

On the type locality of *Ameivula ocellifera*
(Spix, 1825) (Squamata, Teiidae),
with a neotype designation

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Illustration of one syntype of *Tejus ocellifer* Spix, 1825. Plate XXV of Spix (1825).

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ABSTRACT

The whiptail lizard *Ameivula ocellifera* (Spix, 1825) was described from “Bahia”, northeastern Brazil, by Spix in 1825. Its syntypes are considered lost, and the type locality is unknown. For many years, *A. ocellifera* was considered one of the most widespread whiptail lizard species in South America. Since 1997, several populations assigned to *A. ocellifera* have been described as new species. Considering that most species descriptions were solely based on morphological data, the lack of a type specimen and the doubt regarding the type locality have caused taxonomic uncertainties over the years. In addition, the systematics of *Ameivula* Harvey, Ugueto & Gutberlet, 2012 is in a state of flux, and the existence of candidate species currently assigned to *A. ocellifera* makes the designation of a neotype urgent. Here we review the taxonomic history of *A. ocellifera*, including the issues regarding its type locality. We describe a neotype based on morphometric and external morphological characters, providing a solid foundation for future taxonomic studies on the *A. ocellifera* species group.

KEY WORDS

Brazil, redescription, nomenclature, *Tejus ocellifer*, whiptail lizard, neotypification.

RÉSUMÉ

Sur la localité type d'*Ameivula ocellifera* (Spix, 1825) (*Squamata*, *Teiidae*), avec la désignation d'un néotype. Le lézard *Ameivula ocellifera* (Spix, 1825) a été décrit de “Bahia”, nord-est du Brésil, par Spix en 1825. Ses syntypes sont considérés comme perdus et la localité type est inconnue. Pendant de nombreuses années, *A. ocellifera* a été considérée comme l'une des espèces de lézards coureurs les plus répandues en Amérique du Sud. Depuis 1997, plusieurs populations précédemment attribuées à *A. ocellifera* ont été décrites comme de nouvelles espèces. Considérant que la plupart des descriptions d'espèces étaient uniquement basées sur des données morphologiques, l'absence d'un spécimen-type et le doute concernant la localité type ont causé des incertitudes taxonomiques au fil des ans. De plus, la systématique d'*Ameivula* Harvey, Ugueto & Gutberlet, 2012 est en pleine évolution et la description imminente de nouvelles espèces actuellement attribuées à *A. ocellifera* rend urgente la désignation d'un néotype. Ici, nous passons en revue l'histoire taxonomique d'*A. ocellifera*, y compris les problèmes concernant sa localité type. Nous décrivons un néotype basé sur des caractères morphométriques et morphologiques externes, fournissant une base solide pour les futures études taxonomiques sur le groupe d'espèces *A. ocellifera*.

MOTS CLÉS

Brésil, redescription, nomenclature, *Tejus ocellifer*, lézard coureur, neotypification.

INTRODUCTION

The whiptail lizard *Ameivula ocellifera* was described as *Tejus ocellifer* by Johann Baptist von Spix (Spix 1825) from specimens collected by himself accompanied by the botanist Karl Friedrich Philipp von Martius, in “Bahia”, northeastern Brazil, during their expedition to the country (from Rio de Janeiro to Amazonas) between 1817 and 1820 (Spix & Martius 1976). Boie (1826) considered *T. ocellifer* a synonym of *Seps murinus* Laurenti, 1768, which was followed by Fitzinger (1827). Later, Wagler (1830) placed *S. murinus* in a new genus, *Cnemidophorus*. Reinhardt & Lütken (1862) described *C. hygomi* based on 11 specimens from Maruim, Sergipe state, northeastern Brazil, but compared their material only to *C. lacertoides* Duméril & Bibron, 1839 from Uruguay. Peters (1877) revised the Spix's collection and stated that there were two specimens identified initially as *T. ocellifer*, even though the text describing *T. ocellifer* (Spix 1825) was based on a single specimen (probably the one illustrated). According to Peters (1877), the largest specimen in the collection would be the one illustrated (see Fig. 1) in Spix (1825) and was conspecific to *C. hygomi*, while the other specimen belonged to *C. lemniscatus* Linnaeus, 1758, not *C. murinus*. Then, Peters (1877) resurrected *T. ocellifer* as *C. ocellifer* and regarded *C. hygomi* as its synonym.

In the 20th century, specimens assigned to *Cnemidophorus ocellifer* were recorded in many parts of the South American

“open diagonal”, from northeastern Brazil to Bolivia and Paraguay (Burt 1931; Peters & Donoso-Barros 1970; Vanzolini *et al.* 1980). Since 1997, some of these populations were described as new species (Rocha *et al.* 1997, 2000; Dias *et al.* 2002; Colli *et al.* 2003a, b, 2009; Arias *et al.* 2011a, b, 2014a, b, 2018; Cabrera 2012; Silva & Ávila-Pires 2013). A systematic review of Teiidae Gray, 1827 (Harvey *et al.* 2012) and another of Gymnophthalmoidea Fitzinger, 1826 (Goicoechea *et al.* 2016) further split *Cnemidophorus* into more genera, placed *C. ocellifer* in the new genus *Ameivula* Harvey, Ugueto & Gutberlet, 2012 and moved some of the species previously regarded as morphologically close to *C. ocellifer* into *Ameiva* Meyer, 1795 and *Glaucomastix* Goicoechea *et al.*, 2016 (see Harvey *et al.* 2012; Goicoechea *et al.* 2016). Despite those recent advances, the taxonomy of *A. ocellifera* is still problematic, with pending issues regarding, for example, the occurrence of candidate species from central Brazil (Arias *et al.* 2018).

A critical issue with the systematics of *Ameivula ocellifera* is that its syntypes are presumably lost (Hoogmoed & Gruber 1983; Franzen & Glaw 2007), and the only available sources of information are Spix's brief description of the species and the colored illustration (Fig. 1). Considering that most new species formerly identified as *A. ocellifera* (except *A. apipensis*) were described based on morphological data alone (coloration and lepidosis) and that the systematics of *Ameivula* is in a state of flux (Arias *et al.* 2018), a neotype designation is



TEJUS *ocellifer*.

FIG. 1. — Illustration of one syntype of *Tejus ocellifer* Spix, 1825. Plate XXV of Spix (1825).

essential to stabilize the taxonomy of *A. ocellifera* and allied species (Anonymous 1999, Art. 75.3.1).

Designating a neotype for *Ameivula ocellifera* in agreement with Article 75.3 of the International Code of Zoological Nomenclature (Anonymous 1999, hereafter the Code) would require investigating its type locality (Art. 75.3.1). However, the description (Spix 1825) lacks a clear indication of the precise locality where the species was collected. The concept of type locality did not exist at that time when only the indication of the general area of occurrence was enough (Vanzolini 1981). The only clue about the type locality of *A. ocellifera* is its description: “habitat in Bahia sub arbus-tis” (lives under trees in Bahia). After a refined study on the Bavarian expedition to Brazil, Vanzolini (1981) concluded that Salvador, the capital of Bahia state, is the likely type locality of *A. ocellifera* because “Bahia” was frequently used as a synonym for Salvador. As a result, subsequent works have followed Vanzolini’s assumption (e.g. Rocha *et al.* 2000; Silva & Ávila-Pires 2013).

Herein, we conducted a detailed study on Spix and Martius’ expedition to Brazil (Spix & Martius 1976) and incorporated information from herpetological books where the species collected during this expedition were described (e.g. Spix 1824, 1825; Spix & Wagler 1824), gathering evidence to evaluate Vanzolini’s conclusion. Based on our assessment, we define the type locality of *Ameivula ocellifera*, and designate and describe a neotype.

JOURNEY THROUGH THE PROVINCE OF BAHIA

Spix and Martius traveled extensively in the province of Bahia (see Spix & Martius 1976), which was smaller than the current homonymous state (Fig. 2). At that time, the western border of Bahia was bounded by the São Francisco River, excluding the current western part of the state (Vanzolini 1981). The naturalists first entered the province from the west, crossing the São Francisco River from Carinhanha (at that time part of the province of Pernambuco) to Malhada (province of Bahia) on 24 September 1818, proceeding to the capital, Salvador (at

