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Amphisbaena lumbricalis Vanzolini, 1996 is a synonym of *Amphisbaena carvalhoi* Gans, 1965 (Squamata, Amphisbaenidae)

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Abstract

We reassessed the type-series of *Amphisbaena lumbricalis* Vanzolini, 1996 and *Amphisbaena carvalhoi* Gans, 1965, two small amphisbaenid species from northeastern Brazil, to evaluate the characters used to diagnose and distinguish them, and compared these data with additional specimens from four new localities. We found broadly overlapping ranges of the diagnostic characters, and no morphological traits that could support differences between *A. carvalhoi* and *A. lumbricalis*. Based on the morphological similarities, and the overlapping distribution ranges of both species, we consider *A. lumbricalis* as a junior synonym of *A. carvalhoi*. We provide updated data on intraspecific variation in the diagnostic characters of *A. carvalhoi*.

Key words: Amphisbaenia, *Amphisbaena lumbricalis*, Caatinga, Carvalho's worm lizard

Introduction

The Carvalho's Worm Lizard, *Amphisbaena carvalhoi* Gans, 1965, is a small, slender amphisbaenid species described from "Poção, Municipio de Pesqueira, Pernambuco, Brazil", in the Caatinga region, northeastern Brazil (Gans 1965a). The species description was based on nine specimens from the same locality, seven of them housed at Museu Nacional da Universidade Federal do Rio de Janeiro, Brazil (MNRJ), and two of them housed at Stanford University collection (CAS-SU), California, USA. *Amphisbaena carvalhoi* was diagnosed by a combination of the following characters (Gans 1965a): small body size (snout-vent length 82–129 mm in the type series); no major fusion of head shields, with slightly enlarged first parietals; three supra- and three infralabials; 231–245 body annuli; 19–22 caudal annuli; 7–8 caudal annuli up to the autotomy constriction; 12–14 dorsal and 16–18 ventral segments to a midbody annulus; and four clearly expressed, small, round precloacal pores in both sexes.

Three decades after the description of *A. carvalhoi,* Vanzolini (1996) described *A. lumbricalis* based on a sample of 72 specimens housed at Museu de Zoologia da Universidade de São Paulo, Brazil, collected during the filling of a large dam at Xingó, at both margins of the São Franscisco River, between the states of Alagoas and Sergipe, also in the Caatinga region. The type series of *A. lumbricalis* exhibits four precloacal pores (rarely 2, 5 or 6), 225–247 body annuli, 20–26 tail annuli, 12–14 dorsal and 16–18 ventral segments to a midbody annulus (Vanzolini, 1996). Curiously, Vanzolini (1996) compared the new species with some slender amphisbaenid species from South America, but not with the type series of *A. carvalhoi*.

Since its description, *A. lumbricalis* has been recorded in new localities within the Caatinga region (Galdino *et al.* 2015; Mesquita *et al.* 2018; Tavares *et al.* 2017, 2021). With respect to *A. carvalhoi*, Vanzolini (1974) reported the occurrence of this species in the Municipality of Agrestina (8.4500° S, 35.9500° W, 440 m a.s.l.), also in the state of Pernambuco, distant 89 km from the type locality, but since then, over the almost last half century, no new

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records of *A. carvalhoi* were reported in the literature. In addition, *A. carvalhoi* is not well represented in scientific collections: there is only one record in SpeciesLink (specieslink.net) and Vertnet (vertnet.org) databases, which corresponds to the specimen reported by Vanzolini (1974).

Recently, we analyzed a series of 86 specimens of *Amphisbaena* housed at Coleção Herpetológica da Universidade Federal do Rio Grande do Norte, Brazil, from four Caatinga sites of northeastern Brazil (Table 1): four specimens from Serra das Vacas, Paranatama municipality, Pernambuco state; one specimen from Fazenda Riacho do Navio, Campina Grande municipality, Paraíba state; and 81 specimens from two localities in Serra de Santana, Rio Grande do Norte state: one specimen from Lagoa Nova municipality and 80 specimens from São Vicente municipality. The analyzed specimens exhibit four precloacal pores, 223–249 body annuli, 19–23 tail annuli, 12–14 dorsal and 16–20 ventral segments to a midbody annulus, which falls within the range of scale counts of both *A. carvalhoi* and *A. lumbricalis*. We therefore compared these specimens with the holotypes of *A. carvalhoi* and *A. lumbricalis* to confirm their identity and to review the taxonomic status of the two species.

Material and Methods

Specimens examined (Table 2) are deposited in the following collections: Museu Nacional da Universidade Federal do Rio de Janeiro, RJ, Brazil (MNRJ); Museu de Zoologia da Universidade de São Paulo, SP, Brazil (MZUSP); and Coleção Herpetológica da Universidade Federal do Rio Grande do Norte, Natal, RN, Brazil (UFRN-CH). The holotypes of *Amphisbaena carvalhoi* (MNRJ 2095) and *A. lumbricalis* (MZUSP 79433) were analyzed through photographs sent by the collection managers.

We took body measurements (snout–vent length, SVL; tail length, TL; head width, HW) to the nearest 0.1 mm with a digital caliper. Scale counts and nomenclature follow Gans & Alexander (1962). Dorsal and ventral segments were counted in a midbody annulus selected at random, and the five adjacent annuli anterior and posterior to the selected annulus were also counted. Body slenderness proportion (BSP) of each specimen was calculated by the formula SVL/HW, according to Pinna *et al.* (2014).

Comparisons with other species were based on the literature (Gans 1961, 1962a, b, 1963a, b, c, d, 1964, 1965a, b, 1966, 1971; Gans & Amdur 1966; Gonzalez-Sponga & Gans 1971; Vanzolini 1971, 1991a, b, c, 1994, 2002; Gans & Diefenbach 1972; Gans & Mathers 1977; Hoogmoed & Ávila-Pires, 1991; Montero 1996; Montero *et al.* 1997; Strüssmann & Carvalho 2001; Rodrigues 2003; Mott *et al.* 2009; Silva *et al.* 2010; Perez *et al.* 2012; Sousa e Lima *et al.* 2014; Costa *et al.* 2015, 2018a, b, 2019a, b; Lisboa *et al.* 2016; Teixeira Jr. *et al.* 2016, 2019; Almeida *et al.* 2018; Dal Vechio *et al.* 2018; Oliveira *et al.* 2018; Perez & Borges-Martins 2019; Ribeiro *et al.* 2020; Torrez-Ramírez *et al.* 2021; Ribeiro-Junior *et al.* 2022). Geographic coordinates of literature records were taken from original descriptions and Google Earth Pro. Maps were prepared in QGis® version 3.30.0 (http://www.qgis.org).

Results

Both the holotypes of *A. carvalhoi* (MNRJ 2095) and *A. lumbricalis* (MZUSP 79433) have 129 mm SVL, 16 mm TL, 12 dorsal segments and 16 ventral segments in a midbody annulus, three supralabials, three infralabials, one temporal, one postocular, two rows of postgenials (the first one with two and the second one with three scales), postmalars absent, and four precloacal pores without median hiatus (Fig. 1). MZUSP 79433 has 2.6 mm HW, which makes it slightly more slender (BSP 49.6) than MNRJ 2095 (HW 2.8 mm, BSP 46.1). MNRJ 2095 has 231 body annuli, 19 caudal annuli and autotomy site on 7th caudal annulus, while MZUSP 79433 has 232 body annuli, 22 caudal annuli, and the autotomy site is not evident in the tail (Table 2). Contacts between head scales differed between the two holotypes (Table 2): on the left side of the head, the second supralabial does not contact the nasal in MNRJ 2095, while in MZUSP 79433, these scales show point contact; the ocular contacts the frontal and the temporal in MNRJ 2095, but not in MZUSP 79433; finally the postocular broadly contacts the first parietal in MNRJ 2095, but in MZUSP 79433 the first parietal is smaller in size, showing only point contact with the postocular. Regarding color pattern, it is important to note that the holotype of *A. carvalhoi* is discolored, but its original description clearly states that it was brown dorsally, fading out ventrally on the trunk, with pigmentation consisting of a general coloration of the dorsal segments, emphasized on the rectangular segmental centers, like the holotype of *A. lumbricalis*.

TABLE 1. Locality records of *Amphisbaena carvalhoi* (including *A. lumbricalis* under its synonymy) in Northeastern Brazil. Precision of coordinates decrease from "local", to "proximate", and "municipality seat". Voucher acronyms: MNRJ—Museu Nacional da Universidade Federal do Rio de Janeiro; SU—Stanford University Collection; HU-Zoo—Museum of Comparative Zoology, Harvard University; MZUSP—Museu de Zoologia da Universidade de São Paulo; MUFAL—Museu de História Natural da Universidade Federal de Alagoas; MFCH—Coleção de Herpetologia do Museu de Fauna da Caatinga, Universidade Federal do Vale do São Francisco; RT—Coleção Herpetológica da Universidade Federal da Paraíba, Rio Tinto; CHSAR—Coleção Herpetológica do Semiárido, Universidade Federal Rural do Semi-Árido; UFRN-CH—Coleção Herpetológica da Universidade Federal do Rio Grande do Norte. See Fig. 3 for map.

