A New Species of *Amphisbaena* from Northeastern Brazil (Squamata: Amphisbaenidae)

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**ABSTRACT.**—We describe a new species of *Amphisbaena* from the Caatinga in the northeastern region of Bahia, northeastern Brazil. The new taxon is identified mainly by having two precloacal pores, 158–165 body annuli, 12–14 caudal annuli with autotomy on the third and fourth annuli, 14–16 dorsal and 15–16 ventral segments on a midbody annulus, four supralabials, three infralabials, and a postmalar row. Its description increases to 23 the number of species of Amphisbaenia for the Caatinga. Knowledge of worm lizard richness has largely increased in Brazil since the 1990s, especially in the Caatinga and the Cerrado, due mainly to collections in previously unsurveyed areas for environmental impact assessments.

**RESUMO.**—Nós descrevemos uma nova espécie de *Amphisbaena* da Caatinga na região norte da Bahia, nordeste do Brasil. O novo taxon é identificado principalmente por possuir dois poros pré-cloacais, 158–165 anéis corporais, 12–14 anéis caudais com autotomia no terceiro e quarto anéis, 14–16 segmentos dorsais e 15–16 segmentos ventrais em um anel no meio do corpo, quatro supralabiais, três infralabiais, e uma fileira pós-malar. Sua descrição para 23 o número de espécies de Amphisbaenia para a Caatinga. O conhecimento sobre a riqueza de espécies de cobras-de-duas-cabeças tem aumentado intensamente no Brasil desde a década de 1990, especialmente na Caatinga e no Cerrado, em maior parte devido a coletas em áreas previamente não amostradas para fins de estudos de impacto ambiental.

The Caatinga is one of the six Brazilian biomes (sensu IBGE, 2004), located in the northeast of the country. With 844,000 km², it presents mostly a semiarid and very seasonal climate, but is far from being a homogeneous region, harboring several kinds of vegetation from open to forested areas (Velloso et al., 2001).

In past years, biologists thought the Caatinga, together with the Cerrado and the Chaco, did not have particular fauna, but shared species found through the South American diagonal of open formations (Vanzolini, 1963, 1974). This proposition was biased by the lack of adequate information on the region’s endemic biodiversity, and the situation has changed. As a result of accumulation of data from different localities and, more recently, through phylogeographic studies (e.g., Oliveira et al., 2015; Werneck et al., 2016), the Caatinga, Cerrado, and Chaco each are now known to have a high species richness and their own endemic taxa (e.g., Rodrigues, 2003a; Azevedo et al., 2016; Cacciata and Ubilla, 2016).

A good example of the impact of increasing collection effort in the Caatinga comes from worm lizards (*Amphisbaenia*). These reptiles are usually difficult to find because of their fossorial habits, underestimating their richness patterns (Colli et al., 2014). Before the 1990s, nine species were known from the Caatinga region (Vanzolini, 1951, 1964, 1968; Gans, 1965a,b, 1971; Gans and Amdur, 1966; Williams and Vanzolini, 1980). Since 1991 this number has increased to 22 species, after the examination of specimens housed at the herpetological collection of the Museu de Fauna da Caatinga (MFCH), located at the Centro de Conservação e Manejo de Fauna da Caatinga, Universidade Federal do Vale do São Francisco, municipality of Petrolina, state of Pernambuco, and in the herpetological collection of the Centro de Coleções Taxonômicas, Universidade Federal de Minas Gerais, municipality of Belo Horizonte, state of Minas Gerais, Brazil.

Specimens were obtained at a faunal rescue for the installation of a wind farm in the semiarid region of the state of Bahia, Brazil; none of the authors participated in the collections. They were fixed in formalin and are preserved in 70% alcohol at the herpetological collection of the Museu de Fauna da Caatinga (MFCH), located at the Centro de Conservação e Manejo de Fauna da Caatinga, Universidade Federal do Vale do São Francisco, municipality of Petrolina, state of Pernambuco, and in the herpetological collection of the Centro de Coleções Taxonômicas, Universidade Federal de Minas Gerais, municipality of Belo Horizonte, state of Minas Gerais, Brazil.