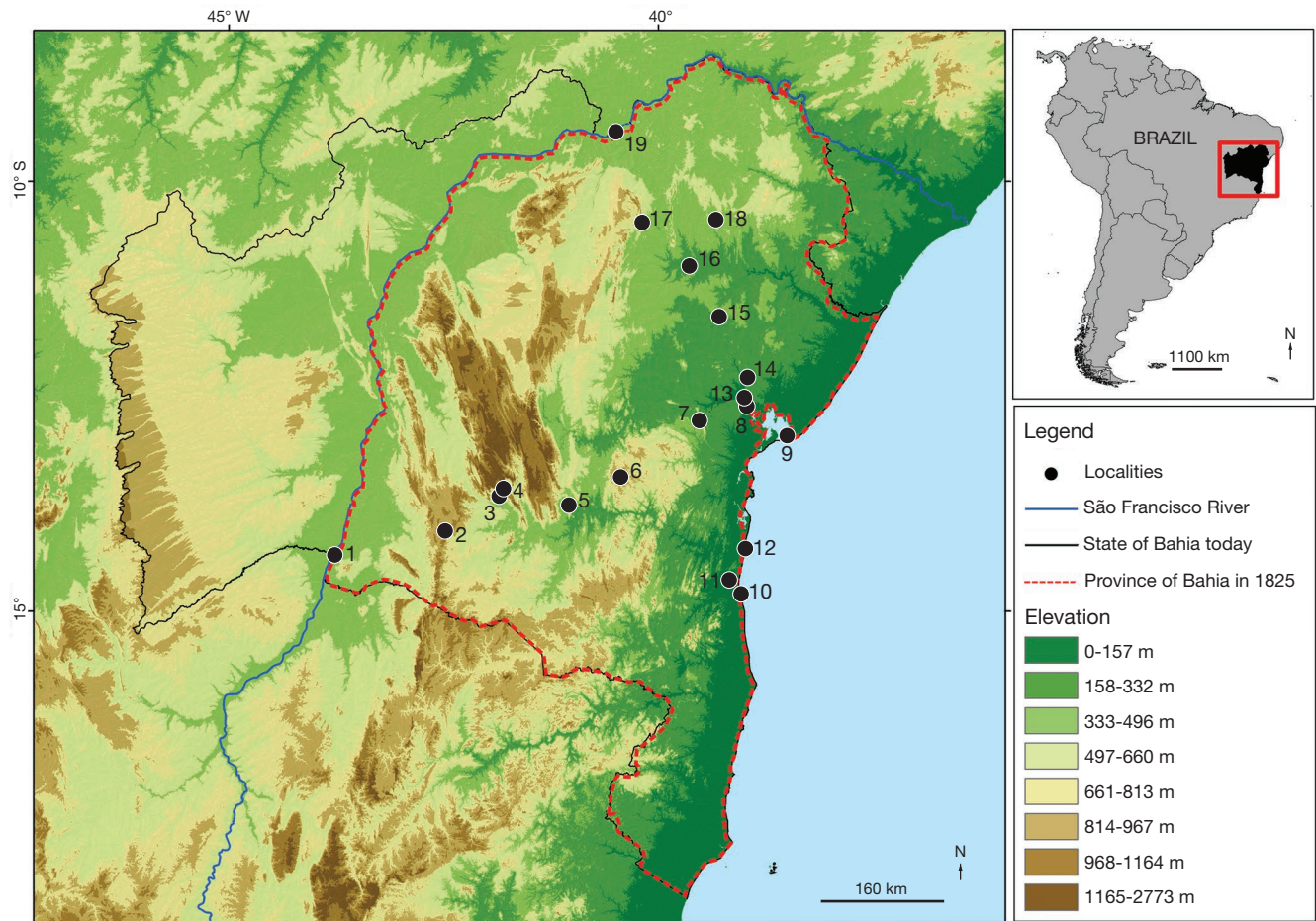


Fig. 2. — Spix and Martius' itinerary on the elevation background, highlighting the province of Bahia in 1825, the current state of Bahia, and São Francisco River. Localities visited: 1, Malhada; 2, Caetitê; 3, Livramento do Brumado; 4, Rio de Contas; 5, Sincorá; 6, Maracás; 7, Vila Pedra Branca; 8, São Félix; 9, Salvador; 10, Ilhéus; 11, Almada; 12, Itacaré; 13, Conceição da Feira; 14, Feira de Santana; 15, Coité; 16, Santo Antônio das Queimadas; 17, Senhor do Bonfim; 18, Bendegó; 19, Juazeiro.

the coast), mainly through the Caatinga. The first part of the journey, from Malhada to the village of Rio de Contas (#1 to #4 in Fig. 2), ran without significant incidents. The greatest difficulties happened next, between Rio de Contas to the village of Maracás (#4 to #6 in Fig. 2). Due to the severe drought, men and mules suffered severe water and food deprivation. This resulted in the foreman abandoning the group, some mules died, and the heaviest part of the collection had to be left behind to accelerate the trip in search of better conditions. The scenario was gradually changing, and some leagues from São Félix (#8 in Fig. 2; formerly Port of São Félix) they found signs of rain and green vegetation. The remaining journey to Salvador (#9 in Fig. 2) took place without major setbacks. This first part of the trip throughout Bahia lasted less than two months. Spix and Martius arrived in Salvador on 10 November 1818, stayed there for a month, and then decided to visit the Atlantic Forest on the southern coast of Bahia. On 11 December 1818, the naturalists departed to the Atlantic Forest around Ilhéus (#10 in Fig. 2), returning to Salvador by sea after 31 days. They stayed in Salvador for another month and, before departing the capital on 18 February 1819, left the boxes with the collections to be dispatched to Hamburg.

In the last part of their journey from Salvador to Juazeiro (formerly Juazeiro do Norte), at the banks of the São Francisco River, Spix and Martius crossed again the Caatinga, now heading north and northwest. They faced a severe drought, with rivers and wells dried from Feira de Santana onwards (#14 in Fig. 2; formerly Feira de Sant'Ana village). Again, they suffered much due to the lack of water and food for the men and mules; the hardships and privations of the journey affected their health, and they continually suffered from diarrhea, fever, and headache. After 39 days of leaving Salvador, they reached Juazeiro (#19 in Fig. 2) and stayed there for a little more than three weeks. The journey across Bahia was over on 21 April 1819, when they once again crossed the São Francisco River into the province of Pernambuco. The whole trip throughout the province of Bahia lasted nearly seven months.

THE HERPETOFAUNA DESCRIBED FROM THE PROVINCE OF BAHIA

From materials collected during the Brazilian expedition, Spix managed to produce eight books, three of them focused on the herpetofauna: 1) snakes (Spix & Wagler 1824); 2) turtles and frogs (Spix 1824); and 3) lizards (Spix 1825). The first book,

Serpentum Brasiliensium species novae, was written from Spix's notes by his assistant Johann Georg Wagler (Spix & Wagler 1824). Spix wrote the last two books: *Animalia nova sive species novae Testudinum et Ranarum* (Spix 1824) and *Animalia nova sive species novae Lacertarum* (Spix 1825). Although the books supposedly described only new species, they included some species already known to science and explicitly used specific names from previous authors without proper references (with some exceptions). Many of the species described are currently accepted as valid, while some are considered synonyms or are not from Brazil (European forms that strayed into the collection) (Vanzolini 1981). Here, we are primarily interested in information about the type locality of specimens from Bahia to gather evidence related to the type locality of *Ameivula ocellifera* (Article 75.3.1 of the Code). Among the species cited in Spix's herpetological books, 46 are from the Bahia province (Table 1).

The habitat description of *Ameivula ocellifera* is referred to as simply "*habitat in Bahia sub arbustis*" (Table 1). Vanzolini (1981) indicated possibly Salvador, the capital of Bahia, as the type locality of *A. ocellifera*. Bahia is frequently used as a synonym for Salvador in the books reporting the expedition (Spix & Martius 1976). However, the association made by Vanzolini is not as apparent as previously thought. Some species described by Spix from the capital are referred to by Latin terms that denote the city of Salvador, such as "*urbem Bahiae*" or "*urbis Bahiae*" (Table 1), but this is not the case for *A. ocellifera*. Likewise, species described from nonspecific localities in the countryside of Bahia are referred to by Latin terms such as "*provincia Bahiae*", "*Bahia interior*", or "*interioris Bahiae*" (Table 1). Again, *A. ocellifera* does not fit here either. Therefore, it is impossible to assure the precise original type locality of *A. ocellifera*.

GEOGRAPHIC DISTRIBUTION OF *AMEIVULA OCELLIFERA* IN THE PROVINCE OF BAHIA

Spix and Martius traveled across the province of Bahia within the occurrence area of two species of *Ameivula* – *A. ocellifera* and *A. nigrigula* (Arias, Carvalho, Rodrigues & Zaher, 2011) – and of *Glaucomastix abaetensis* (Dias, Rocha & Vrcibradic, 2002), all of them split from *A. ocellifera* when described. *Ameivula nigrigula* occurs in the southwest of the Caatinga and adjacent areas, from northern Bahia (Itaguaçu da Bahia) to northern Minas Gerais (Grão Mogol) states (Pinto-Silva & Silva-Soares 2018; Arias *et al.* 2018; Sousa *et al.* 2019). *Glaucomastix abaetensis* is distributed from Salvador to Costa do Sauípe in coastal Bahia (Rosário *et al.* 2019). Both species show consistent differences in color pattern in life when compared with *A. ocellifera*. *Glaucomastix abaetensis* has a bright blue-green tail (brownish in *A. ocellifera*), while *A. nigrigula* presents the gular and, occasionally, the sublabial region dark black (white in *A. ocellifera*). Therefore, it is unlikely that the specimen described by Spix (1825) corresponds to any of those two species based on their distinct coloration patterns.

Based on molecular evidence (Oliveira *et al.* 2015), *Ameivula ocellifera* was considered a widely distributed species in the Caatinga, occurring from northern to southeastern

Caatinga, including eastern Bahia. The authors considered *A. pyrrhogularis* (Silva & Avila-Pires, 2013) a junior synonym of *A. ocellifera* (Northeast lineage in Oliveira *et al.* 2015). Later, Arias *et al.* (2018) resurrected *A. pyrrhogularis* based on molecular and morphological evidence, consequently restricting the geographic range of *A. ocellifera*, although still including eastern Bahia (see more details about geographic distribution in Results).

Spix and Martius' itinerary across the province of Bahia was mostly within the range of *Ameivula ocellifera*. The syntypes of *A. ocellifera* used in Spix's description could have been collected anywhere within this portion of the itinerary. We speculate that the specimens were probably collected where Spix and Martius stayed for days or weeks under suitable conditions, not in places they only crossed and faced harsh conditions. Salvador is where Spix and Martius stayed longer (two months) during the trip through the province of Bahia. Additionally, specimens from Salvador present a color pattern similar to the original description of *A. ocellifera*. Therefore, although our arguments differ from Vanzolini (1981), we reached the same conclusion: Salvador is the type locality of *A. ocellifera*.

MATERIAL AND METHODS

We selected a recently collected male specimen as the neotype of *Ameivula ocellifera* (Fig. 3). Collection permits were issued by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), authorization #61760-1. The specimen was euthanized with 1 ml of thiopental (Hawk *et al.* 2005), fixed in 10% formalin solution, and posteriorly transferred to 70% ethanol for permanent storage. Before fixation, we took pictures of the specimen in life with a Nikon D750 mounted with Nikon 105 mm macro lens. We also collected a muscle sample and preserved it in absolute ethanol for posterior molecular analyses. We deposited the specimen and the tissue sample in the Coleção Zoológica de Referência da Universidade Federal de Mato Grosso do Sul (ZUFMS-REP) and Coleção de Tecidos do Mapeamento UFMS (MAP-T), respectively.