Number in map	State	Municipality	Locality	Latitude	Longitude	Source	Voucher	Precision
1	Pernambuco	Poção	-	-8.1865°	-36.7023°	Gans (1965a)	MNRJ 1759, 2093-98; SU 17289-90	municipality seat
2	Pernambuco	Agrestina	-	-8.45°	-35.95°	Vanzolini (1974) Specieslink	HU-Zoo R128421	municipality seat
3	Alagoas	Piranhas	UHE Xingó, left bank	-9.6111°	-37.7616°	Vanzolini (1996)	MZUSP 78433, 79434-90	municipality seat
4	Sergipe	Canindé de São Francisco	UHE Xingó, right bank	-9.6492°	-37.7927°	Vanzolini (1996)	MZUSP 79419-32	municipality seat
5	Alagoas	Delmiro Gouveia	UHE Xingó, left bank	-9.3856°	-37.9991°	Galdino *et al.* (2015)	MUFAL 2790	municipality seat
6	Alagoas	Traipu	Serra das Mãos	-9.7591°	-36.9483°	Galdino *et al.* (2015)	MUFAL 9071, 9812	local
7	Pernambuco	Floresta	-	-8.624°	-38.137°	Tavares *et al.* (2017)	MFCH 2166, 2253, 2327, 2331	proximate
8	Pernambuco	Custódia	-	-8.237°	-37.655°	Tavares *et al.* (2017)	MFCH 2186-87	proximate
9	Pernambuco	Sertânia	-	-8.109°	-37.404°	Tavares *et al.* (2017)	MFCH 2163-64, 2240, 2245-46, 2254, 2256-58, 2264, 2267, 2272-74, 2276, 2281, 2291, 2295-96, 2299, 2301, 2306, 2322, 3434	proximate
10	Paraíba	Mamanguape	REBIO Guaribas	-6.742°	-35.142°	Mesquita *et al.* (2018)	RT 0267	proximate
11	Paraíba	São Mamede	-	-6.932°	-37.097°	Tavares *et al.* (2021)	CHSAR 1714	municipality seat
12	Pernambuco	Paranatama	Serra das Vacas	-8.9308°	-36.7472°	New record	UFRN-CH 5143-44, 5170, 5583	local
13	Rio Grande do Norte	São Vicente	Serra de Santana	-6.0748°	-36.6613°	New record	UFRN-CH 6351-71, 6373-6404, 6406-32	local
14	Rio Grande do Norte	Lagoa Nova	Serra de Santana	-6.1233°	-36.5641°	New record	UFRN-CH 4711	local
15	Paraíba	Campina Grande	Fazenda Riacho do Navio	-7.3065°	-36.0739°	New record	UFRN-CH 6683	local

TABLE 2. Morphological data of examined specimens. All present a lateral sulcus, four precloacal pores without a median hiatus, three supralabials, three infralabials, and no postmalar row. [HAC] = Holotype of *Amphisbaena carvalhoi*; [HAL] = Holotype of *A. lumbricalis*. SVL = snout-vent length; HW = maximum head width; BSP = body slenderness proportion (SVL/HW); TL = tail length ([HB] indicates a healed broken tail, [UB] indicates and unhealed broken tail); BA = body annuli; LA = lateral annuli; CA = caudal annuli; AA = autotomic annulus; DS = dorsal segments at midbody annuli; VS = ventral segments at midbody annuli; PeC = precloacal segments; PoC = postcloacal segments; PG = number of scales in first and second postgenial rows; N+SL2 = contact between nasal and second supralabial; O+F = ocular-frontal contact; O+T = ocular-temporal contact; P+PO = parietal-postocular contact. Contacts between head scales are presented as left/right side of head (Y = yes; N = no; P = point contact). Morphometric values are in millimeters.

Specimen	SVL	HW	BSP	TL	BA	LA	CA	AA	DS	VS	PeC	PoC	PG	N+SL2	O+F	O+T	P+PO
MNRJ 2095[HAC]	129.0	2.6	49.6	16.0	231	4	19	7	12	16	8	12	2-3	N/N	Y/P	Y/Y	Y/Y
MZUSP 79433[HAL]	129.0	2.4	53.8	16.0	232	4	22	NE	12	16	6	?	2-3	P/N	N/Y	N/N	P/N
UFRN-CH 6351	143.7	3.1	46.4	17.5	234	4	22	7	14	18	6	11	2-3	P/P	N/Y	P/N	N/N
UFRN-CH 6352	138.8	2.7	51.4	5.7[UB]	237	4	-	NE	14	18	8	11	2-3	P/P	Y/Y	N/N	Y/Y
UFRN-CH 6353	117.2	2.5	46.9	14.6	232	3	20	8	14	18	6	10	2-3	P/N	N/Y	P/N	Y/Y
UFRN-CH 6354	154.6	3.0	51.5	16.0	237	4	21	8	14	18	7	12	2-3	P/P	P/P	P/N	Y/Y
UFRN-CH 6355	139.8	2.6	53.8	7.6[HB]	230	3	-	8	14	18	7	12	3-3	P/N	P/P	N/N	Y/Y
UFRN-CH 6356	139.2	2.9	48.0	16.3	233	3	21	8	14	18	6	11	2-3	P/N	P/P	N/P	Y/Y
UFRN-CH 6357	139.0	2.6	53.5	16.5	230	4	20	8	14	17-18	6	11	2-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6358	131.4	2.6	50.5	15.2	229	3	21	8	14	18	8	11	2-3	P/N	P/P	N/N	Y/Y
UFRN-CH 6359	154.5	2.6	59.4	17.2	229	3	21	7	14	18	7	12	2-3	Y/P	P/P	P/P	Y/Y
UFRN-CH 6360	131.8	2.7	48.8	15.7	234	4	20	8	13-14	18	7	11	2-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6361	143.9	2.6	55.3	5.1[UB]	239	3	-	7	14	18	6	11	2-3	N/P	N/N	P/P	Y/Y
UFRN-CH 6362	138.6	2.7	51.3	16.3	226	4	20	7	14	18	8	11	2-3	P/P	Y/P	N/N	Y/Y
UFRN-CH 6363	137.9	2.6	53.0	16.7	230	4	20	8	14	18	8	10	2-3	N/P	P/N	N/P	Y/Y
UFRN-CH 6364	152.5	2.9	52.6	16.1	232	4	19	7	12-13	18	6	10	2-3	P/P	P/P	P/Y	Y/N
UFRN-CH 6365	150.7	2.6	58.0	5.7[UB]	236	4	-	8	14	18	8	11	2-3	P/N	P/P	P/Y	Y/Y
UFRN-CH 6366	123.2	2.6	47.4	14.5	230	3	20	7	14	18	6	10	3-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6367	151.3	2.8	54.0	6.1[UB]	237	4	-	7	12-13	18	7	11	2-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6368	146.5	2.7	54.3	16.5	231	4	19	7	12-13-14	18	7	11	2-3	P/N	P/P	N/N	Y/Y
UFRN-CH 6369	142.2	2.9	49.0	15.9	232	4	19	7	12-13-14	17-18	6	12	2-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6370	149.5	2.7	55.4	7.9[HB]	234	3	-	7	14	18	8	11	2-3	P/P	P/N	N/N	Y/Y
UFRN-CH 6371	146.0	2.8	52.1	6.5[UB]	231	4	-	7	14	18	8	12	2-3	P/P	P/Y	N/N	N/P
UFRN-CH 6373	146.5	3.0	48.8	17.1	233	4	20	8	14	18	8	11	2-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6374	168.5	2.9	58.1	18.1	236	3	22	7	14	18-19	8	10	2-3	P/N	N/N	N/Y	Y/Y
UFRN-CH 6375	141.5	2.6	54.4	15.6	238	4	20	7	14	18	7	11	2-3	P/P	N/N	Y/N	Y/Y
UFRN-CH 6376	155.5	2.6	59.8	17.8	232	4	20	8	14	18	8	10	2-3	P/Y	P/P	P/P	Y/Y
UFRN-CH 6377	154.4	3.0	51.5	16.3	236	3	21	NE	14	18	6	11	2-3	P/P	P/P	P/P	Y/Y
UFRN-CH 6378	136.2	2.7	50.4	6.3[UB]	232	3	-	8	13-14	18	8	10	2-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6379	143.6	2.8	51.3	16.3	232	3	21	9	14	18	6	10	2-3	P/P	P/P	P/P	Y/Y
UFRN-CH 6380	150.3	2.8	53.7	16.8	231	4	20	8	14	18	8	11	2-3	P/P	P/P	P/P	Y/Y
UFRN-CH 6381	143.6	2.7	53.2	15.9	229	3	20	8	14	18	8	10	2-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6382	153.3	2.9	52.9	17.3	239	3	21	7	12-13-14	18	8	11	2-3	P/P	P/P	N/P	Y/Y
UFRN-CH 6383	142.0	2.7	52.6	16.3	231	4	20	8	14	18	7	11	2-3	P/P	P/N	N/P	Y/Y
UFRN-CH 6384	150.7	3.0	50.2	17.3	234	3	21	8	14	18	7	10	2-3	Y/P	P/P	N/P	Y/Y
UFRN-CH 6385	136.2	2.6	52.4	5.8[UB]	231	4	-	8	14	18	6	10	2-3	Y/N	P/P	P/N	Y/Y
UFRN-CH 6386	145.5	3.0	48.5	16.0	232	3	19	7	13-14	18	8	12	2-3	N/N	P/P	N/N	Y/N
UFRN-CH 6387	134.1	2.9	46.2	16.3	231	3	21	7	14	18	6	11	2-3	N/N	P/P	N/N	Y/Y
UFRN-CH 6388	129.4	2.5	51.8	14.1	232	3	21	NE	14	18	6	11	2-3	P/P	Y/Y	N/P	Y/N
UFRN-CH 6389	132.0	2.7	48.9	15.5	233	3	20	8	14	18	6	10	2-3	P/P	P/P	P/N	Y/Y

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TABLE 2. (Continued)