Scale nomenclature follows Gans and Alexander (1962). Measurements were taken to the nearest 0.1 mm with a digital caliper, except for the snout–vent length (SVL), measured with a flexible ruler to the nearest 1.0 mm. Body slenderess proportion (BSP) (SVL/head width) follows Vanzolini (1997) and Pinna et al. (2014). Color descriptions are based on preserved specimens. Sex was determined by the direct examination of hemipenes after a small incision at the base of tail, or by direct examination of the gonads after a small incision at the abdomen. Comparisons with other taxa were facilitated by both literature (e.g., Vanzolini, 1997; Costa et al., 2015; Ribeiro et al., 2016) and specimens from the herpetological collections of Fundação Ezequiel Dias (FUNED), Museu de Zoologia da Universidade de São Paulo (MZUSP), Universidade Federal de Goiás (UFG), and Universidade Federal de Minas Gerais (UFMG) (Appendix 1). All geographic coordinates were recorded in datum WGS84.
Amphisbaena kiriri sp. nov.

Figures 1–2; Table 1

Holotype.—Female, MFCH 3939 (field number 3971), municipality of Campo Formoso, state of Bahia, Brazil, (10.558345°S 40.569221°W; 877 m above sea level [m a.s.l.]), collected on 6 September 2014 by Robson Lúcio Moraes Dias Santos.

Paratypes.—All from Campo Formoso, Bahia, Brazil, but collected at different sites. Female, MFCH 4165 (field number RE67) (10.024767°S 40.845489°W; 556 m a.s.l.), 5 March 2016. Male, UFMG 3080 (former MFCH 4166, field number RBF302) (9.999412°S 40.910579°W; 944 m a.s.l.), 28 March 2016. Male, MFCH 4167 (field number REC2C02) (9.994342°S 40.919906°W; 969 m a.s.l.), 28 April 2016. Female, MFCH 4168 (field number RE2-11) (10.042046°S 40.961339°W; 987 m a.s.l.), 30 April 2016. Male, MFCH 4169 (field number RE2C16) (10.001281°S 40.929805°W; 1,001 m a.s.l.), 11 May 2016. Female, MFCH 4170 (field number RE2B42) (10.016805°S 40.940276°W; 1,002 m a.s.l.), 25 May 2016. Female, UFMG 3081 (former MFCH 4171, field number RE2B43) (10.01712°S 40.940369°W; 1,002 m a.s.l.), 25 May 2016.

Definition.—Amphisbaena kiriri sp. nov. is identified by the following combination of characters: 1) head round-shaped; 2) nasal suture > < frontal suture > prefrontal suture; 3) two precloacal pores without a median hiatus; 4) 158–165 body annuli; 5) three to four lateral annuli; 6) 12–14 caudal annuli; 7) autotomy on third or fourth caudal annulus; 8) tail tip rounded; 9) 14–16 dorsal segments on midbody annulus; 10) 15–16 ventral segments on midbody annulus; 11) four supralabials; 12) three infralabials; 13) one row of postgenials; 14) postmalar row present; 15) dorsal and ventral sulci absent, lateral sulcus present; 16) rostral, nasals, first supralabial, and (sometimes) anterior part of prefrontals cream colored; 17) dorsum dark gray; 18) first two to three ventral segments dark gray, the rest cream colored or (at least after first third of body) cream with a dark gray half-circle at anterior border.

Diagnosis.—Amphisbaena kiriri sp. nov. is diagnosed from all South American amphisbaenids by the combination of two precloacal pores, 158–165 body annuli, four supralabials, and a postmalar row. The closest species in number of body annuli are A. anaemariae (156–170) and A. neglecta (151–155), which also have two precloacal pores, but three supralabials and no postmalar. The new species can be further distinguished from A. anaemariae...
and *A. neglecta* by the nasal suture longer than prefrontal suture (vs. shorter in both species) (Fig. 3).

**Description of the Holotype.**—An adult specimen, SVL 146.9 mm; caudal length 10.5 mm; head short (4.7 mm, 3.2% of SVL), rounded, not depressed or compressed, and not distinct from the neck; BSP 36.5; rostrum rounded, projecting beyond the jaw. Rostral triangular, visible in dorsal view, in contact with nasals and first supralabial. A pair of quadrangular nasals (middorsal suture 1.5 mm [0.98% head length]), in broad contact with rostral anteriorly and first supralabials, and prefrontals posteriorly. Point contact between nasals and second supralabials. Nostrils in the anteroinferior portion of nasal shields. A pair of parallelogram-shaped prefrontals (middorsal suture 0.8 mm [0.53% head length]), in contact with nasals anteriorly, second supralabials inferiorly, ocular and frontals posteriorly. A pair of triangular frontals (middorsal 1.21 mm [0.82% head length]), in point contact with oculars and postoculars inferiorly, prefrontals anteriorly, parietals and an unnamed scale posteriorly. No enlarged parietals (middorsal suture 0.6 mm [0.43% head length]), in contact with frontals anteriorly, and unnamed scale inferiorly, and first body annulus posteriorly. A diamond-shaped ocular shield, in contact with second and third supralabials below, prefrontal anteriorly, frontal above, and postocular posteriorly. Eye visible. Temporal squarish, contacting third supralabial anteriorly, postocular dorsally, fourth supralabial inferiorly, and first body annulus posteriorly.