We examined the specimen with a Leica EZ4 stereo microscope (13–56X). Scale nomenclature, scale counts, and measurements follow Harvey *et al.* (2012) and Arias *et al.* (2011a). We followed Harvey *et al.* (2012: fig. 49 on page 55) for the nomenclature of dorsal stripes; more details are available in Appendix 1. Using a Mitutoyo digital caliper (0.01 mm precision), we took the following measurements from the preserved specimen: snout-vent length, trunk length, tail length, head length, head height, head width, humeral length, forelimb length, femur length, tibia length, foot length, and hindlimb length.

We also recorded the following meristic counts (see Appendices 1; 2): supraoculars, supraciliaries, supralabials (the last supralabial lies below the posterior end of the longest subocular scale), infralabials (the last infralabial is the scale immediately below the last supralabial), gulars (along the midline, from postsymphysal scale to mesoptychial scales), longitudinal rows of ventrals (midway between fore- and hindlimbs), transverse rows of ventrals (from gular fold to

TABLE 1. — Species cited in Spix's herpetological books from the Province of Bahia, depicting the pages (p.) where each species and its type locality are available. More details in Spix (1824), Spix & Wagler (1824), Spix (1825), Vanzolini (1981), Wallach *et al.* (2014), Frost (2021), and Uetz *et al.* (2022).

p.	Species (as originally cited)	Species (current name)	Type locality as originally cited/Habitat
Snakes, amphisbaenians, and caecilians (Spix & Wagler 1824)			
14	<i>Natrix chiametla</i> (Shaw, 1802)	<i>Erythrolamprus miliaris</i> (Linnaeus, 1758)	Habitat non rara in provincia Bahiae et adjacentibus
16	<i>Natrix g. forsteri</i> Wagler, 1824	<i>Erythrolamprus poecilogyrus</i> (Wied, 1824)	Habitat in provincia et prope urbem Bahiae
17	<i>Natrix melanostigma</i> Wagler, 1824	<i>Echinanthera melanostigma</i> (Wagler, 1824)	Habitat in provincia Bahiae
18	<i>Natrix lacertina</i> Wagler, 1824	<i>Malpolon monspessulanus</i> (Hermann, 1804)	Habitat in locis sylvestribus urbis Bahiae
27	<i>Natrix bahiensis</i> Wagler, 1824	<i>Hemorrhois hippocrepis</i> (Linnaeus, 1758)	Habitat in terris provinciae Bahiae
30	<i>Natrix almada</i> Wagler, 1824	<i>Erythrolamprus almadensis</i> (Wagler, 1824)	Habitat prope Almada in vicinitate urbis Bahiae
37	<i>Natrix aspera</i> Wagler, 1824	<i>Helicops angulatus</i> (Linnaeus, 1758)	Habitat numerosus in provinciae Bahiae adjacentibus
39	<i>Natrix punctatissima</i> Wagler, 1824	<i>Thamnodynastes pallidus</i> (Linnaeus, 1758)	Habitat non rara ad urbem Bahiae
47	<i>Ophis merremii</i> Wagler, 1824	<i>Xenodon merremii</i> (Wagler, 1824)	Habitat ad urbem Bahiae; vicitat bufonibus
50	<i>Bothrops megaera</i> Wagler, 1824	<i>Bothrops leucurus</i> Wagler, 1824	Habitat ad urbem Bahiam
53	<i>Bothrops leucostigma</i> Wagler, 1824	<i>Bothrops jararaca</i> Wied, 1824	Habitat in provincia Bahiae campis sylvaticis
56	<i>Bothrops neuwiedi</i> Wagler, 1824	<i>Bothrops neuwiedi</i> Wagler, 1824	Habitat in provincia Bahiae
57	<i>Bothrops leucurus</i> Wagler, 1824	<i>Bothrops leucurus</i> Wagler, 1824	Habitat in provinciae Bahiae sylvis campestribus sub arborum cõrtice
60	<i>Crotalus cascavella</i> Wagler, 1824	<i>Crotalus durissus</i> (Linnaeus, 1758)	Habitat non rarus in campis provinciae Bahiae
73	<i>Amphisbaena vermicularis</i> Wagler, 1824	<i>Amphisbaena vermicularis</i> Wagler, 1824	Habitat in Provincia Bahiae
74	<i>Caecilia annulata</i> Mikan, 1820	<i>Siphonops annulatus</i> (Mikan, 1820)	Habitat numerosa in provincia Bahiae, in paludum vicinitate, plures pedes sub terra latens
Turtles and frogs (Spix 1824)			
23	<i>Testudo cagado</i> Spix, 1824	<i>Chelonoidis denticulatus</i> (Linnaeus, 1766)	Habitat sub nomine cagado in campis et nemoribus campestribus Bahiae
26	<i>Rana pachypus</i> Variet. 1 Spix, 1824	<i>Leptodactylus latrans</i> (Steffen, 1815)	Habitat in locis humidis Bahiae
27	<i>Rana mystacea</i> Spix, 1824	<i>Leptodactylus mystaceus</i> (Spix, 1824)	Habitat ad Bahiam in aqua fluviatili
30	<i>Rana pygmaea</i> Spix, 1824	nomen dubium	Habitat in Provincia Bahiae
32	<i>Hyla ranoides</i> Spix, 1824	<i>Hylodes nasus</i> (Lichtenstein, 1823)	Habitat in Provincia Bahiae
33	<i>Hyla albomarginata</i> Spix, 1824	<i>Boana albomarginata</i> (Spix, 1824)	Habitat in Provincia Bahiae
36	<i>Hyla bipunctata</i> Spix, 1824	<i>Dendropsophus bipunctatus</i> (Spix, 1824)	Habitat in Provincia Bahiae
38	<i>Hyla strigilata</i> Spix, 1824	<i>Scinax strigilatus</i> (Spix, 1824)	Habitat in Provincia Bahiae
40	<i>Hyla x-signata</i> Spix, 1824	<i>Scinax x-signatus</i> (Spix, 1824)	Habitat in Provincia Bahiae
46	<i>Bufo stellatus</i> Spix, 1824	<i>Rhinella crucifer</i> (Wied, 1821)	Habitat in Provincia Bahiae
48	<i>Bufo ephippium</i> Spix, 1824	<i>Brachycephalus ephippium</i> (Spix, 1824)	Habitat in Provincia Bahiae
48	<i>Bufo albifrons</i> Spix, 1824	<i>Physalaemus albifrons</i> (Spix, 1824)	Habitat in Provincia Bahiae
51	<i>Bufo granulosa</i> Spix, 1824	<i>Rhinella granulosa</i> (Spix, 1824)	Habitat in Provincia Bahiae
53	<i>Pipa cururu</i> Spix, 1824	<i>Pipa pipa</i> (Linnaeus, 1758)	Habitat in fundo aquarum lacustrium prope Bahiam et ad flumen Amazonum.
Lizards (Spix 1825)			
1	<i>Jacaretinga moschifer</i> Spix, 1825	<i>Paleosuchus palpebrosus</i> (Cuvier, 1807)	Habitat in lacu urbis Bahiae, odorem moschiferum quam maxime repandens
5	<i>Iguana squamosa</i> Spix, 1825	<i>Iguana iguana</i> (Linnaeus, 1758)	Habitat, esca incolarum delicatissima, supra arbores ad ipam lacus et fluminum Bahiae, Parae
8	<i>Iguana lophyroides</i> Spix, 1825	<i>Iguana iguana</i> (Linnaeus, 1758)	Habitat non rara supra ramos in sylvis Rio de Janeiro, Bahiae
10	<i>Lophyrus margaritaceus</i> Spix, 1825	<i>Enyalius catenatus</i> (Wied, 1821)	Habitat in sylvis Bahiae et Solimoëns
12	<i>Agama hispida</i> Spix, 1825	<i>Tropidurus hispidus</i> (Spix, 1825)	Habitat sub arbustis et locis petrosis soli expositis Rio de Janeiro, Bahiae, formicis vicitans
12	<i>Agama tuberculata</i> Spix, 1825	<i>Tropidurus torquatus</i> (Wied, 1820)	Habitat sub arbustis et locis petrosis soli expositis Rio de Janeiro, Bahiae, formicis vicitans
13	<i>Agama semitaeniata</i> Spix, 1825	<i>Tropidurus semitaeniatus</i> (Spix, 1825)	Habitat sub petris in campis montosis Sincura provinciae Bahiae
13	<i>Agama nigrocollaris</i> Spix, 1825	<i>Tropidurus hispidus</i> (Spix, 1825)	Habitat in Bahia interiore
14	<i>Agama cyclurus</i> Spix, 1825	<i>Tropidurus hispidus</i> (Spix, 1825)	Habitat in confinibus Bahiae
15	<i>Polychrus acutirostris</i> Spix, 1825	<i>Polychrus acutirostris</i> Spix, 1825	Reperi in sylvis Bahiae in terra lente ingredientem
16	<i>Gecko cruciger</i> Spix, 1825	<i>Hemidactylus mabouia</i> (Moreau de Jonnès, 1818)	Habitat in Provincia Bahiae
17	<i>Thecadactylus pollicaris</i> Spix, 1825	<i>Phyllopezus pollicaris</i> (Spix, 1825)	Habitat sub cortice arborum in sylvis interioris Bahiae campestribus
17	<i>Gymnodactylus geckoides</i> Spix, 1825	<i>Gymnodactylus geckoides</i> Spix, 1825	Habitat in confinibus Bahiae
21	<i>Tejus ameiva</i> Spix, 1825	<i>Ameiva ameiva</i> (Linnaeus, 1758)	Habitat inter arbusta sub terra arenosa Bahiae et Rio de Janeiro
22	<i>Tejus tritaeniatus</i> Spix, 1825	<i>Ameiva ameiva</i> (Linnaeus, 1758)	Habitat in Provincia Bahiae
23	<i>Tejus ocellifer</i> Spix, 1825	<i>Ameivula ocellifera</i> (Spix, 1825)	Habitat in Bahia sub arbustis



FIG. 3. — **A**, *Ameivula ocellifera* (Spix, 1825) neotype male ZUFMS-REP 04144 in life; **B**, habitat of neotype at the Parque das Dunas, municipality of Salvador, state of Bahia, Brazil. Photos: Ricardo Marques.

anterior margin of hindlimbs), scales around midbody (midway between fore- and hindlimbs excluding ventrals), scales around tail (on the fourth transverse row), dorsals (along the midline, from occiput to first transverse row of scales around tail), enlarged scales of preanal plate, femoral pores (total), subdigital lamellae under fourth finger (total on both sides), subdigital lamellae under fourth toe (total on both sides), and longitudinal rows of enlarged scales in the dorsal region of the forearm. In addition, we searched for the presence or absence of enlarged scales in the temporal region (posterior to suboculars), presence of keel in subdigital lamellae in the hand or foot, and presence of tibiotarsal spurs.