Specimen	SVL	HW	BSP	TL	BA	LA	CA	AA	DS	VS	PeC	PoC	PG	N+SL2	O+F	O+T	P+PO
UFRN-CH 6390	124.4	2.6	47.8	15.1	228	3	20	8	13-14	18	6	11	2-3	P/N	P/P	P/N	Y/Y
UFRN-CH 6391	150.6	2.9	51.9	16.3	226	4	19	8	14	18	6	11	3-4	Y/Y	P/P	P/Y	N/Y
UFRN-CH 6392	106.2	2.4	44.3	12.2	226	4	19	7	14	18	6	12	3-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6393	135.6	2.7	50.2	7.2[UB]	230	3	-	NE	14	18	6	10	2-3	N/P	N/N	N/N	N/Y
UFRN-CH 6394	144.0	2.5	57.6	14.7	233	3	21	7	14	18	6	10	2-3	P/Y	P/P	P/Y	Y/Y
UFRN-CH 6395	130.1	2.6	50.0	15.8	229	4	19	8	12-13	17-18	6	11	2-3	Y/N	P/P	P/N	Y/Y
UFRN-CH 6396	129.5	2.6	49.8	15.5	234	3	21	NE	13-14	18	6	11	2-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6397	143.2	2.6	55.1	6.4[UB]	232	4	-	7	14	18	D	D	2-3	N/N	N/N	P/P	Y/Y
UFRN-CH 6398	123.0	2.6	47.3	12.6	229	3	19	8	13-14	18	6	10	2-3	P/N	P/Y	N/N	N/N
UFRN-CH 6399	136.8	2.9	47.2	17.0	229	3	21	7	14	18	6	11	2-3	N/N	Y/P	P/P	N/Y
UFRN-CH 6400	155.6	2.9	53.7	17.3	233	3	20	NE	12-13-14	18	6	11	2-3	P/N	N/N	Y/P	Y/Y
UFRN-CH 6401	119.9	2.5	48.0	15.1	233	3	21	8	13-14	18	8	10	2-3	N/N	P/P	N/N	Y/Y
UFRN-CH 6402	130.0	2.7	48.1	5.1[UB]	231	3	-	7	12-13	16-17	9	11	3-3	Y/P	P/P	Y/P	Y/Y
UFRN-CH 6403	136.5	2.8	48.8	6.0[UB]	225	3	-	8	14	18	8	11	2-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6404	144.3	2.8	51.5	17.1	228	3	22	7	12-13	16-17	6	11	2-3	N/N	P/P	N/N	N/Y
UFRN-CH 6406	130.9	2.6	50.3	12.8	235	4	20	8	14	18	7	11	2-3	N/P	P/N	P/N	Y/Y
UFRN-CH 6407	121.5	2.4	50.6	14.7	223	4	20	NE	14	18	9	11	2-3	N/N	Y/P	N/P	Y/Y
UFRN-CH 6408	152.2	2.8	54.4	7.8[UB]	229	4	-	7	14	18-20	8	12	2-3	P/P	P/P	N/N	N/P
UFRN-CH 6409	144.0	3.1	46.5	9.1[HB]	231	4	-	NE	14	18	8	11	3-4	P/N	P/N	Y/Y	Y/Y
UFRN-CH 6410	136.0	2.7	50.4	16.2	229	4	20	8	14	18	6	11	2-3	N/N	N/Y	N/N	Y/Y
UFRN-CH 6411	136.2	2.9	47.0	15.8	229	3	20	8	12-13	18	7	12	2-3	N/N	P/P	P/P	Y/Y
UFRN-CH 6412	126.5	2.7	46.9	14.0	226	3	21	NE	14	18	6	12	2-3	N/N	N/Y	P/P	Y/Y
UFRN-CH 6413	146.9	2.9	50.7	15.7	227	3	20	8	14	17	8	10	2-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6414	132.0	2.8	47.1	14.4	229	4	19	8	12-13-14	18	8	D	2-3	P/P	P/P	N/N	Y/Y
UFRN-CH 6415	142.6	2.8	50.9	15.5	225	4	20	8	14	18	8	10	2-3	N/N	P/P	N/N	P/Y
UFRN-CH 6416	127.8	2.7	47.3	16.0	231	3	21	7	14	18	6	13	2-3	P/N	P/P	N/P	Y/Y
UFRN-CH 6417	123.5	2.7	45.7	14.7	228	3	21	7	14	18	6	11	2-3	N/N	P/P	N/P	Y/Y
UFRN-CH 6418	134.0	2.6	51.5	14.6	230	4	20	8	12	16	7	11	2-3	N/N	N/N	P/N	Y/Y
UFRN-CH 6419	135.8	2.7	50.3	15.0	223	3	21	NE	14	18	6	11	2-3	P/P	P/P	Y/P	Y/Y
UFRN-CH 6420	130.0	2.7	48.1	7.3[HB]	225	3	-	7	14	18	8	12	2-3	N/N	P/P	P/Y	Y/Y
UFRN-CH 6421	153.5	3.0	51.2	16.4	235	4	21	NE	14	18	6	12	2-3	P/P	P/P	N/Y	Y/Y
UFRN-CH 6422	161.2	3.0	53.7	7.5[UB]	235	4	-	8	14	18	6	10	2-3	P/P	P/N	N/P	Y/Y
UFRN-CH 6423	136.8	2.8	48.9	14.9	225	3	20	7	14	18	8	10	2-3	N/N	P/P	N/P	N/N
UFRN-CH 6424	127.4	2.8	45.5	14.7	226	4	19	7	14	18	7	11	2-3	N/N	P/P	N/N	Y/Y
UFRN-CH 6425	140.3	3.2	43.8	16.9	228	3	22	8	13-14	18	6	11	2-3	P/P	N/N	N/N	Y/Y
UFRN-CH 6426	135.6	2.6	52.2	14.4	228	4	20	7	13-14	18	6	10	2-3	P/P	P/P	P/P	Y/Y
UFRN-CH 6427	139.0	2.7	51.5	15.5	229	3	20	NE	14	18	7	11	2-3	P/P	P/P	P/P	Y/Y
UFRN-CH 6428	143.0	3.0	47.7	8.4[HB]	223	3	-	NE	12	16-17-18	7	11	2-3	P/P	P/P	N/N	N/P
UFRN-CH 6429	146.4	2.8	52.3	8.1[HB]	225	4	-	8	14	18	6	11	2-3	N/N	P/P	P/P	Y/Y
UFRN-CH 6430	140.4	3.0	46.8	15.7	224	4	19	8	14	18	7	11	2-3	P/P	P/P	P/N	P/Y
UFRN-CH 6431	119.5	2.6	46.0	15.0	227	3	21	7	12-14	18	6	12	2-3	N/N	N/Y	N/N	Y/Y
UFRN-CH 6432	158.0	3.3	47.9	17.0	230	4	20	7	13-14	18	7	10	2-3	P/P	P/P	P/P	Y/Y
UFRN-CH 4711	151.6	3.0	50.5	17.2	227	3	20	8	14	18	7	11	2-3	N/N	P/N	N/P	Y/Y
UFRN-CH 6683	139.5	2.7	51.7	17.0	246	4	22	8	13-14	18	6	10	2-3	N/N	Y/Y	N/N	P/Y
UFRN-CH 5143	140.0	2.9	48.3	18.9	249	3	22	8	14	18	8	D	3-0	Y/Y	N/N	Y/Y	Y/N
UFRN-CH 5144	90.9	2.4	37.9	12.3	240	3	22	8	14	18	6	10	2-2	N/N	Y/Y	P/N	Y/Y
UFRN-CH 5583	91.0	2.4	37.9	11.1	235	3	23	7	12	16	6	11	3-0	P/P	P/P	Y/Y	Y/Y
UFRN-CH 5170	91.6	2.1	43.6	10.9	240	3	23	7	12	16	6	13	3-0	P/P	N/N	Y/Y	Y/N

FIGURE 1. Head in dorsal, lateral, and ventral views, and cloacal region of the holotype of *Amphisbaena carvalhoi* (MNRJ 2095; left) and the holotype of *A. lumbricalis* (MZUSP 79433; right).

Despite the morphological similarities between the two holotypes, some differences are also evident, as pointed out above. However, the existent variation in the type series of both species and the new material examined (Table 2; Fig. 2) revealed intrapopulation variations in morphology that support the hypothesis that the differences between the holotypes reflect intraspecific variation, as they occur among individuals from the same locality. In the specimens from Serra de Santana, Fazenda Riacho do Navio and Serra das Vacas (Table 2), BSP ranged from 37.9 to 59.8, body annuli 223 to 249, caudal annuli 19 to 23, autotomy site on 7th to 9th caudal annulus (non-evident in 15.3% of specimens), lateral annuli 3 to 4, dorsal segments 12 to 14, and ventral segments 16 to 20 in a midbody annulus (some individuals have differences of one to two dorsal or ventral segments along adjacent midbody annuli). Additionally, contacts between head scales showed strong variation among specimens, including asymmetries between left and right sides of the head in some individuals (Table 2). In eight of the 81 specimens from Serra de Santana, the third infralabial is fused with the postinfralabial (e.g. Fig. 2c), giving the impression that there is a row of postmalars, but this row was not considered postmalars, as it is in contact with the posterior half of the medial surface of the third infralabial and thus lies beyond the angulus oris on the level of the first body annulus.

The available information on morphology and geographic distribution (Table 1; Table 2; Fig. 3) led us to propose that *Amphisbaena carvalhoi* Gans, 1965 and *A. lumbricalis* Vanzolini, 1996 should be treated as synonyms, with the older name taking precedence according to the Principle of Priority (International Commission on Zoological Nomenclature 1999). An updated diagnosis of *A. carvalhoi* is provided below.

FIGURE 2. Head in dorsal, lateral, and ventral views, caudal region, and general view of four new examined specimens of *A. carvalhoi*: (A) UFRN-CH 5143, from Serra das Vacas, Paranatama, Pernambuco; (B) UFRN-CH 4711, from Serra de Santana, Lagoa Nova, Rio Grande do Norte; (C) UFRN-CH 6432, from Serra de Santana, São Vicente, Rio Grande do Norte; (D) UFRN-CH 6683, from Fazenda Riacho do Navio, Campina Grande, Paraíba. Scale bars: head = 1 mm; caudal region = 5 mm; general view = 10 mm.

Amphisbaena carvalhoi Gans, 1965

Amphisbaena carvalhoi Gans, 1965. Holotype: MNRJ 2095. Type Locality: "Poção, Municipio de Pesqueira, Pernambuco, Brazil".

Amphisbaena lumbricalis Vanzolini, 1996. Holotype: MZUSP 79433. Type locality: "Hydroelectric plant of Xingó, on the lower Rio São Francisco, on the side of the state of Alagoas (left bank)".

Holotype. MNRJ 2095 (Fig. 4). Currently the specimen is discolored and broken in three pieces, but basic taxonomic characters are present. The specimen was collected by Antenor Leitão de Carvalho (1910–1985), in June to November 1936, during a trip to the states of Pernambuco, Paraíba, and Ceará, Northeastern Brazil (Carvalho, 1937). However, neither Carvalho (1937), nor Miranda-Ribeiro (1937), who studied the fishes and amphibians obtained, referred to the collection of amphisbaenians.

Type locality. Gans (1965) referred the type locality of *A. carvalhoi* as "Poção, Municipio de Pesqueira, Pernambuco, Brazil". He added: "Poção lies on the Serra do Acahy at 1035 m elevation, and the specimen was collected in broken up granite graves near the top of the mountain range (cf. Carvalho, 1937)". However, Carvalho (1937) didn't present this information. It is possible that Carl Gans obtained it directly from Antenor Carvalho's personal communication.

At the time of the collection of the type specimens in 1937, Poção was a district subordinate to the Municipality of Pesqueira. Poção was raised to the grade of municipality through a decree from 29 December 1953, dismembered from Pesqueira. The installation of the Municipality of Poção, Pernambuco state, occurred on 22 May 1954. Currently, the type locality of *A. carvalhoi* must be quoted as Municipality of Poção (8.1865° S, 36.7023° W; 995 m a.s.l.), Pernambuco state, Northeastern Brazil (Table1; Fig. 2).