Four supralabials, first triangular, as long as high, and longer than other supralabials, contacting rostral anteriorly, nasal dorsoanteriorly, and second supralabial posteriorly. Second supralabial pentagonal, the highest and higher than long, in point contact with nasal anteriorly, contacting prefrontal dorsally, ocular posterodorsally, and third supralabial posteriorly. Third supralabial pentagonal, higher than long, as high as first supralabial, contacting second supralabial anteriorly, fourth supralabial and temporal posteriorly, ocular dorsally, and in point contact with postocular; fourth supralabial smallest, squarish, contacting third supralabial anteriorly, temporal dorsally, the first body annulus posteriorly, and third infralabial inferiorly.

Mental shield trapezoidal, contacting postmental posteriorly and first infralabials laterally. Postmental pentagonal, contacting mental anteriorly, first and second infralabials laterally, and postgenials posteriorly. One row with four postgenials, in contact with postmental anteriorly, malars laterally, and post-
malars posteriorly. A small, squarish "secondary malar" between the third infralabial and the "primary" malar on each side (possibly originating from a division of the malars during development). Postmalar row with nine scales.

Three infralabials, first triangular and smaller than second. Second infralabial trapezoidal, largest; third infralabial rectangular, smallest. First infralabial contacting mental and postmental laterally, and second infralabial posteriorly; second infralabial contacting postmental laterally, third infralabial, secondary malar, primary malar, and one postgenial posteriorly; third infralabial in contact with second infralabial anteriorly, secondary malar and first scale of postmalar row laterally, and the first body annulus posteriorly.

The first body annulus dorsally includes the segments posterior to the fourth supralabial, temporal, ocular, and parietals; ventrally it includes the segments posterior to postmalars. There are 160 body annuli; 14 dorsal and 16 ventral quadrangular segments (midventral segments about 1.5× wider than long). There are no dorsal or ventral sulci, but a lateral sulcus; the lateral sulcus is visible from the 38th body annulus to the cloacal neck in both specimens. There are two small round precloacal pores; the precloacal pores are separated by a median hiatus caused by the longitudinal division of the pore-bearing segments, which we consider an anomaly. The frontal suture is longer than the nasal suture in MFCH 4165, 4167, 4169, and CA 12. A small, squarish "secondary malar" makes reference to the indigenous tribes (also known as kariri or kiri) that once inhabited Brazilian backlands, particularly the Caatinga. Four dialects were spoken by them, all currently extinct (Campbell and Grondona, 2012). The word kariri is said to have it origin in the Tupi language spoken by the natives of coastal areas, meaning "silent," "taciturn" (Sampaio, 1901).

Variation.—In UFMG 3080, the precloacal pores are separated by a median hiatus caused by the longitudinal division of the pore-bearing segments, which we consider an anomaly. The frontal suture is longer than the nasal suture in MFCH 4165, 4167, 4169, and UFMG 3081. The secondary malar is absent on the left side of the head of UFMG 3081. The parietal region is variable, with fusions between adjacent scales in UFMG 3080 and 3081. A summary of variation in morphometry, annuli, and segment counts of the type series is shown in Table 1; we also noted some color variation. MFCH 4165 has supralabial II and precloacal cream colored. UFMG 3080 has supralabial II cream on the ventral part of the head.
the left side, and with a dark spot on the bottom left corner on the right side. MFCH 4167 has supralabial I with dark spots. Prefrontals are completely dark gray in UFMG 3080 and 3081. All paratypes with most ventral segments after the first third of the body with a gray blotch on the anterior border.

**DISCUSSION**

Among South American worm lizards, *Amphisbaena kiriri* sp. nov. is morphologically most similar to *A. anaemariae* and *A. neglecta*, two Cerrado endemic species. *Amphisbaena anaemariae* is known from the core region of the Cerrado (Colli et al., 2016), whereas *A. neglecta* is known only from the type series from the southwestern state of Mato Grosso (Vanzolini, 1997); a specimen reportedly belonging to this species from Anápolis, in the state of Goiás (Gans, 1962a; Colli et al., 2016), was determined to be misidentified (Vanzolini, 1997). Localities where *A. kiriri* sp. nov. was found are 740 km east and 1,700 km northeast from the closest records of *A. anaemariae* and *A. neglecta*, respectively.