RESULTS

Family TEIIDAE Gray, 1827

Genus *Ameivula* Harvey, Ugueto & Gutberlet, 2012

Ameivula ocellifera (Spix, 1825)

Tejus ocellifer Spix, 1825: 23.

Cnemidophorus ocellifer – Peters 1877: 414.

Ameivula ocellifera – Harvey *et al.* 2012: 93 (type species of *Ameivula*).

Cnemidophorus hygomi Reinhardt & Lütken, 1862: 231 (name-bearing type: holotype, ZMB 4335. Type locality: “Maruim”, state of Sergipe, Brazil).

Heterochresonymy

Tej[us] murinus (non *Seps murinus* Laurenti, 1768) – Boie 1826: 120 (*partim*). — Fitzinger 1827: 747 (*partim*).

Seps murinus (non *Seps murinus* Laurenti, 1768) – Wagler 1830: 154 (*partim*).

Teius (Ameiva) vulgaris (non *Ameiva vulgaris* Lichtenstein, 1823) – Gray 1831: 29 (*partim*).

Cnemidophorus murinus (non *Seps murinus* Laurenti, 1768) – Duméril & Bibron 1839: 107 (*partim*).

Cnemidophorus lacertoides (non *Cnemidophorus lacertoides* Duméril & Bibron, 1839) – Reinhardt & Lütken 1862: 146.

TYPE MATERIAL. — **Original name-bearing types.** Brazil • 2 syntypes; “Bahia”; ZSM 111/0 and a second unlabeled specimen, both lost. **Neotype** (here designated). Brazil • 1 ♂; Parque das Dunas; 12°55'3"S, 38°19'12"W; 20 m a.s.l.; municipality of Salvador, state of Bahia; R. Marques, M. L. T. Oliveira, N. J. L. Santos, and M. S. Bonfim leg.; 15.VII.2018; ZUFMS-REP 04144.

ORIGINAL TYPE LOCALITY. — “Bahia”.

TYPE LOCALITY (BY NEOTYPE DESIGNATION). — Parque das Dunas, 12°55'3"S, 38°19'12"W, 20 m a.s.l., municipality of Salvador, state of Bahia, Brazil (Fig. 3).

ETYMOLOGY. — The specific name *ocellifera* (masculine *ocellifer*) means “bearing little eyes”. It derives from the Latin *ocellus* (diminutive of *oculus*, i.e., “small eye”) and *fero* (“to carry”, “to bear”), in reference to the series of small bluish ocelli between the fore and hindlimbs.

DESCRIPTION OF THE NEOTYPE

Morphometry and lepidosis

Adult male in good condition; no evident scar or damage (Figs 4; 5). Tail whole; small longitudinal incision on left thigh due to muscle sample collection. Snout-vent length, 61.08 mm; trunk length, 30.36 mm; tail length, 133.59 mm; head length, 18.53 mm; head width, 10.25 mm; head height, 8.41 mm; humeral length, 6.48 mm; forelimb length, 19.4 mm; femur length, 13.03 mm; tibia length, 12.68 mm; foot length, 22.10 mm; hindlimb length, 47.81 mm (Fig. 4). Head distinct from neck (Fig. 5), longer than wide (head length/head width, 1.80); head length/snout-vent length, 0.30. Trunk elongate (trunk length/snout-vent length, 0.49); tail long, about 2.2 × snout-vent length. Snout moderately pointed. Rostral and frontonasal separated by pair of anterior nasals (Figs 4; 5, see details in Appendices 1; 2). Nostril anterior to and in contact with nasal suture. Posterior nasals contact pair of prefrontals. Prefrontal on each side separated from first supraciliary by loreal and first supraocular. Loreal, single, large, almost high as long, in contact with posterior nasal, prefrontal, first supraocular, first supraciliary, first and second suboculars, and third and fourth supralabials. Frontal entire, lacking ridges; posterior suture of frontal aligns with first half of third supraocular. Frontoparietals, two. Parietals, four (a pair on each side). Interparietal subequal in size to each flanking pair of parietals. Occipitals (c. 45) irregular, variable in size, larger than dorsals on first row, immediately posterior to them. Temporals irregular in size. Four enlarged supratemporals in longitudinal row behind supraciliaries. Supratemporals separated from parietals by occipitals. Circumorbitals reaching posterior border of first supraocular. Supraoculars, four on each side, 3rd > 2nd > 1st > 4th; first supraocular entire, contacting second supraocular, loreal, prefrontal, frontal, and first supraciliary; second to fourth supraoculars separated from supraciliaries by one row of lateral supraocular granules. Supraciliaries, five on each side; first supraciliary in contact with first subocular. Supralabials, six on each side, third largest. Infralabials, five on each side; third to sixth separated from chinshields by row of granules. Chinshields, four on each side; first pair with suture through almost their length. Gular region divided in two: anterior gular region with rounded and larger scales, in 20 irregular transverse rows; posterior gular region covered by smaller scales in 15 transverse rows. Interangular and intertympanic sulci absent; interauricular crease present. Dorsal and lateral head scales juxtaposed and smooth. Dorsals round, smooth, and sub-imbricate; 176 dorsals along mid-dorsum, from nape to base of tail; 88 around midbody. Ventrals smooth, wider than long, imbricated, in eight longitudinal rows and 26 transverse rows. Preanal plate with three enlarged scales (a central and two posterior scales), surrounded by seven smaller scales. Scales on base of tail rectangular, smaller than ventrals, in transverse rows; scales around tail, 28, longer and narrower posteriorly; tail scales keeled dorsally, smooth ventrally. Scales on flanks granular, round, smooth, sub-imbricate. Forelimbs with large, smooth, imbricate scales on dorsal surface of upper arms and anterodorsal forearms; elsewhere scales small and granular. Scales in the dorsal region of the forearm enlarged, in two

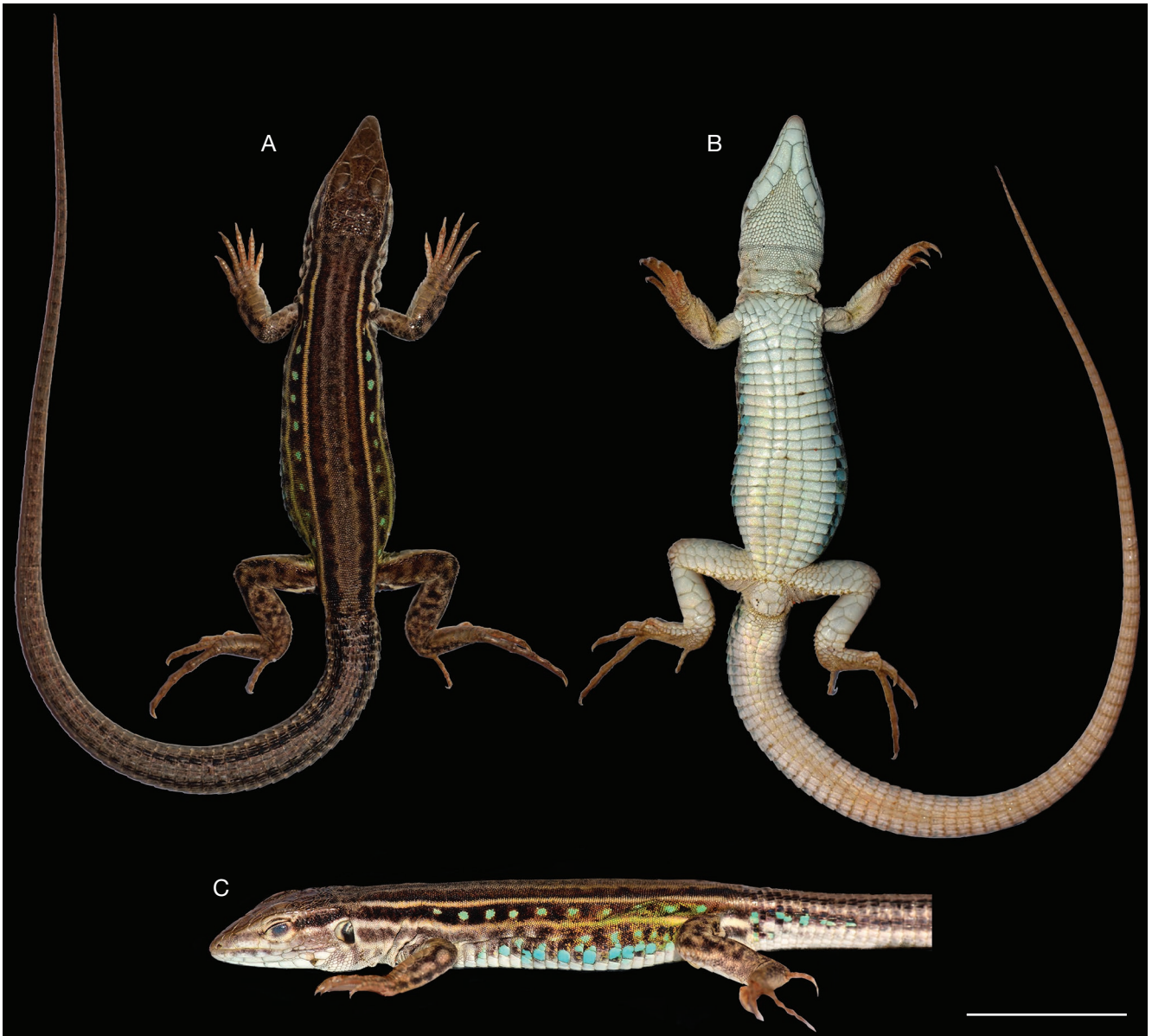


FIG. 4. — *Ameivula ocellifera* (Spix, 1825) neotype male ZUFMS-REP 04144: **A**, dorsal view of the body; **B**, ventral view of the body; **C**, lateral view of the body. Scale bar: 20 mm.