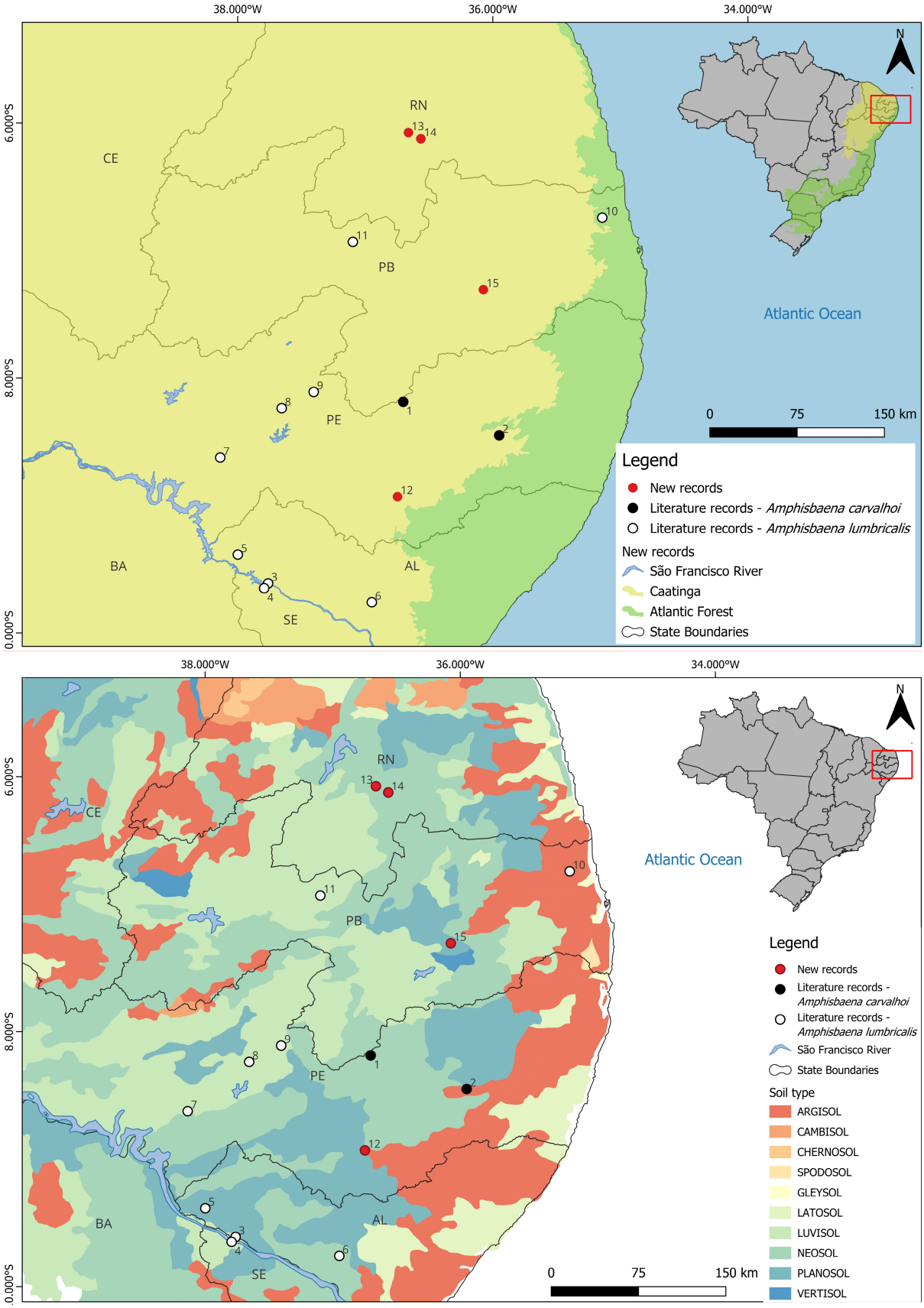

FIGURE 3. Geographic distribution map of literature records *Amphisbaena carvalhoi* (black circles), literature records of *A. lumbricalis* (white circles), and new records presented in this study. Locality names are in Table 1. Acronyms: CE—Ceará state; RN—Rio Grande do Norte state; PB = Paraíba state; PE: Pernambuco state; AL = Alagoas state; SE = Sergipe state; BA = Bahia state.

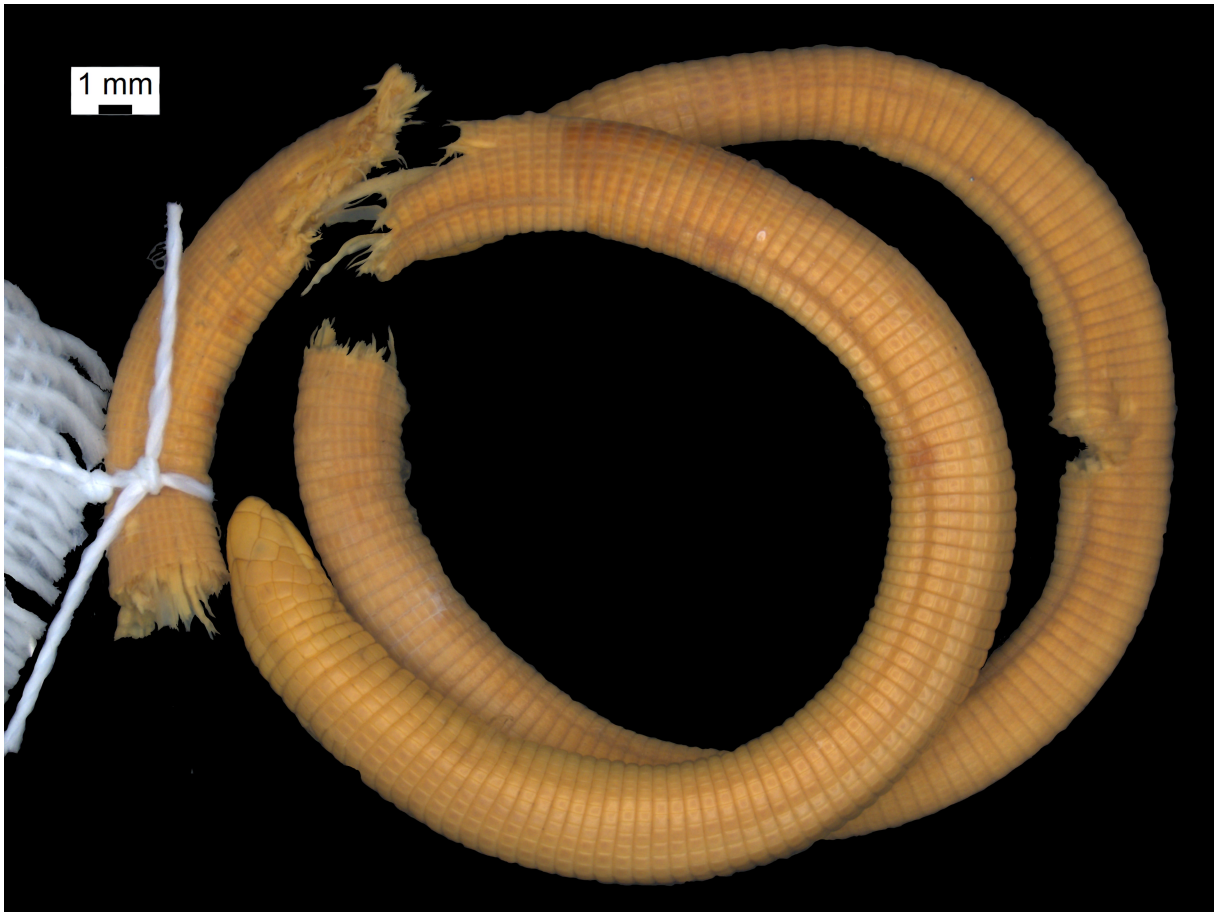

FIGURE 4. *Amphisbaena carvalhoi* Gans, 1965. Holotype, MNRJ 2095, general view.

Definition. A species of *Amphisbaena* with: (1) a round head in dorsal and lateral view, more or less pointed and dorsoventrally compressed; (2) suture lengths: prefrontal > frontal > nasal; (3) precloacal pores four, round, variably expressed, without median hiatus (rarely 2, 5 or 6); (4) lateral sulcus present, dorsal and ventral sulci absent; (5) body annuli 223–249; (6) lateral annuli 3–4; (7) caudal annuli 19–26; (8) autotomy on 6th to 10th caudal annulus (not apparent in the intact tail of some specimens); (9) tail round in cross-section, throughout its length until the tip; (10) dorsal surface of tail with non-tuberculate segments; (11) dorsal segments 12–14 and ventral segments 16–20 in a midbody annulus; (12) supralabials three; (13) infralabials three; (14) first parietals very variable in size and shape, but usually contacting postoculars; (15) postocular one; (16) temporal one; (17) postgenials usually in two rows, the first one with two and the second one with three scales (some individuals with two rows of three scales, two rows of three and four scales, or one row of two or three scales); (18) postmalar row absent; (19) small body size (SVL < 170 mm); (20) in preservative, dorsal ground color cream (pinkish in life), with center of segments brown, and venter immaculate cream after the first to seventh segment below the lateral sulcus; tail slightly darker than body, with center of segments brown dorsally and brown or immaculate cream ventrally; head slightly lighter than body (Fig. 5).

Diagnosis. Comparisons are made with all species of Amphisbaenidae from South America. The presence of a round head distinguishes *Amphisbaena carvalhoi* from *A. anomala* and all species of *Leposternon* (head shovel-shaped), and from *A. acrobeles*, *A. bilabialata*, *A. kingii*, and *Mesobaena* spp. (head keel-shaped). Among species with a round head, the presence of four precloacal pores in *A. carvalhoi* (97% of examined specimens) distinguishes it from (number of pores inside parentheses) *A. maranhensis* and *A. uroxena* (0), *A. dubia* and *A. hiata* (0 in females, 2 in males), *A. absaberi*, *A. anaemariae*, *A. brevis*, *A. caiari*, *A. carli*, *A. crisae*, *A. filiformis*, *A. kiriri*, *A. leeseri*, *A. longinqua*, *A. mebengokre*, *A. miringoera*, *A. mitchelli*, *A. neglecta*, *A. persephone*, *A. roberti*, and *A. silvestrii* (2), *A. mertensii* (5–8), *A. pretrei* (5–9), *A. littoralis* (5–6), *A. ignatiana*, *A. kraoh*, *A. saxosa*, and *A. stejnegeri* (6), *A. fuliginosa* (6–10), and *A. leucocephala* (10–13).