Two other species, *A. alba* and *A. vermicularis*, are known from Campo Formoso (Dal Vechio et al., 2016), though with no information if in syntopy with *A. kiriri* sp. nov. From *A. alba* and *A. vermicularis* the new species can be easily distinguished by many characters such as the number of precloacal pores, body annuli, and segments in a midbody annulus (Gans, 1962b; Gans and Amdur, 1966). Two other species have been recorded in localities at the state of Bahia close to Campo Formoso, and may be found in sympathy with *A. kiriri* sp. nov. in the future: *A. bahiana*, from Senhor do Bonfim (previously known as Vila Nova, 40 km east of the type locality of *A. kiriri* sp. nov.) (Vanzolini, 1992), and *A. frontalis*, from Alagoado, municipality of Casa Nova (70 km northwest from paratype localities and 145 from the type locality of *A. kiriri* sp. nov.) (Vanzolini, 1991a) (Fig. 4). Both species differ from *A. kiriri* sp. nov. by having four precloacal pores and higher body annulus counts (Vanzolini, 1991a, 1992). Colli et al. (2016) apparently mistakenly cited *A. hastata* and *A. ignatiana* from Casa Nova on the basis of Rodrigues (1996), who recorded *A. hastata* for only Ibiraba and Queimadas (municipality of Barra), and *A. ignatiana* for only Santo Inácio (municipality of Gentio do Ouro), both localities about 200 km southwest of Campo Formoso (Rodrigues, 1996), state of Bahia. Finally, *A. pretrei*, widespread in northeastern Brazil (Colli et al., 2016), may also be found in sympathy with the new species. From it, *A. kiriri* sp. nov. is easily separated by the number of pores and annulus counts (Gans, 1965b). Table 2 reports a summary of morphological characters useful to distinguish *A. kiriri* sp. nov. from congeners occurring or potentially occurring in sympathy with it.

The municipality of Campo Formoso, where the new species was discovered, has an area of about 7,000 km² and 73,000 inhabitants (IBGE, 2016), including “quilombolas” (rural communities of slaves descendants) (Dantas-Aguiar et al., 2011). Although part of the native vegetation was removed for farming and cattle raising, the region still harbors important areas of Caatinga (Dantas-Aguiar et al., 2011).

The extent of occurrence (IUCN, 2001) of *A. kiriri* sp. nov. is 505 km² (on the basis of the minimum convex polygon). At present, we recommend it be assigned to the Data Deficient
category, because the available information is inadequate to make any assessment of its risk of extinction (IUCN, 2001); we stress, however, that the type locality was affected by the construction of a wind farm, and no protected area exists in the region, although the creation of a national park has been considered (MMA, 2006).

The discovery of *A. kiriri* sp. nov. contributes to our knowledge of Brazilian biodiversity. Because of sampling biases, many species of these fossorial reptiles remain to be discovered (Colli et al., 2016). An effort is needed to focus sampling efforts on novel and previously unstudied localities, and to review museum specimens, particularly from small regional collections. Our understanding of amphisbaenian species diversity is still far from complete and inevitably will increase with additional fieldwork.

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**Fig. 4.** Geographic distribution map of *Amphisbaena kiriri* sp. nov. Top right map: location of specimen records in South America; middle right map: magnification showing locality records of *A. kiriri* and the type localities of *A. bahiana* and *A. frontalis* in northeastern Brazil; top left map: magnification detailing the elevation gradient of the region where *A. kiriri* specimens were found, together with the type localities of *A. bahiana* and *A. frontalis*; bottom left and right maps: remnants of Caatinga vegetation (MMA and IBAMA, 2011) and the soil types (IBGE and EMBRAPA, 2001) in the study region (type locality of *A. frontalis* not shown).
Table 2. Morphological comparison between *Amphisbaena kiriri* sp. nov. and other species of *Amphisbaena* known to occur or probably occurring in sympathy with it. BA = body annuli; CA = caudal annuli; DS = dorsal segments on midbody; VS = ventral segments on midbody; PP = preocular pores; SL = supralabials; IL = infralabials.

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SANTAR, T. 1901. O Tupi na geografia nacional. Instituto Histórico e Geográfico de São Paulo, Brazil.
NEW SPECIES OF AMPHISBAENA FROM BRAZIL

APPENDIX 1. SPECIMENS EXAMINED (ALL FROM BRAZIL).


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