longitudinal rows. Hindlimbs with large, smooth, imbricate scales on anteroventral surface of thighs and ventral surface of lower legs; elsewhere, scales small and granular; enlarged prefemoral scales, 10. Femoral pores in continuous row along each thigh; seven pores on right side and eight pores on left side. Abdominal pores, one on each side. Lamellae under fourth finger, 16 on each side; under fourth toe, 27 on each side. Fifth toe shortened. Tibiotarsal spurs absent.

Coloration in life

Dorsal parts of head, body, limbs, and tail medium brown (Fig. 3A). Lateral parts of the head light brown. Belly and ventral parts of the head, limbs, and tail, uniform creamy white. Vertebral stripe absent. Paravertebral field enlarged, light brown, bordered on both sides by lighter paraverte-

bral stripes that run from nape to base of tail (see details in Appendix 1). Paravertebral stripes separated from dorsolateral stripe on each side by dark brown dorsolateral field, from nape to first third of tail. Dorsolateral stripe creamy white, from nape to first third of tail, separated from upper lateral stripe by upper lateral field. Upper lateral field with irregular black spots that tend to fuse anteriorly and series of small and irregularly spaced bluish ocelli (7-21 scales diameter) between fore and hindlimbs; ocelli close to hindlimbs in brown to greenish-yellow background; blue coloration along upper lateral stripe in some anterior caudal scales. Upper lateral stripe from subocular scales to first third of tail, creamy white anteriorly, light brown and greenish-yellow in middle of trunk, creamy white posterior to hindlimbs. Upper lateral stripe separated from creamy white lower lateral stripe by

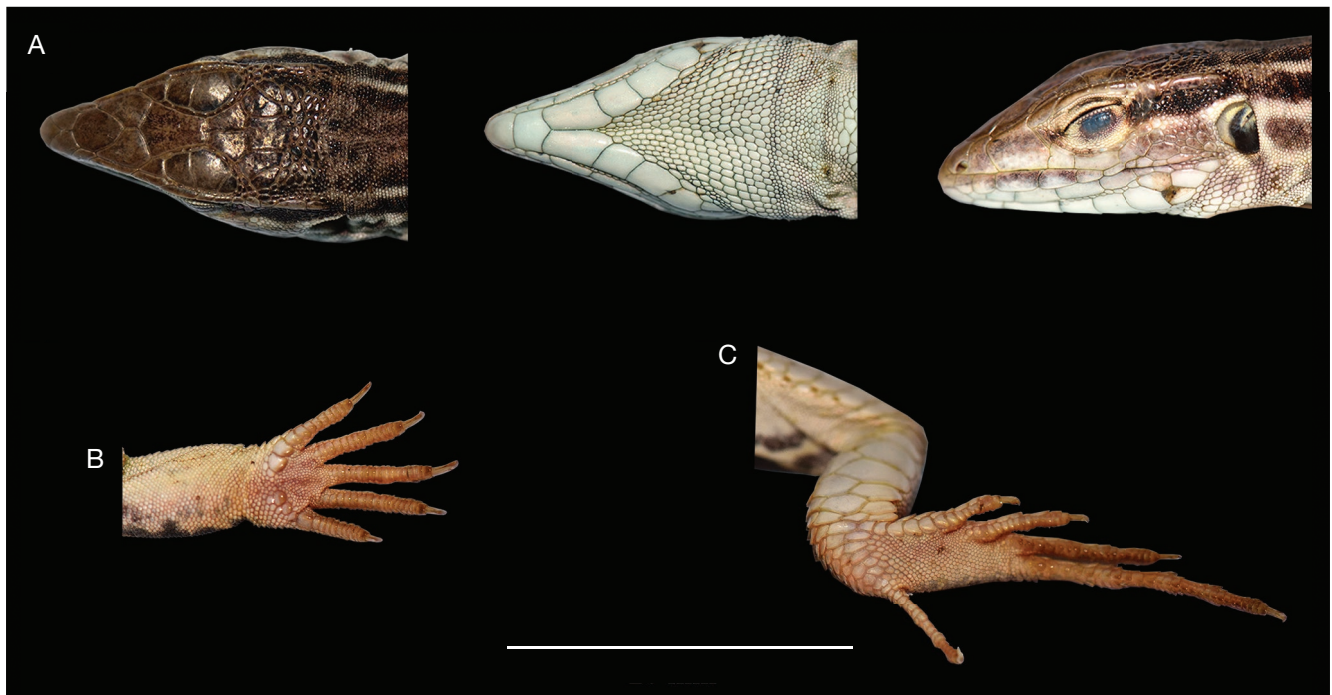


FIG. 5. — *Ameivula ocellifera* (Spix, 1825) neotype male ZUFMS-REP 04144: **A**, dorsal, ventral, and lateral view of the head; **B**, ventral view of the right hand; **C**, ventral view of the right foot. Scale bar: 20 mm.

lower lateral field, enlarged anterior to forelimbs. Lower lateral stripe short, from below ear to axilla. Lower lateral field irregularly black-spotted, interspersed with whitish-blue ocelli (8-16 scales diameter) surrounded by greenish-yellow scales between fore and hindlimbs; some enlarged lateral scales and some outermost ventral scales blue.

Color in ethanol

Head brownish dorsally, brownish-white laterally, and bluish-white ventrally. Dorsum brownish, stripes bluish-white, fields dark brown or black (except paravertebral field light gray), and ocelli faded bluish-white. Belly bluish-white. Ventral aspect of forelimbs and hindlimbs immaculate. Dorsal aspect of tail like in life, although faded, including few blue scales close to the base of tail. Ventral aspect of tail immaculate (Fig. 4).

COMPARISON WITH OTHER *AMEIVULA* SPECIES

The following characters (see Table 2 and Table 3) distinguish *A. ocellifera* from its congeners (data in parentheses). *Ameivula ocellifera* differs from *A. abalosi* in having 82-141 scales around midbody (75-98), 26-38 subdigital lamellae under fourth toe (24-31), and whitish blue ocelli (light-blue or whitish green ocelli). *Ameivula ocellifera* differs from *A. apipensis* in having 14-28 femoral pores (12-17), 26-38 subdigital lamellae under fourth toe (24-27), vertebral stripes absent (present), whitish-blue ocelli (no ocelli), and immaculate throat (yellow). Although the description of *A. apipensis* indicates an intertympanic sulcus (absent in *A. ocellifera*), the figures available indicate the contrary, i.e., the absence of such structure in *A. apipensis*. *Ameivula ocellifera* differs from *A. cipoensis* in having 13-20 subdigital lamellae under fourth finger (12-14),

26-38 subdigital lamellae under fourth toe (21-24), lower lateral stripes broken (absent), whitish-blue ocelli (yellow-greenish ocelli), and hindlimb spots present (absent). *Ameivula ocellifera* differs from *A. confusioniba* in having paravertebral and dorsolateral fields present (absent), paravertebral and lower lateral stripes present (absent), whitish-blue ocelli (bright yellow ocelli), and hindlimb spots present (absent). *Ameivula ocellifera* differs from *A. jalapensis* in having eight longitudinal rows of ventral scales (6-8), 14-28 femoral pores (10-16), 172-248 dorsal scales (200-250), 35 gular scales (41-64), larger body size (maximum SVL, 56 mm), vertebral stripe absent (broken), upper and lower lateral fields spotted (uniform), whitish-blue ocelli (no ocelli), hindlimb spots present (absent), and immaculate throat (lime-green). *Ameivula ocellifera* differs from *A. mumbuca* in having eight longitudinal rows of ventral scales (6-8), 172-248 dorsal scales (194-271), 26-38 subdigital lamellae under fourth toe (24-32), 35 gular scales (38-49), larger body size (maximum SVL, 59 mm in males), lower lateral fields spotted (uniform), and whitish-blue ocelli (whitish-blue spots only in males). *Ameivula ocellifera* differs from *A. nativo* in having 25-31 transverse rows of ventral scales (29-32), vertebral stripe absent (present), paravertebral fields present (absent), paravertebral and lower lateral stripes present (absent), upper and lower lateral fields spotted (uniform), whitish-blue ocelli (no ocelli), hindlimb spots present (absent), immaculate throat (light blue), and bisexual (only females). *Ameivula ocellifera* differs from *A. nigrigula* in having 21-30 scales around tail (27-32), whitish-blue ocelli (bright turquoise ocelli), hindlimb spots present (absent), and throat region immaculate (black). *Ameivula ocellifera* differs from *A. pyrrhogularis* in having 172-248 dorsal scales (192-