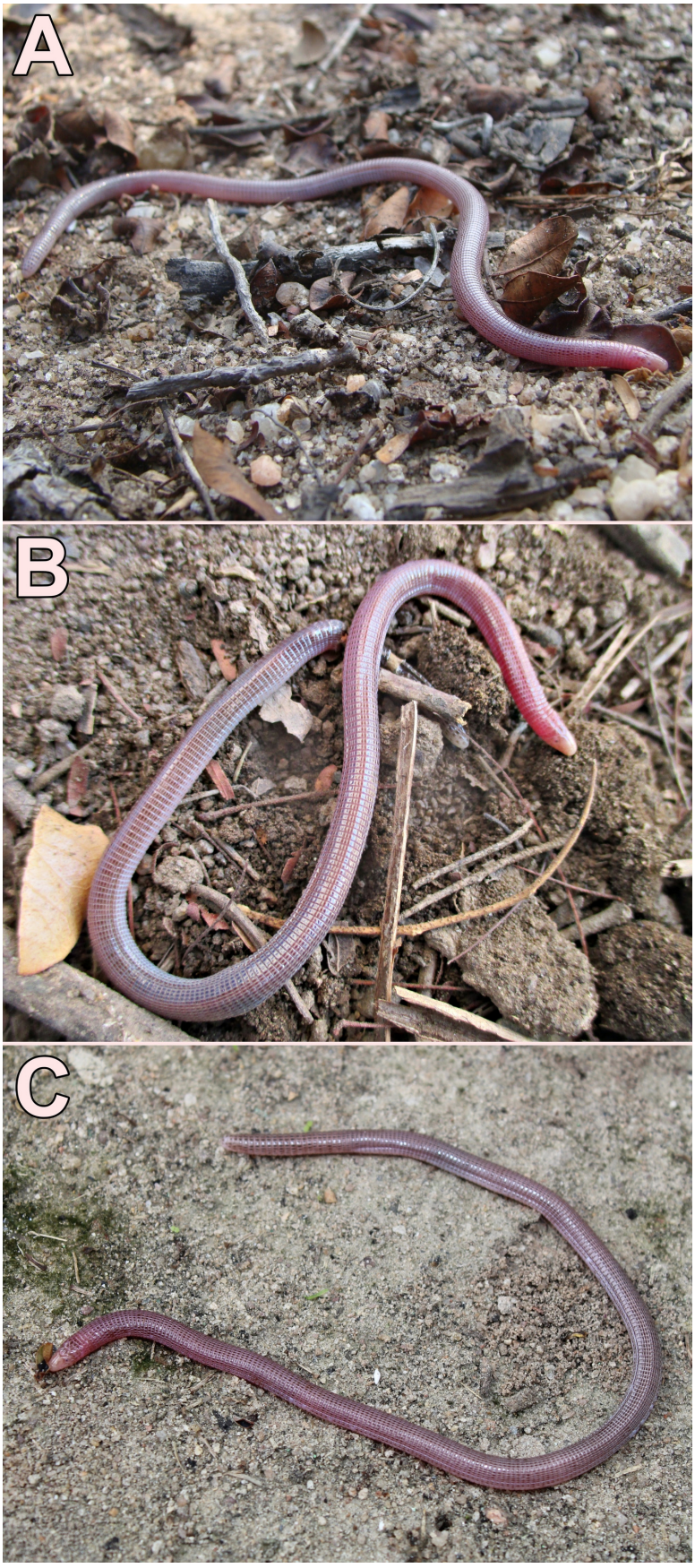

FIGURE 5. Living specimens of *Amphisbaena carvalhoi*: (A) UFRN-CH 4711, from Serra de Santana, Rio Grande do Norte; (B) UFRN-CH 5143, from Serra das Vacas, Pernambuco (tail was damaged at time of collection); (C) UFRN-CH 6683, from Fazenda Riacho do Navio, Paraíba. Photos taken by Matheus Meira-Ribeiro (A) and Raul Fernandes Dantas Sales (B, C).

Among round-headed amphisbaenians from South America with four precloacal pores (Table 3), the absence of median hiatus in the series of pores of *A. carvalhoi* distinguishes it from *A. arenaria, A. bedai, A. borelli, A. brasiliana, A. cuiabana* and *A. steindachneri* (pores separated by a median hiatus). The presence of 223–249 body annuli distinguishes *A. carvalhoi* from *A. albocingulata*, *A. angustifrons*, *A. arenicola*, *A. caetitensis*, *A. camura*, *A. cegei*, *A. darwinii*, *A. heathi*, *A. heterozonata*, *A. hogei*, *A. metallurga*, *A. mongoyo*, *A. munoai*, *A. myersi*, *A. nana*, *A. pericensis*, *A. prunicolor*, *A. ridleyi*, *A. rozei*, *A. slateri*, *A. slevini*, *A. spurrelli*, *A. tiaraju*, *A. trachura* and *A. tragorrhectes* (body annuli < 223), and from *A. arenaria*, *A. bedai*, *A. cuiabana*, *A. hastata*, *A. occidentalis*, *A. polygrammica*, *A. sanctaeritae*, *A. steindachneri*, *A. supernumeraria* and *A. townsendi* (body annuli > 256).

Additionally, *A. carvalhoi* possesses 19–26 caudal annuli, which distinguishes it from *A. acangaoba*, *A. angustifrons*, *A. bahiana*, *A. brasiliana*, *A. caetitensis*, *A. medemi*, *A. ridleyi* and *A. steindachneri* (caudal annuli < 18), and from *A. arda* and *A. hastata* (caudal annuli > 30). The autotomic site on 6th to 10th caudal annulus distinguishes *A. carvalhoi* from *A. acangaoba*, *A. alba*, *A. angustifrons*, *A. bahiana*, *A. brasiliana*, *A. caetitensis* and *A. ridleyi* (absence of autotomic site), from *A. bolivica* and *A. camura* (autotomic site on 3rd to 5th caudal annulus), and from *A. hastata* and *A. hogei* (autotomic site on 12th to 16th caudal annulus).

In possessing 12–14 dorsal segments at midbody annuli, *A. carvalhoi* can also be distinguished from *A. acangaoba*, *A. alba*, *A. angustifrons*, *A. arda*, *A. bedai*, *A. bolivica, A. brasiliana*, *A. camura*, *A. cegei*, *A. hoogmoedi*, *A. myersi*, *A. occidentalis*, *A. plumbea*, *A. polygrammica*, *A. ridleyi*, *A. rozei*, *A. spurrelli*, *A. townsendi* and *A. vermicularis* (dorsal segments > 14), and from *A. nigricauda* and *A. sanctaeritae* (dorsal segments < 12). Finally, the 16–20 ventral segments at midbody annuli distinguishes *A. carvalhoi* from *A. alba*, *A. arda*, *A. bolivica*, *A. camura*, *A. occidentalis*, *A. polygrammica* and *A. townsendi* (ventral segments > 21), and from *A. rozei*, *A. sanctaeritae*, *A. slevini* and *A. tragorrhectes* (ventral segments < 15).

The only species that cannot be distinguished from *A. carvalhoi* by any of the abovementioned characters are *A. cunhai*, *A. elbakyanae*, *A. frontalis*, *A. gracilis*, *A. talisiae* and *A. vanzolinii*. These six species can be distinguished from *A. carvalhoi* by a combination of other characters, as detailed next (divergent values from *A. carvalhoi* in parentheses). *Amphisbaena carvalhoi* is a small amphisbaenid, reaching up to 168.5 mm SVL, being smaller than *A. cunhai* (maximum SVL 246 mm), *A. elbakyanae* (maximum SVL 237 mm), *A. frontalis* (maximum SVL 283 mm) and *A. gracilis* (maximum SVL 252 mm). The presence of three supralabials, first and second subequal to each other, third the smallest, distinguishes *A. carvalhoi* from *A. cunhai* (second and third supralabials distinctly smaller than the first one) and *A. vanzolinii* (only two supralabials). The presence of three infralabials, second by far the largest, distinguishes *A. carvalhoi* from *A. cunhai* (first and second infralabials subequal to each other) and *A. vanzolinii* (only two infralabials). The prefrontal suture distinctly longer that frontal and nasal sutures distinguishes *A. carvalhoi* from *A. cunhai* and *A. vanzolinii* (nasal suture longer than prefrontal and frontal sutures), and from *A. frontalis* (frontal suture slightly longer than prefrontal suture). The presence of one pair of enlarged malars distinguishes *A. carvalhoi* from *A. elbakyanae*, *A. gracilis* and *A. vanzolinii* (malar scales absent). The postgenials commonly in two rows of two and three scales, or rarely in two rows of three scales, two rows of three and four scales, or one row of two or three scales distinguish *A. carvalhoi* from *A. cunhai* (a single row of postgenials with two or three scales), *A. elbakyanae* (a single row of postgenials with four scales), *A. frontalis* (three rows of postgenials or two rows with four and five scales), *A. gracilis* (two rows of postgenials with four and seven or eight scales), *A. talisiae* (a single row of postgenials usually with two scales, rarely three), and *A. vanzolinii* (a single row of postgenials with three scales). The absence of postmalars distinguishes *A. carvalhoi* from *A. cunhai*, *A. elbakyanae* and *A. gracilis* (postmalars present). Finally, the dorsal ground color cream in preservative (pinkish in life) with center of segments brown, and venter immaculate cream, distinguishes *A. carvalhoi* from *A. elbakyanae* (dorsal and ventral surfaces homogeneously dark brown or dark-brown-reddish), *A. frontalis* (dorsal ground color dark brown with center of segments darker), and *A. gracilis* (dorsal and ventral surfaces dark-purplish color).

Geographic distribution and habitat. *Amphisbaena carvalhoi* is known from Northeastern Brazil, in the states of Rio Grande do Norte, Paraíba, Pernambuco, Alagoas and Sergipe (Fig. 3). It has been recorded mostly in the Caatinga region, both in lowlands and altitudinal areas, but also occurs in transitional areas between Caatinga and Atlantic Forest, and in the Atlantic Forest (Fig. 3). Regarding soil types, the species occurs in areas dominated by luvisols, neosols, planosols and argisols (Fig. 3). Locally, the occurrence of *A. carvalhoi* seems to be more associated with sandy soil microhabitats (Tavares *et al.* 2017).

TABLE 3. Morphological comparisons among four-pored *Amphisbaena* species from South America. Pores: N = number of precloacal pores; MH = median hiatus (Y = present, N = absent). Head: SL = number of supralabials; IL = number of infralabials; PG = number of postgenial rows; M = pair of enlarged malar scales (Y = present, N = absent); PM = postmalars (Y = present, N = absent). Body and tail: BA = body annuli; LA = lateral annuli; CA = caudal annuli; DS = dorsal segments at midbody annulus; VS = ventral segments at midbody annulus; PeC = precloacal segments; PoC = postcloacal segments; AA = autotomic annulus (N = autotomic site absent); TT = tail tip (R = rounded; LC = laterally compressed; VK = vertically keeled). Max SVL = maximum snout-vent length (in millimeters). Blank cells indicate information not provided by the consulted literature.

