11043. *Mato Grosso:* Chapada dos Guimarães: MZUSP6349. *Minas Gerais:* Uberlândia: IBSP75588. *Paraná:* Andirá: IBSP26467; Araucária: IBSP8886; Curitiba: IBSP74097, MZUSP4086–4089, MZUSP15643; Foz do Chopim: MZUSP11544–11551; Ponta Grossa: IBSP68127; Rolândia: MZUSP2756–2757, MZUSP4098. *São Paulo:* Barueri: IBSP75391; Carapicuíba: IBSP62761, IBSP75379; Cotia: IBSP62751–62752; Itapecerica da Serra: IBSP75958; Itapevi: IBSP62642; Jandira: IBSP26544-26545, IBSP64196, IBSP71725; Jundiaí: IBSP44295; Mairinque: IBSP30559, IBSP42554; Mauá: IBSP68909; Osasco: IBSP6403–6404, IBSP25288–25289, IBSP31879, IBSP32677, IBSP44235, IBSP58709, IBSP59055, IBSP59187, IBSP59964, IBSP60481, IBSP62141, IBSP62802, IBSP71915, IBSP71929–71930, MZUSP10661, MZUSP12092; Ourinhos: IBSP73549; Porto Feliz: IBSP55927; Porto Primavera: IBSP63077; Riacho Grande: IBSP42736; São Paulo: IBSP19577, IBSP22446, IBSP23748, IBSP26629, IBSP27867, IBSP32428, IBSP34494, IBSP42271, IBSP42422, IBSP42709, IBSP42886, IBSP43817, IBSP43881, IBSP44091, IBSP44348, IBSP45317, IBSP46102, IBSP53639, IBSP58948, IBSP60557, IBSP61935, IBSP62010, IBSP62027, IBSP62099, IBSP62662, IBSP62676, IBSP62705, IBSP62859, IBSP62944, IBSP63017, IBSP68356, IBSP68682, IBSP70206, IBSP72649, IBSP72797, IBSP72924, IBSP73342, IBSP74105, IBSP74185, IBSP74477, IBSP75354, IBSP75355; MZUSP12393; São Roque: IBSP42515, IBSP43618, IBSP61946; Sorocaba: IBSP22416, IBSP-27646–27648, IBSP42757, IBSP44129, IBSP44131, IBSP-44133, IBSP44139, IBSP44143; Taboão da Serra: IBSP-22712, IBSP43664, IBSP55334, IBSP59335, IBSP62943, IBSP63599, IBSP64468, IBSP72517; Vargem Grande: IBSP42318. ***Liotyphlops schubarti.***—BRAZIL: *São Paulo:* Sapucaí: MZUSP4099. ***Liotyphlops ternetzii.***—BRAZIL: *Distrito Federal:* Brasília: IBSP20567. *Goiás:* Anápolis: IBSP21094. *Minas Gerais:* Formoso: MZUSP14622. *Pará:* Belém: IBSP25443. *Paraná:* Paranavaí: IBSP30724. *Tocantins:* Lageado: MZUSP12886. ***Liotyphlops wilderi.***—BRAZIL: *Mato Grosso do Sul:* Costa Rica: MZUSP10981. *Minas Gerais:* Viçosa: IBSP8894. *Rio de Janeiro:* Ilha Grande: MZUSP3193.