TABLE 2. — Comparison of meristic characters in the *Ameivula ocellifera* group: *Ameivula ocellifera* (Spix, 1825), *Ameivula abalosi* (Cabrera, 2012), *Ameivula apipensis* Arias et al., 2018, *Ameivula cipoensis* Arias et al., 2014, *Ameivula confusioniba* (Arias et al., 2011), *Ameivula jalapensis* (Colli et al., 2009), *Ameivula mumbuca* (Colli et al., 2003), *Ameivula nativo* (Rocha et al., 1997), *Ameivula nigrigula* (Arias et al., 2011), *Ameivula pyrrhogularis* (Silva & Ávila-Pires, 2013), *Ameivula xacriaba* Arias et al., 2014. Most values were taken from the original descriptions (values without symbols) and other studies (values with symbols). Numbers indicate the range of each character, with mean in parentheses or mode value in brackets. **Bold** indicates data from the holotype. *Italics* indicates divergent data from the same source/article (text and tables). Abbreviations: **VLR**, longitudinal rows of ventrals; **VTR**, transverse rows of ventrals; **FP**, femoral pores on both sides; **DS**, dorsal scales; **SAT**, scales around tail; **SAM**, scales around midbody; **L4F**, subdigital lamellae under fourth finger on both sides; **L4T**, subdigital lamellae under fourth toe on both sides; **GS**, gular scales; see Appendices 1; 2. Symbols: †, raw data from Table 2 by Colli et al. (2003a) and Table 1 by Colli et al. (2009), excluding specimens from Irecê and Ibipeba, state of Bahia, which may be *Ameivula nigrigula*; *, from Table 1 by Arias et al. (2011a) and Table 2 by Arias et al. (2011b); †, from Table 1 by Arias et al. (2014a); ‡, from Table 2 by Arias et al. (2014b); §, from Table 2 by Silva & Ávila-Pires (2013); ?, values not available.

Character	<i>A. ocellifera</i>												
	This study	Colli et al. 2003a†	Arias et al. 2011a*	<i>A. abalosi</i>	<i>A. apipensis</i>	<i>A. cipoensis</i>	<i>A. confusioniba</i>	<i>A. jalapensis</i>	<i>A. mumbuca</i>	<i>A. nativo</i>	<i>A. nigrigula</i>	<i>A. pyrrhogularis</i>	<i>A. xacriaba</i>
Neotype	n = 44	n = 52	n = 17 ♂; n = 6 ♀; n = 22 or 28¶; n = ?‡	n = ?	n = 40; n = 40‡	n = 19; n = 34§; n = 30‡	n = 51; n = 38‡	n = 229; n = 35‡	n = 34 or 35; n = 19*	n = 83; n = 25‡	n = 128	n = 92	
VLR	8	8	8	8; 8; 8¶	8	8	8; 8§	6-8 (7.51); 6-8 (7.33)‡	6-8 (8); 8‡	8	8	8	8
VTR	26	25-31 (28)	26-28 (27.2)	27-31 (28.71); 24-31 (28.33); 27-30 (28.6)¶	28	28-30 (29.1)	27-29 (28.2); 26-31 (28.8)§	24-29 (25.96); 25-27 (25.7)‡	24-29 (27.03); 26-28 (27.1)‡	29-32 [31]; 29-32 (30.8)*	26-29 (27.4)	26-31 (28.3)	27-29 (28)
FP	15	16-28 (20.4)	14-17 (16)	16-19 (17.59); 15-19 (17.17); 16-20 (17.5)¶	12-17	17-20 (17.7)	16-21 (17.5); 14-21 (17.6)§	11-16 (13.35); 10-16 (13.1)‡	14-20 (16.66); 16-20 (18.3)‡	22-26 [24]; 22-26 (24)*	15-20 (17)	16-22 (18.5)	14-17 (15)
DS	176	203-248 (222.5)	172-188 (181)	184-212 (198.63); 190-208 (201.1); 185-208 (204)¶	184-230	202-225 (213.6)	188-211 (201.6); 196-240 (215)§	200-250 (225.96); 208-226 (218)‡	194-271 (229.57); 200-227 (211.5)‡	192-212 (196)*	190-220 (208.6)	192-255 (222.9)	191-216 (202); 184-216
SAT	28	21-30 (26.3)	25-30 (28)	23-26 (24.41); 23-26 (24.67); 24-27 (25.3)¶	31	25-29 (26.7); 24-29 (27.2)	22-28 (24.9); 20-28 (23.8)§	19-26 (22.72); 22-26 (24)‡	19-27 (22.61); 22-28 (25.1)‡	25-27 (26)*	27-32 (30)	23-33 (26.7)	23-29 (26.3); 24-29
SAM	88	82-141 (97.9)	92-100 (94.6)	75-98 (84.6); 77-98 (85.83); 84-95 (89)¶	84-90	85-100 (92.6)	87-105 (95); 89-116 (102.6)§	91-122 (104.04); 89-100 (94.3)‡	91-117 (101.05); 95-102 (98.8)‡	93-102 (95.5)*	97-105 (99.8)	87-124 (104)	94-106 (99.3); 94-102
L4F	16	13-20 (16.7)	15-17 (16)	15-17 (16.06); 14-16 (15.17); 15-17 (15.9)¶	14-16	12-14 (12.5)	15-17 (15.6); 14-18 (17)§	12-18 (15.49); 14-16 (14.7)‡	13-19 (16.26); 15-17 (16)‡	16-17 [16]; 14-17 (16)*	16-18 (17)	13-19 (16.1)	13-15 (14.1)
L4T	27	26-38 (31.6)	28-31 (30)	26-31 (28.25); 25-31 (27.67); 24-30 (27.3)¶	24-27	21-24 (22.5)	29-35 (30.4); 27-34 (31.1)§	22-37 (26.63); 23-28 (26)‡	24-32 (27.36); 25-29 (26.8)‡	29-33 [31 and 32]; 26-33 (31)*	30-32 (31.2)	24-34 (29.8)	23-28 (25.4)
GS	35	?	?	31-35‡	28-35	30-38‡; 31-38‡	29-39‡	41-64 (51.3)‡	38-49 (44.9)‡	?	31-35 (33.3)‡	?	41-52 (45.7); 41-47

TABLE 3. — Comparison of coloration patterns among the members of the *Ameivula ocellifera* group: *Ameivula ocellifera* (Spix, 1825), *Ameivula abalosi* (Cabrera, 2012), *Ameivula apipensis* Arias et al., 2018, *Ameivula cipoensis* Arias et al. 2014, *Ameivula confusioniba* (Arias et al. 2011), *Ameivula jalapensis* (Colli et al. 2009), *Ameivula mumbuca* (Colli et al., 2003), *Ameivula nativo* (Rocha et al. 1997), *Ameivula nigrigula* (Arias et al., 2011), *Ameivula pyrrhogularis* (Silva & Ávila-Pires, 2013), *Ameivula xacriaba* Arias et al. 2014. Abbreviations: **VES**, vertebral stripe; **PVF**, paravertebral fields; **PVS**, paravertebral stripes; **DLF**, dorsolateral fields, **DLS**, dorsolateral stripes; **ULF**, upper lateral fields; **ULS**, upper lateral stripes; **LLF**, lower lateral fields; **LLS**, lower lateral stripes; **LAS**, lateral spots; **HLS**, hindlimb spots; **THR**, throat region; **SED**, sexual dichromatism; see Appendices 1; 2.

<i>A. ocellifera</i>											
Character	Neotype	<i>A. abalosi</i>	<i>A. apipensis</i>	<i>A. cipoensis</i>	<i>A. confusioniba</i>	<i>A. jalapensis</i>	<i>A. mumbuca</i>	<i>A. nativo</i>	<i>A. nigrigula</i>	<i>A. pyrrhogularis</i>	<i>A. xacriaba</i>
VES	absent	absent	present	absent	absent	present, broken	absent	present	absent	present (juveniles absent and females)	
PVF	present	present	present	present	absent	present	present	absent	present (juveniles)	present	present
PVS	present	present (faint)	present	present	absent	present, broken	present, broken	absent	present (juveniles)	present	absent
DLF	present	present	present	present	absent	present	present	present	present (juveniles)	present	present
DLS	present	present	present	present	present (occasionally)	present	present, broken	present	present (juveniles)	present	present
ULF	spotted	spotted	spotted	spotted	spotted	uniform	uniform or spotted	uniform	spotted	spotted	spotted
ULS	present	present	present	present	present	present	present	present	present	present	present
LLF	spotted	uniform or spotted	spotted	spotted	uniform or spotted	uniform	uniform	uniform	spotted	spotted	spotted
LLS	present, broken	present	present	absent	absent	present, broken	present, broken	absent	present	present, broken	present
LAS	whitish-blue ocelli alternating with irregular black spots	light blue or whitish-green ocelli alternating with irregular black spots	irregular light green spots (no ocellus) alternating with black spots	yellow-greenish ocelli alternating with irregular black spots	bright yellow ocelli	absent	bluish-white spots (males)	absent	bright turquoise ocelli	light blue or greenish-blue ocelli (adults), tan ocelli (juveniles)	bright green ocelli
HLS	present	present	present	absent	absent	absent	mostly present	absent	absent	present (frequently)	absent
THR	immaculate	pearly white	yellow	white	immaculate	lime-green	immaculate	light blue	black	orange (adult males)	white
SED	n/a	absent	present (dorsolateral fields dark brown in adult males, bright green in females)	present (belly yellow in males, bluish-white in females; ocelli from fore- to hindlimbs in males, 2-3 ocelli proximal to the forelimb in females)	absent	absent	present (anteriormost light areas bluish in males and whitish in females; lower lateral fields generally with bluish-white spots in males, uniform in half of the females)	parthenogenetic (only females)	present (stripes absent in males)	present (stripes barely visible and fields partially fade away in adult males)	present (flanks bright green in adult males, bright yellow in adult females)

255), 21–30 scales around tail (23–33), vertebral stripe absent (present in juveniles and females), whitish-blue ocelli (light blue or greenish-blue ocelli), and immaculate throat (orange in adult males). *Ameivula ocellifera* differs from *A. xacriaba* in having 26–38 subdigital lamellae under fourth toe (23–28), 35 gular scales (41–52), paravertebral stripes present (absent), whitish-blue ocelli (bright green ocelli), and hindlimb spots present (absent). Although the description of *A. xacriaba* indicates an intertympanic sulcus (absent in *A. ocellifera*), the figures available reveal the contrary, i.e., the lack of such structure, but with an interauricular crease in *A. xacriaba*. Less marked differences between species can be found in Table 2 and Table 3.