Species	Pores	Head						Body and tail									Max	Source
	N	MH	SL	IL	PG	M	PM	BA	LA	CA	DS	VS	PeC	PoC	AA	TT	SVL	
A. carvalhoi	4 (rarely 2, 5, 6)	N	3	3	1–2	Y	N	223–249	3–4	19–26	12–14	16–20	6–9	10–14	6–10	R	168.5	This study
A. acangaoba	4–8	N	4	3	1–2	Y	Y	216–239	2–4	13–17	18–24	18–24	6–10	13–18	N		290	44
A. alba	4–10	N	4	3	1–2	Y	Y	198–248		13–21	30–42	35–46			N	R	550	2
A. albocingulata	4	N	3	3	1–2	Y	N	190–204	3–4	24–27	12–14	16–18	6–8	10–12	7–9		138	30,43
A. angustifrons	3–6	N	3–4	3	2	Y	Y	190–218	2–4	12–18	20–31	20–30	6–10	12–20	N	LC	345	10,21
A. arda	4		4	3	1	Y	Y	242		30	23	23	8		8		285	27
A. arenaria	4	Y	3	3	2	Y	N	285–307		22–23	12–14	14–16	8	10–12	6–7	R	245	18,38
A. arenicola	4	N[H]	3–4	3	2[H]	Y[H]	Y	199–216		20–22	12–14	16–18	6[H]	11[H]	8–9	R	168	43
A. bahiana	4	N	3	3	2	Y	Y	204–223		14–17	12–16	14–16			N	VK	215	41
A. bedai	4	Y	4	3	1	Y[H]	N	272–284		22–23	18–20	16–18			6		300	16
A. bolivica	3–6	N	4	3	2	Y	Y	200–231		18–26	27–36	26–36			3–5	R	328	10,20,24
A. borelli	4	Y	3	3	2		N	239–261		17–19	14–18	16–20			6–8	VK		8,33
A. brasiliana	4	Y	3–4	3	1	Y	Y	213–229	2–4	11–15	18–21	18–21	8–10	10–17	N	R	317	12
A. caetitensis	4	N	3	3	2	Y	N	186–194		10–12	16	19–22	6–7	12–14	N	PT	235	40
A. camura	3–6	N	4	3	2	Y	Y	188–207		14–19	28–42	28–45			3–5	R	380	10,20,24
A. cegei	0 or 4	N	3	3	2	Y	N	179–199	3–4	21–24	17–22	20–24	6	13–15	6–8	R	111	25,33
A. cuiabana	4	Y[3]	3	3	2	Y	N	278–309	3–5	17–20	14	14–16	6–8	11–13	8–10	VK	316	26,29
A. cunhai	4	N	3	3	1	Y	Y	224–239	3–4	25–26	14–16	14–18	6	7–11	5–7	R	246	23
A. darwinii	2–5	N	3	3	2	Y	Y	174–199	2–4	18–25	13–19	16–23	6–8	9–15	6–10	LC	304	11,43
A. elbakyanae	4	N	3	3	1	N	Y	245–257	4	20–24	13–15	16–18	6–7	11–12	6–8	R	237	45
A. frontalis	0, 4 or 6	N	3	3	2–3	Y	N	235–275	2–4	23–29	14–18	14–16	5–8	14–18	5–7		283	46
A. gracilis	4	N	3	3	2	N	Y	224–248	5	21–24	13–16	14–17	6	12–13	6–7	R	252	14,45
A. hastata	4	N	3	3	2–3	Y	N	266–273	4	40	35–37[1]		8		12–16	R	149	17
A. heathi	0–4	N	3	3	2	Y	Y	182–201	3–4	23–28	11–12	18–20	8	11–12	7–9	R	136	9,37
A. heterozonata	2–6	N	3	3	1–2	Y	Y	189–207		18–23	13–18	16–22	6	8–16	5–8	LC	277	11,33,43
A. hogei	4	N	3	3			Y	177–191		15–19	10–13	14–18			12–16		134	43
A. hoogmoedi	4	N	3	3	2	Y	N	247–252		27	22–24	20[H]	10[H]	12[H]	7–8	R	291	42
A. medemi	4	N	3	3	2	Y	N	230–235	3–5	17–18	14–16	17–18	6–8	12–17	5–7	R[2]	184	22
A. metallurga	2–4	N	3	3	1–2	Y	Y–N	185–199	2–3	23–25	12–14	14–16	6–7	9–16	7–9	R	179	32,35

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TABLE 3. (Continued)

Species	Pores		Head					Body and tail									Max	Source
	N	MH	SL	IL	PG	M	PM	BA	LA	CA	DS	VS	PeC	PoC	AA	TT	SVL	
A. mongoyo	4	N	3	3	2	Y	N	208		25	14	16	6		10	R	141	39
A. munoai	4	N	3	3	1–2	Y	Y	202–218		18–23	10–14	13–18	6–8	7–14	5–9	R	151	43
A. myersi	4		3	3				221		28	16	16			8			20
A. nana	4	N[H]	3	3	2[H]	Y[H]	Y	195–216		18–22	12–14	14–17	6[H]	13[H]	7–10	R	152	43
A. nigricauda	0, 4 or 5	N	3	3	2	Y	N	192–226	3–5	19–24	9–11	13–16	6	10–13	6–10	R	168	11,31
A. occidentalis	4	N	4	3	2	Y	Y	262–275	3–5	18–21	16–20	24–26	6–9	11–16	?	R	243	1
A. pericensis	4	N	3	3	2	Y	N	198–218	3–5	16–19	12–16	16–20	6–8	11–14	6–8	LC	153	5
A. plumbea	4	N	4	3	1–2	Y	Y	210–282	3–6	16–21	18–27	20–30	6–9	12–16	5–9	R	365	21
A. polygrammica	4		3	3	1		Y	270		22	18	26				?		33
A. prunicolor	4	N	3	3	1–2	Y	Y	181–215		18–27	10–17	14–20	6–8	7–14	7–11	R	238	30,43
A. ridleyi	4	N	4	3	1–2	Y	Y	172–192	2–4	14–17	16–18	20–28	6–8	11–14	N	R	245	6
A. rozei	4	N	3	3	1	Y	Y	205–209	3	20	15–16	14	6[H]	14[H]	6		252	34
A. sanctaeritae	4	N	3	3	1–2	Y	Y	269–288	2–3	18–20	10	14	6		6–7	LC	165	19,35
A. slateri	4	N	3	3	1–2	Y	Y–N	176–213	3–4	20–24	10–14	14–16	6–8	10–12	7–10	R	163	33
A. slevini	4	N	2	2	N	N	N	204–211	2–4	23–25	10–14	10–12	6–8	9–12	4–6	R	115	4
A. spurrelli	4	N	3	3	1–2	Y	Y	218–222	3–5	18–20	16–18	16–18			7		297	3
A. steindachneri	4	Y	3	3	1–2		N	256–266	2–5	17–18	12–16	12–16	6–10	10–19	7	VK	256	8,33
A. supernumeraria	4	N	3	3	2	Y	N	333–337		22–23	14	17–18			10–12	VK	195	28
A. talisiae	4	N	3	3	1	Y	N	205–234	2–4	17–29	10–14	14–18	5–8	8–14	6–8	R	146	36
A. tiaraju	4	N[H]	3	3	1[H]	Y[H]	Y	204–221		18–25	10–14	13–16	6[H]	10[H]	7–9	R	183	43
A. townsendi	4	N	4	3	1	Y	Y	261–279	2–5	22–26	16–19	22–28	6–9	11–16	7–8	R	230	1
A. trachura	3–4	N	3	3	1–2	Y	Y	186–208		15–25	14–21	16–24	6–8	9–14	5–9		322	11,43
A. tragorrhectes	4	N	4[4]	3[4]	1	Y	Y	196		31	12	12	6				110	15
A. vanzolinii	4	N	2	2	1	N	N	200–231	4–5	28–31	12–16	12–18	6	12	7–14		153	7,45
A. vermicularis	4 (rarely 5 or 6)	N	4	3	1–2	Y	Y	211–254	3–5	23–30	18–26	18–25	6–9	10–16	5–7	R	327	13

[1] Total number of segments around midbody (absence of lateral sulcus). [2] Tail rounded, with slight distal pinching. [3] *Amphisbaena cuiabana* has a median hiatus in the series of precloacal pores that results from the position of median pores near the lateral sutures of wide wedge-shaped segments; non-pored medial segments are absent. [4] Possibly three supralabials and two infralabials, not four supralabials and three infralabials as stated by Vanzolini (1971). [H] Information based only on the holotype, not the entire type series. Source: 1 = Gans (1961), 2 = Gans (1962a), 3 = Gans (1962b), 4 = Gans (1963a), 5 = Gans (1963b), 6 = Gans (1963c), 7 = Gans (1963d), 8 = Gans (1964), 9 = Gans (1965a), 10 = Gans (1965b), 11 = Gans (1966), 12 = Gans (1971), 13 = Gans & Amdur 1966, 14 = Gonzalez-Sponga & Gans (1971), 15 = Vanzolini (1971), 16 = Vanzolini (1991a), 17 = Vanzolini (1991b), 18 = Vanzolini (1991c), 19 = Vanzolini (1994), 20 = Vanzolini (2002), 21 = Gans & Diefenbach (1972), 22 = Gans & Mathers (1977), 23 = Hoogmoed & Ávila-Pires (1991), 24 = Montero (1996), 25 = Montero et al. (1997), 26 = Strüssmann & Carvalho (2001), 27 = Rodrigues (2003), 28 = Mott et al. (2009), 29 = Silva et al. (2010), 30 = Perez et al. (2012), 31 = Sousa e Lima et al. (2014), 32 = Costa et al. (2015), 33 = Costa et al. (2018a), 34 = Costa et al. (2018b), 35 = Costa et al. (2019a), 36 = Costa et al. (2019b), 37 = Lisboa et al. (2016), 38 = Teixeira Jr. et al. (2016), 39 = Teixeira Jr. et al. (2019), 40 = Almeida et al. (2018), 41 = Dal Vechio et al. (2018), 42 = Oliveira et al. (2018), 43 = Perez & Borges-Martins (2019), 44 = Ribeiro et al. (2020), 45 = Torrez-Ramírez et al. (2021), 46 = Ribeiro-Junior et al. (2022).

Discussion

In the original description of *A. lumbricalis*, Vanzolini (1996) did not compare the new species with the type series of *A. carvalhoi*; he merely stated that "the only species that approaches *A. lumbricalis* in all scale counts is *A. carvalhoi* Gans, 1965, which is, however, much more robust". This affirmation contrasts with body proportions provided by Gans (1965a) for the type specimens, which indicate that *A. carvalhoi* is a very slender amphisbaenid (values of body width between 3 and 4 mm; values of head width not provided; Gans, 1965a). The comparation of the holotypes and the new material examined in this study evidence that there is no morphological character that can differentiate the two species, and that the slight differences between the two the type series most likely reflect intraspecific variation. Moreover, the literature records, combined with the new distribution records, placed the type locality of *A. carvalhoi* within the known distribution range of *A. lumbricalis* (Fig. 3).

Some species of *Amphisbaena* are distinguished by only small differences in annuli, segmental counts and/or head scales, but their disjunct distributions justify keeping them as separate taxa at least provisionally, especially because most amphisbaenians lack available genetic samples (Costa *et al.* 2019b). Given the morphological similarities and the overlapping geographic distributions of *A. carvalhoi* and *A. lumbricalis*, and the absence of molecular data, the synonymy of these two species seems appropriate. Similar kind of evidence supported the synonym of *A. mensae* and *A. talisiae* in central Brazil (Costa *et al.* 2019), and *A. ibijara* and *A. frontalis* in northeastern Brazil (Ribeiro-Junior *et al.* 2022).

Currently, *A. carvalhoi* and *A. lumbricalis* are classified as "Endangered" in the IUCN Red List (Silveira *et al.* 2021a, b). In the Brazilian red list, *A. carvalhoi* is classified as "Near Threatened" and *A. lumbricalis* as "Least Concern" (ICMBio 2023). Following the synonym with *A. lumbricalis* and the new records presented here, the red list category of *A. carvalhoi* needs to be reassessed.

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References

Almeida, J.P.F.A., Freitas, M.A., Silva, M.B., Valverde, M.C.C., Rodrigues, M.T., Pires, A.M. & Mott, T. (2018) A new four-pored *Amphisbaena* (Squamata: Amphisbaenidae) from northeastern Brazil. *Zootaxa*, 4514 (4), 553–562. https://doi.org/10.11646/zootaxa.4514.4.8

Carvalho, A.L. (1937) Notas oecologicas e zoogeographicas sobre vertebrados do nordeste brasileiro. *O Campo*, March 1937, 12–15.

Costa H.C., Resende, F.C., Teixeira Jr., M, Dal Vechio, F. & Clemente, C.A. (2015) A new *Amphisbaena* (Squamata: Amphisbaenidae) from southern Espinhaço Range, southeastern Brazil. *Anais da Academia Brasileira de Ciências*, 87, 891–901. https://doi.org/10.1590/0001-3765201520140088

Costa, H.C., Welton, L.J. & Hallermann, J. (2018a) An updated diagnosis of the rare *Amphisbaena slateri* Boulenger, 1907, based on additional specimens (Squamata, Amphisbaenia, Amphisbaenidae). *Evolutionary Systematics*, 2, 125–135. [http://zoobank.org/1036F066-E737-4ACF-95E9-00E78425169B] https://doi.org/10.3897/evolsyst.2.28059

Costa, H.C., Señaris, J.C., Rojas-Runjaic, F.J.M., Zaher, H. & Garcia, P.C.A. (2018b) Redescription of the rare South American worm lizard *Amphisbaena rozei* (Squamata: Amphisbaenidae). *Amphibia-Reptilia*, 39, 21–30. https://doi.org/10.1163/15685381-00003136

Costa, H.C., Velasquez, S., Zaher, H., Garcia, P.C.A. (2019a) Updated diagnosis of *Amphisbaena metallurga* and *A. sanctaeritae* and first record of *A. hiata* in Brazil (Squamata: Amphisbaenidae). *South American Journal of Herpetology*, 14, 233–241. https://doi.org/10.2994/SAJH-D-17-00105.1

Costa, H.C., Graboski, R. & Zaher, H. (2019b) *Amphisbaena mensae* Catro-Mello, 2000 is a synonym of *Amphisbaena talisiae* Vanzolini, 1995 (Squamata: Amphisbaenia: Amphisbaenidae). *Zootaxa*, 4559 (1), 166–174. https://doi.org/10.11646/zootaxa.4559.1.7

Dal Vechio, F., Teixeira Jr., M., Mott, T. & Rodrigues, M.T. (2018) Rediscovery of the poorly known *Amphisbaena bahiana* Vanzolini, 1964 (Squamata, Amphisbaenidae), with data on its phylogenetic placement, external morphology and natural history. *South American Journal of Herpetology*, 13, 238–248. https://doi.org/10.2994/SAJH-D-16-00053.1

Galdino, J.Y., Gonçalves, U., Matias, G. & Torquato, S. (2015) *Amphisbaena lumbricalis* Vanzolini, 1996 (Squamata: Amphisbaenidae). Distribution extension and map. *Boletim do Museu de Biologia Mello Leitão*, 37, 293–299.

Gans, C. (1961) Notes on Amphisbaenids (Amphisbaenia: Reptilia). 2. *Amphisbaena occidentalis* Cope from the Central Plain of Northern Peru. *Postilla*, 56, 1–17. [https://www.biodiversitylibrary.org/part/83250]

Gans, C. (1962a) Notes on amphisbaenids (Amphisbaenia, Reptilia). 5. A redefinition and a bibliography of *Amphisbaena alba* Linne. *American Museum Novitates*, 2105, 1–31. [http://hdl.handle.net/2246/3410]

Gans, C. (1962b) Notes on amphisbaenids (Amphisbaenia, Reptilia). 6. Redescription and range extension of *Amphisbaena spurrelli* Boulenger. *Breviora*, 171, 1–11. [https://www.biodiversitylibrary.org/part/21443]

Gans, C. (1963a) Notes on amphisbaenids (Amphisbaenia, Reptilia). 7. Redescription and redefinition of *Amphisbaena mitchelli* Procter and *Amphisbaena slevini* Schmidt from the middle and lower Amazon, Brazil. *American Museum Novitates*, 2127, 1–22. [http://hdl.handle.net/2246/3375]

Gans, C. (1963b) Notes on amphisbaenids (Amphisbaenia, Reptilia). 10. Redescription and redefinition of *Amphisbaena pericensis* Noble form the mountains of northwestern Peru. *Breviora*, 189, 1–15. [https://www.biodiversitylibrary.org/part/31334]

Gans, C. (1963c) Redescription of *Amphisbaena ridleyi* Boulenger. *Copeia*, 1963, 102–107. https://doi.org/10.2307/1441276

Gans, C. (1963d) Notes on amphisbaenids (Amphisbaenia, Reptilia). 8. A redescription of *Amphisbaena stejnegeri* and the description of a new species of *Amphisbaena* from British Guiana. *American Museum Novitates*, 2128, 1–18. [http://hdl.handle.net/2246/3374]

Gans, C. (1964) The South American species of *Amphisbaena* with a vertically keeled tail (Reptilia, Amphisbaenidae). *Senckenbergiana biologica*, 45, 387–416.

Gans, C. (1965a) On *Amphisbaena heathi* Schmidt and *A. carvalhoi*, new species, small forms from the northeast of Brazil (Amphisbaenia: Reptilia). *Proceedings of the California Academy of Sciences*, 31, 613–630. [https://archive.org/details/biostor-545]

Gans, C. (1965b) Notes on amphisbaenids (Amphisbaenia, Reptilia). 17. A redescription and discussion of *Amphisbaena angustifrons* Cope and *Amphisbaena camura* Cope of southern South America. *American Museum Novitates*, 2225, 1–32. [http://hdl.handle.net/2246/3328]

Gans, C. (1966) Studies on amphisbaenids (Amphisbaenia, Reptilia). 3. The small species from southern South America commonly identiffied as *Amphisbaena darwini*. *Bulletin of the American Museum of Natural History*, 134, 185–260. [http://hdl.handle.net/2246/1983]

Gans, C. (1971) Redescription of three monotypic genera of amphisbaenians from South America: *Aulura* Barbour, *Bronia* Gray, and *Mesobaena* Mertens. *American Museum Novitates*, 2475, 1–32. [http://hdl.handle.net/2246/2683]

Gans, C. & Alexander, A.A. (1962) Studies on the amphisbaenids (Amphisbaenia; Reptilia). 2. On the amphisbaenids of the Antilles. *Bulletin of the Museum of Comparative Zoology*, 128, 65–158.

Gans, C. & Amdur, M.A. (1966) Redescription of *Amphisbaena vermicularis* Wagler, with comments on its range and synonymy (Amphisbaenia: Reptilia). *Proceedings of the California Academy of Sciences*, 33, 69–90. [https://www.biodiversitylibrary.org/part/63841] https://doi.org/10.2307/1441079

Gans, C. & Diefenbach, C.O.C. (1972) Description and geographical variation of the South American *Amphisbaena angustifrons*: the southernmost amphisbaenian in the world (Reptilia, Amphisbaenia). *American Museum Novitates*, 2494, 1–20. [https://digitallibrary.amnh.org/handle/2246/2701]

Gans, C. & Mathers, S. (1977) *Amphisbaena medemi*, an interesting new species from Colombia (Amphisbaenia, Reptilia), with a key to the amphisbaenians of the Americas. *Fieldiana Zoology*, 72, 21–46. https://doi.org/10.5962/bhl.title.5131 [https://www.biodiversitylibrary.org/bibliography/5131#/summary]

Gonzales-Sponga, M.A. & Gans, C. (1971) *Amphisbaena gracilis* Strauch rediscovered (Amphisbaena: Reptilia). *Copeia*, 1971 (4), 589–595. https://doi.org/10.2307/1442627

Hoogmoed, M.S. & Ávila-Pires, T.C.S. (1991) A new species of small *Amphisbaena* (Reptilia: Amphisbaenia: Amphisbaenidae) from western Amazonian Brazil. *Boletim do Museu Paraense Emilio Goeldi*, Serie Zoologia, 7, 77–94.

ICMBio, Instituto Chico Mendes de Conservação da Biodiversidade. (2023) Sistema de Avaliação do Risco de Extinção da Biodiversidade – SALVE. Available from: https://salve.icmbio.gov.br/ (accessed 6 April 2023)

ICZN, International Commission on Zoological Nomenclature. (1999) *International Code of Zoological Nomenclature. 4th Edition*. The International Trust for Zoological Nomenclature, London. Available from: https://www.iczn.org (accessed 14 October 2022)

Lisboa, C.M.C.A., Sales, R.F.D., Macêdo, B.F.M. & Freire, E.M.X. (2015) Diet of *Amphisbaena heathi* Schmidt, 1936 (Squamata: Amphisbaenidae) from remnants of the Atlantic Forest, northeastern Brazil, with notes on distribution, diagnosis and conservation. *South American Journal of Herpetology*, 11 (1), 12–17.
https://doi.org/10.2994/SAJH-D-15-00025.1

Mesquita, D.O., Alves, B.C.F., Pedro, C.K.B., Laranjeiras, D.O., Caldas, F.L.S., Pedrosa, I.M.M.C., Rodrigues, J.B., Drummond, L.O., Cavalcanti, L.B.Q., Wachlevski, M., Nogueira-Costa, P., França, R.C. & França, F.G.R. (2018) Herpetofauna in two habitat types (tabuleiros and Stational Semidecidual Forest) in the Reserva Biológica Guaribas, northeastern Brazil. *Herpetology Notes*, 11, 455–474.