DISTRIBUTION

The current known geographic range of *Ameivula ocellifera* is in the southeastern portion of the Caatinga (states of Pernambuco, Alagoas, Sergipe, and Bahia) and part of the Atlantic Forest of eastern Bahia (including Salvador, its type locality), Sergipe, and Alagoas (Arias *et al.* 2018). The identity of populations from central and north Caatinga (Paraíba, Rio Grande do Norte, Ceará, and Piauí) is under reevaluation, and may reveal a distinct taxon in the near future. Records attributed to *A. ocellifera* in northern Brazil (Rondônia, Pará, and Tocantins), midwestern Brazil (Mato Grosso, Mato Grosso do Sul, Goiás, Distrito Federal, Minas Gerais, and São Paulo), and northeastern Brazil (Maranhão) (Costa *et al.* 2022) represent candidate species close to *A. ocellifera* (e.g. “W-Ce clade” in Arias *et al.* 2018) or probably misidentifications.

DISCUSSION

We review the taxonomic history of the whiptail lizard *Ameivula ocellifera*, including the issues regarding its type locality, and designate and describe a neotype based on morphometric and external morphological characters, including color patterns. The nomenclature used to describe the color pattern of the *A. ocellifera* group is not standardized in the literature, being a source of confusion. We used the nomenclature proposed by Harvey *et al.* (2012), reviewed the descriptions of all species in the *A. ocellifera* group, and encourage researchers to follow this nomenclature to standardize descriptions of the color pattern from now on. We also call attention to some scale counts (e.g. which scale is the last supralabial and infralabial) that are not consistent among authors (e.g. Colli *et al.* 2009; Harvey *et al.* 2012; Arias *et al.* 2014b), as well for divergent data between the text and tables in some species descriptions (see italicized values in Table 2).

The definition of the type locality and neotype description for *Ameivula ocellifera* will provide a solid foundation for future taxonomic work focusing on this group (Anonymous 1999, Art. 75.3.1). Considering that most species recently split from *A. ocellifera* were described solely based on morphological data, the lack of a type specimen and the doubt regarding the type locality have caused taxonomic uncertainties. Moreover, there are still critical pending issues about the taxonomy of

A. ocellifera, such as the limits of its geographic range and the associated morphological variation, which would improve its diagnosis. Finally, the imminent descriptions of candidate species currently assigned to *A. ocellifera* (Arias *et al.* 2018) make the designation of a neotype urgent. Therefore, a neotype of *A. ocellifera* is essential for solving complex taxonomic problems, such as the confusing or doubtful identities of closely similar species (Article 75.3.1 of the Code).

Despite recent advances in the systematics of *Ameivula* (see Arias *et al.* 2018), a robust phylogenetic hypothesis is still lacking. It is necessary to delimit taxa with confidence based on broad geographic and taxonomic sampling and molecular data. Species descriptions and phylogenetic studies based on a handful of specimens from few localities within the range of widely distributed lineages increase the chance of spurious morphological or genetic differences and should be avoided. Besides, we encourage future genetic studies to include the available tissue samples from the neotype or topotypes. The systematics of Neotropical whiptail lizards is complex and wanting, and this is one further step towards a stable taxonomy.

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REFERENCES

- ARIAS F. J., CARVALHO C. M., RODRIGUES M. T. & ZAHER H. 2011a. — Two new species of *Cnemidophorus* (Squamata: Teiidae) from the Caatinga, Northwest Brazil. *Zootaxa* 2787: 37–54. <https://doi.org/10.11646/zootaxa.2787.1.3>
- ARIAS F. J., CARVALHO C. M., RODRIGUES M. T. & ZAHER H. 2011b. — Two new species of *Cnemidophorus* (Squamata: Teiidae).

- dae) of the *C. ocellifer* group, from Bahia, Brazil. *Zootaxa* 3022 (1): 1-21. <https://doi.org/10.11646/zootaxa.3022.1.1>
- ARIAS F. J., CARVALHO C. M., ZAHER H. & RODRIGUES M. T. 2014a. — A new species of *Ameivula* (Squamata, Teiidae) from Southern Espinhaço Mountain Range, Brazil. *Copeia* 2014 (1): 95-105. <https://doi.org/10.1643/CH-13-037>
- ARIAS F. J., TEIXEIRA M., RECODER R., CARVALHO C. M., ZAHER H. & RODRIGUES M. T. 2014b. — Whiptail lizards in South America: a new *Ameivula* (Squamata, Teiidae) from Planalto dos Gerais, Eastern Brazilian Cerrado. *Amphibia-Reptilia* 35 (2): 227-242. <https://doi.org/10.1163/15685381-00002948>
- ARIAS F. J., RECODER R., ÁLVAREZ B. B., ETHCEPARE E., QUIPILDOR M., LOBO F. & RODRIGUES M. T. 2018. — Diversity of teiid lizards from Gran Chaco and western Cerrado (Squamata: Teiidae). *Zoologica Scripta* 47 (2): 144-158. <https://doi.org/10.1111/zsc.12277>
- BOIE H. 1826. — Bemerkungen über die von Herrn von Spix abgebildeten brasilianischen Saurier. *Isis von Oken* 18 (1): 117-120.
- BURT C. E. 1931. — A study of the teiid lizards of the genus *Cnemidophorus*, with special reference to their phylogenetic relationships. *Bulletin of the United States National Museum* 154: 1-286. <https://doi.org/10.5479/si.03629236.154.1>
- CABRERA M. R. 2012. — A new species of *Cnemidophorus* (Squamata, Teiidae) from the South American Chaco. *The Herpetological Journal* 22 (2): 123-131.
- COLLI G. R., CALDWELL J. P., COSTA G. C., GAINSBURY A. M., GARDA A. A. & MESQUITA D. O. 2003a. — A new species of *Cnemidophorus* (Squamata, Teiidae) from the Cerrado biome in central Brazil. *Occasional Papers of the Sam Noble Oklahoma Museum of Natural History* 14: 1-14.
- COLLI G. R., COSTA G. C., GARDA A. A., KOPP K. A., MESQUITA D. O., PÉRES JR A. K., VALDUJO P. H., VIEIRA G. H. & WIEDERHECKER H. C. 2003b. — A critically endangered new species of *Cnemidophorus* (Squamata, Teiidae) from a Cerrado enclave in Southwestern Amazonia, Brazil. *Herpetologica* 59 (1): 76-88. [https://doi.org/10.1655/0018-0831\(2003\)059\[0076:ACENS O\]2.0.CO;2](https://doi.org/10.1655/0018-0831(2003)059[0076:ACENS O]2.0.CO;2)
- COLLI G. R., GIUGLIANO L. G., MESQUITA D. O. & FRANÇA F. G. R. 2009. — A new species of *Cnemidophorus* from the Jalapão region, in the central Brazilian Cerrado. *Herpetologica* 65 (3): 311-327. <https://doi.org/10.1655/08-049R1.1>
- COSTA H. C., GUEDES T. B. & BERNILS R. S. 2022 "2021". — Lista de Répteis do Brasil: padrões e tendências. *Sociedade Brasileira de Herpetologia*, 10 (3): 110-279. <https://doi.org/10.5281/zenodo.5838950>
- DIAS E. J. R., ROCHA C. F. D. & VRCIBRADIC D. 2002. — New *Cnemidophorus* (Squamata: Teiidae) from Bahia State, northeastern Brazil. *Copeia* 2002 (4): 1070-1077. [https://doi.org/10.1643/0045-8511\(2002\)002\[1070:NCSTFB\]2.0.CO;2](https://doi.org/10.1643/0045-8511(2002)002[1070:NCSTFB]2.0.CO;2)
- DUMÉRIL A. M. C. & BIBRON G. 1839. — *Erpétologie Générale on Histoire Naturelle Complète des Reptiles*. Tome 5. Librairie Encyclopédique de Roret, Paris, 854 p. <https://doi.org/10.5962/bhl.title.45973>
- FITZINGER L. 1827. — Recension des Spixischen Eidechsenwerkes. *Isis von Oken* 20: 741-750.
- FRANZEN M. & GLAW F. 2007. — Type catalogue of reptiles in the Zoologische Staatssammlung München. *Spixiana* 30 (2): 201-274.
- FROST D. R. 2021. — Amphibian Species of the World: an Online Reference. Version 6.1 (*Date of access*). Electronic Database accessible at <https://amphibiansoftheworld.amnh.org/index.php>. American Museum of Natural History, New York, USA. <https://doi.org/doi.org/10.5531/db.vz.0001>
- GOICOECHEA N., FROST D. R., DE LA RIVA I., PELLEGRINO K. C., SITES JR. J. W., RODRIGUES M. T. & PADIAL J. M. 2016. — Molecular systematics of teioid lizards (Teioidea/Gymnophthalmodea: Squamata) based on the analysis of 48 loci under tree-alignment and similarity-alignment. *Cladistics* 32 (6): 624-671. <https://doi.org/10.1111/cla.12150>
- GRAY J. E. 1831. — A synopsis of the species of the Class Reptilia, in Griffith E. & Pidgeon E. (eds) *The animal kingdom arranged in conformity with its organisation*. Whittaker, Treacher and Co., London, 1-110. <https://doi.org/10.5962/bhl.title.45021>
- HARVEY M. B., UGUETO G. N. & GUTBERLET JR. R. L. 2012. — Review of teiid morphology with a revised taxonomy and phylogeny of the Teiidae (Lepidosauria: Squamata). *Zootaxa* 3459: 1-156. <https://doi.org/10.11646/zootaxa.3459.1.1>
- HAWK C. T., LEARY S. L. & MORRIS T. H. 2005. — *Formulary for Laboratory Animals*. Blackwell Publishing, 193 p.
- HOOGMOED M. S. & GRUBER U. 1983. — Spix and Wagler type specimens of reptiles and amphibians in the Natural History Museum in Munich (Germany) and Leiden (the Netherlands). *Spixiana* 9: 319-415.
- ANONYMOUS (INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE) 1999. — *International Code of Zoological Nomenclature*. International Trust for Zoological Nomenclature, London, xxix + 306 p.
- OLIVEIRA E. F., GEHARA M., SÃO-PEDRO V. A., CHEN X., MYERS E. A., BURBRINK F. T., MESQUITA D. O., GARDA A. A., COLLI G. R., RODRIGUES M. T., ARIAS F. J., ZAHER H., SANTOS R. M. L. & COSTA G. C. 2015. — Speciation with gene flow in whiptail lizards from a Neotropical xeric biome. *Molecular Ecology* 24 (23): 5957-5975. <https://doi.org/10.1111/mec.13433>
- PETERS J. A. & DONOSO-BARROS R. 1970. — Catalogue of Neotropical Squamata. Part II: Lizards and Amphisbaenians. *United States National Museum Bulletin* 297: 1-293. <https://doi.org/10.5962/bhl.title.46653>
- PETERS W. 1877. — Herpetologische Notizen. I. Über die von Spix in Brasilien gesammelten Eidechsen des Königlichen Naturalien-Kabinetts zu München. *Monatsbericht der Königlich-Preussischen Akademie der Wissenschaften zu Berlin* 1877: 407-414.
- PINTO-SILVA K. & SILVA-SOARES T. 2018. — New records of *Glaucmastix cyanura* and *Ameivula nigrigula* (Arias, de Carvalho, Rodrigues & Zaher, 2011) (Squamata: Teiidae) in the state of Bahia, northeastern Brazil. *Herpetology Notes* 11: 405-408.
- REINHARDT J. & LÜTKEN C. 1862 "1861". — Bidrag til Kundskab om Brasiliens Padder og Krybdyr. Første Afdeling Padderne og Öglerne. *Videnskabelige meddelelser fra den Naturhistoriske forening i Kjøbenhavn* 1861: 143-242.
- ROCHA C. F. D., BERGALLO H. G. & PECCININI-SEALE D. 1997. — Evidence of a unisexual population of the Brazilian whiptail lizard genus *Cnemidophorus* (Teiidae), with description of a new species. *Herpetologica* 53 (3): 374-382.
- ROCHA C. F. D., ARAÚJO A. E., VRCIBRADIC D., COSTA E. M. M. & PRICE A. 2000. — New *Cnemidophorus* (Squamata; Teiidae) from coastal Rio de Janeiro state, southeastern Brazil. *Copeia* 2000 (2): 501-509. [https://doi.org/10.1643/0045-8511\(2000\)000\[0501:NCSTFC\]2.0.CO;2](https://doi.org/10.1643/0045-8511(2000)000[0501:NCSTFC]2.0.CO;2)
- ROSÁRIO I., SANTOS R. S., ARIAS F., ROCHA C. F., DIAS E. J. R., CARVALHO D. E. & RODRIGUES M. T. 2019. — Phylogeography of the endangered sand dune whiptail lizard *Glaucmastix abaetensis* (Dias, Rocha & Vrcibradic, 2002) with the description of a new species. *Zootaxa* 4624 (4): 451-477. <https://doi.org/10.11646/zootaxa.4624.4.1>
- SILVA M. B. & ÁVILA-PIRES T. C. S. 2013. — The genus *Cnemidophorus* (Squamata: Teiidae) in state of Piauí, northeastern Brazil, with description of a new species. *Zootaxa* 3681 (4): 455-477. <https://doi.org/10.11646/zootaxa.3681.4.8>
- SOUSA J. G. G., CAVALCANTE L. A. & FERREIRA-SILVA C. 2019. — Geographic Distribution: *Ameivula nigrigula*. *Herpetological Review* 50 (1): 101.
- SPIX J. B. R. 1824. — *Animalia nova sive species novae Testudinum et Ranarum, quas in itinere per Brasiliam annis MDCCCXXVII-MDCCCXXVIII jussu et auspiciis Maximiliani Josephi I. Bavariae regis suscepto, Typis Franc. Seraph. Hübschmanni, Monachii*. <https://doi.org/10.5962/bhl.title.3665>
- SPIX J. B. R. 1825. — *Animalia nova sive species novae Lacertarum,*