Miranda-Ribeiro, A. (1937) Sobre uma collecção de vertebrados do nordeste brasileiro. Primeira parte: Peixes e batrachios. *O Campo*, January 1937, 54–56.

Montero, R. (1996) *Amphisbaena bolivica* Mertens 1929, nueva combinacion (Squamata: Amphisbaenia). *Cuadernos de Herpetologia*, 9 (2), 75–84.

Montero, R., Sáfadez, I.F. & Álvarez, L.G. (1997) A new species of *Amphisbaena* from Bolivia. *Journal of Herpetology*, 31, 218–220.
https://doi.org/10.2307/1565389

Mott, T., Rodrigues, M.T. & Santos, E.M. (2009) A new *Amphisbaena* with chevron-shaped anterior body annuli from state of Pernambuco: Brazil (Squamata: Amphisbaenidae). *Zootaxa*, 2165 (1), 52–58.
https://doi.org/10.11646/zootaxa.2165.1.4

Oliveira, E.C.S., Vaz-Silva, W., Santos-Jr., A.P., Graboski, R., Teixeira-Jr., M. Dal Vechio, F. & Ribeiro, S. (2018) A new four-pored *Amphisbaena* Linnaeus, 1758 (Amphisbaenia, Amphisbaenidae) from Brazilian Amazon. *Zootaxa*, 4420 (4), 451–474.
https://doi.org/10.11646/zootaxa.4420.4.1

Perez, R., Ribeiro, S. & Borges-Martins, M. (2012) Reappraisal of the taxonomic status of *Amphisbaena prunicolor* (Cope 1885) and *Amphisbaena albocingulata* Boettger 1885 (Amphisbaenia: Amphisbaenidae). *Zootaxa*, 3550 (1), 1–25.
https://doi.org/10.11646/zootaxa.3550.1.1

Perez, R. & Borges-Martins, M. (2019) Integrative taxonomy of small worm lizards from Southern South America, with description of three new species (Amphisbaenia: Amphisbaenidae). *Zoologischer Anzeiger*, 283, 124–141.
https://doi.org/10.1016/j.jcz.2019.09.007

Pinna, P.H., Mendonça, A.F., Bocchiglieri, A. & Fernandes, D.S. (2014) A new species of *Amphisbaena* Linnaeus, 1758 from a Cerrado region in Bahia, northeastern Brazil (Squamata: Amphisbaenidae). *Herpetologica*, 70 (3), 339–349.
https://doi.org/10.1655/HERPETOLOGICA-D-13-00039

Ribeiro, L.B., Gomides, S.C. & Costa, H.C. (2018) A new species of *Amphisbaena* from northeastern Brazil (Squamata: Amphisbaenidae). *Journal of Herpetology*, 52 (2), 234–241.
https://doi.org/10.1670/17-028

Ribeiro, L.B., Gomides, S.C. & Costa, H.C. (2020) A new worm lizard species (Squamata: Amphisbaenidae: *Amphisbaena*) with non-autotomic tail, from northeastern Brazil. *Journal of Herpetology*, 54 (1), 9–18.
https://doi.org/10.1670/19-043

Ribeiro Jr., M.A., Ribeiro, S., Cintra, C.E.D. & Gomes, J.O. (2022) *Amphisbaena ibijara* Rodrigues, Andrade and Lima, 2003 is a junior synonym of *Amphisbaena frontalis* Vanzolini, 1991 (Squamata, Amphisbaenia). *Journal of Herpetology*, 56, 234–240.
https://doi.org/10.1670/21-039

Rodrigues, M.T. (2003) Herpetofauna of the Quaternary sand dunes of the Middle Rio São Francisco, Bahia, Brazil. VIII. *Amphisbaena arda* sp. nov., a fuliginosa-like checkered patterned *Amphisbaena* (Squamata, Amphisbaenidae). *Phyllomedusa*, 1, 51–56.
https://doi.org/10.11606/issn.2316-9079.v1i2p51-56

Silva, P.C., Mott, T. & Kawashita-Ribeiro, R. (2016) Reptilia, Squamata, Amphisbaenia, *Amphisbaena cuiabana* (Strüssmann and Carvalho, 2001): Range extension in the state of Mato Grosso, Brazil. *Check List*, 6, 644–645.
https://doi.org/10.15560/6.4.644

Silveira, A.L., Rocha, C., Nogueira, C.C., Werneck, F., Moura, G.J.B., Winck, G., Ribeiro Júnior, M.A., Kiefer, M., Freitas, M.A., Hoogmoed, M.S., Tinôco, M.S.T., Valadão, R., Vieira, R.C., Maciel, R.P., Faria, R.G., Recoder, R., D'Ávila, R., Silva, S.T., Ribeiro, S.B. & Avila-Pires, T.C.S. (2021a) *Amphisbaena lumbricalis*. *The IUCN Red List of Threatened Species*, 2021, e.T176227A159252546. Available from: https://doi.org/10.2305/IUCN.UK.2021-3.RLTS.T176227A159252546.pt (accessed 10 April 2023)

Silveira, A.L., Rocha, C., Nogueira, C.C., Werneck, F., Moura, G.J.B., Winck, G., Ribeiro Júnior, M.A., Kiefer, M., Freitas, M.A., Hoogmoed, M.S., Tinôco, M.S.T., Valadão, R., Vieira, R.C., Maciel, R.P., Faria, R.G., Recoder, R., D'Ávila, R., Silva, S.T., Ribeiro, S.B. & Avila-Pires, T.C.S. (2021b) *Amphisbaena carvalhoi*. *The IUCN Red List of Threatened Species*, 2021, e.T75159757A75159771.
https://doi.org/10.2305/IUCN.UK.2021-3.RLTS.T75159757A75159771.pt

Souza e Lima, F.A., Gasparini, J.L., Almeida, A.P., Vital, M.V. & Mott, T. (2014) Sexual dimorphism in *Amphisbaena nigricauda* (Reptilia, Squamata, Amphisbaenidae) from Southeastern Brazil. *Iheringia Serie Zoologia*, 104, 299–307.
https://doi.org/10.1590/1678-476620141043299307

Strüssmann, C. & Carvalho, M.A. (2001) Two new species of *Cercolophia* Vanzolini 1992 from the state of Mato Grosso, western Brazil (Reptilia, Amphisbaenia, Amphisbaenidae). *Bollettino del Museo Regionale di Scienze Naturali, Torino*, 18, 487–505.

Tavares, A.P.G., Carvalho, J.J.S. & Ribeiro, L.B. (2017) First record of *Amphisbaena lumbricalis* (Squamata, Amphisbaenidae) in the state of Pernambuco, Brazil: including a distribution map and soil classification of its occurrence. *Herpetology Notes*, 10, 19–22.

Tavares, A.P.G., Coelho-Lima, A.D., Delfim, F.R., Mesquita, D.O. & Passos, D.C. (2021) Distribution extension of *Amphisbaena lumbricalis* Vanzolini, 1996 with its first predation record by snake *Erythrolamprus viridis* (Günther, 1862). *Cuadernos de Herpetología*, 35, 177–181.

Teixeira Jr., M., Dal Vechio, F. & Rodrigues, M.T. (2016) Diagnostic clarification, new morphological data and phylogenetic placement of *Amphisbaena arenaria* Vanzolini, 1991 (Amphisbaenia, Amphisbaenidae). *Zootaxa*, 4205 (3), 293–296. https://doi.org/10.11646/zootaxa.4205.3.9

Teixeira Jr., M., Dal Velchio, F., Recoder, R., Cassimiro, J., Sena, M.A. & Rodrigues, M.T. (2019) Two new highland species of *Amphisbaena* Linnaeus, 1758 (Amphisbaenia, Amphisbaenidae) from Bahia state, Brazil. *South American Journal of Herpetology*, 14 (3), 213–232. https://doi.org/10.2994/SAJH-D-17-00097.1

Torres-Ramírez, J.J., Angarita-Sierra, T. & Vargas-Ramírez, M. (2021) A new species of *Amphisbaena* (Squamata: Amphisbaenidae) from the Orinoquian region of Colombia. *Vertebrate Zoology*, 71, 55–74. [http://zoobank.org/EC812295-41EF-4D78-8FCD-CFB2A45DC359] https://doi.org/10.3897/vz.71.e59461

Vanzolini, P.E. (1971) New Amphisbaenidae from Brasil. *Papéis Avulsos de Zoologia, Sao Paulo*, 24, 191–195. https://doi.org/10.11606/0031-1049.1971.24.p191-195

Vanzolini, P.E. (1974) Ecological and geographical distribution of lizards in Pernambuco, Northeastern Brasil (Sauria). *Papéis Avulsos de Zoologia*, 18 (4), 61–90. https://doi.org/10.11606/0031-1049.1974.28.p61-90

Vanzolini, P.E. (1991a) A third species of *Bronia* Gray, 1865 (Reptilia, Amphisbaenia). *Papéis Avulsos de Zoologia*, 37, 379–388. https://doi.org/10.11606/0031-1049.1990.37.p379-388

Vanzolini, P.E. (1991b) Two new small species of *Amphisbaena* from the fossil dune field of the middle Rio São Francisco, State of Bahia, Brasil (Reptilia, Amphisbaenia). *Papéis Avulsos de Zoologia*, 37, 259–276. https://doi.org/10.11606/0031-1049.1990.37.p259-276

Vanzolini, P.E. (1991c) Two further new species of *Amphisbaena* from the semi-arid northeast of Brasil (Reptilia, Amphisbaenia). *Papéis Avulsos de Zoologia*, 37, 347–361. https://doi.org/10.11606/0031-1049.1990.37.p347-361

Vanzolini, P.E. (1994) A new species of *Amphisbaena* from the state of São Paulo, Brasil (Reptilia, Amphisbaenia, Amphisbaenidae). *Papéis Avulsos de Zoologia*, 39, 29–32. https://doi.org/10.11606/0031-1049.1994.39.p29-32

Vanzolini, P.E. (1996) On slender species of *Amphisbaena*, with the description of a new one from northeastern brasil (Reptilia, Amphisbaenia). *Papéis Avulsos de Zoologia*, 39 (16), 293–305.

Vanzolini, P.E. (2002) An aid to the identification of the South American species of *Amphisbaena* (Squamata, Amphisbaenidae). *Papéis Avulsos de Zoologia*, 42 (15), 351–362. https://doi.org/10.1590/S0031-10492002001500001