- quas in itinere per Brasiliam annis MDCCCXVII-MDCCCXX jussu et auspiciis Maximiliani Josephi I. Bavariae regis suscepto*, Typis Franc. Seraph. Hübschmanni, Monachii. <https://doi.org/10.5962/bhl.title.5117>
- SPIX J. B. R. & WAGLER J. G. 1824. — *Serpentum Brasiliensium species novae ou histoire naturelle des espèces nouvelles de serpens, recueillies et observées pendant le voyage dans l'intérieur du Brésil dans les années 1817, 1818, 1819, 1820*. Typis Franc. Seraph. Hübschmanni, Monachii. <https://doi.org/10.5962/bhl.title.4269>
- SPIX J. B. R. & MARTIUS K. F. P. 1976. — *Viagem pelo Brasil*. Tomo II. Tradução de Lúcia Furquim Lahmeyer e revisão de B.F. Ramiz Galvão e Basílio de Magalhães (que foi também o anotador), Edições Melhoramentos em colaboração com o Instituto Histórico e Geográfico Brasileiro e Instituto Nacional do Livro, Comp. Melhoramentos de São Paulo, São Paulo, 270 p.
- UETZ P., FREED P., AGUILAR R. & HOŠEK J. 2022. — The Reptile Database, <http://www.reptile-database.org>, accessed on March 24th 2022.
- VANZOLINI P. E. 1981. — The scientific and political contexts of the Bavarian Expedition to Brasil, in ADLER K. (ed.), *Herpetology of Brazil, by J. B. von Spix and J. G. Wagler*. Society for the Study of Amphibians and Reptiles, Ithaca, New York, ix-xxix.
- VANZOLINI P. E., RAMOS-COSTA A. M. & VITT L. J. 1980. — *Répteis das Caatingas*. Academia Brasileira de Ciências, Rio de Janeiro, 161 p. <https://doi.org/10.5962/bhl.title.109659>
- WALLACH V., WILLIAMS K. L. & BOUNDY J. 2014. — *Snakes of the World: A Catalogue of Living and Extinct Species*, CRC Press, xxvii + 1227 p.
- WAGLER J. 1830. — *Natürliches System der Amphibien, mit vorangehender Classification der Säugthiere und Vögel, ein Beitrag zur vergleichenden Zoologie*. München, Stuttgart und Tübingen, vi + 354 p. <https://doi.org/10.5962/bhl.title.58730>

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APPENDICES

APPENDIX 1. — Neotype (ZUFMS-REP 04144, adult male) of *Ameivula ocellifera* (Spix, 1825): **A**, body in dorsal view, showing: two longitudinal rows of enlarged scales in the dorsal region of the forearm (**EFA**); dorsal scales (**DS**); paravertebral field (**PVF**); paravertebral stripe (**PVS**); dorsolateral field (**DLF**); dorsolateral stripe (**DLS**); upper lateral field (**ULF**); and upper lateral stripe (**ULS**); **B**, body in ventral view, showing: longitudinal rows of ventrals (**VLR**); transverse rows of ventrals (**VTR**); femoral pores (**FP**); abdominal pores (**AP**); enlarged prefemoral scales (**EPF**); and enlarged scales of preanal plate (**EP**); **C**, body in lateral view, showing: dorsolateral field (**DLF**); dorsolateral stripe (**DLS**); upper lateral field (**ULF**); upper lateral stripes (**ULS**); lower lateral field (**LLF**); and lower lateral stripe (**LLS**). Scale bar: 20 mm.



APPENDIX 2. — Neotype (ZUFMS-REP 04144, adult male) of *Ameivula ocellifera* (Spix, 1825): **A**, head in dorsal view, showing: rostral (**R**); anterior nasals (**AN**); posterior nasals (**PN**); frontonasals (**FN**); loreals (**L**); prefrontals (**PF**); frontal (**F**); supraoculars (**SO**); supraciliaries (**SC**); frontoparietals (**FP**); parietals (**P**); interparietals (**IP**); supratemporals (**ST**); occipitals (**OC**); circumorbitals (*); and lateral supraocular granules (x); **B**, Head in ventral view, showing: mental (**M**); postmental (**PM**); infralabials (**IL**); chinshields (**CS**); anterior gulars (**AG**); interauricular crease (**IAC**); posterior gulars (**PG**); mesoptychials (**MP**); and gular fold (**GF**); **C**, head in lateral view, showing: rostral (**R**); anterior nasals (**AN**); posterior nasals (**PN**); frontonasals (**FN**); loreals (**L**); prefrontals (**PF**); supraoculars (**SO**); supraciliaries (**SC**); suboculars (**SB**); supralabials (**SL**); infralabials (**IL**); and supratemporals (**ST**); **D**, right hand in ventral view, showing the subdigital lamellae under fourth finger (**L4F**); **E**, right foot in ventral view, showing the subdigital lamellae under fourth toe (**L4T**). Scale bars: 20 mm.

