Lost in the middle of the sea, found in the back of the shelf: A new giant species of *Trachylepis* (Squamata: Scincidae) from Tinhosa Grande islet, Gulf of Guinea

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Abstract

A new species of *Trachylepis* is described from Tinhosa Grande islet, São Tomé e Príncipe, Gulf of Guinea. Tinhosa Grande islet is a small (20.5 ha), isolated desert islet used by several bird communities as a nesting place. The new species is distinguished from its congeners by its color pattern, size and lepidosis. Due to its limited geographical distribution the new species appears to be one of the most vulnerable vertebrate species on the planet. In this study we provide a brief discussion on the natural history of the new species, as well as conservation concerns and suggestions.

Key words: Conservation, São Tomé e Príncipe, taxonomy, Tinhosas, *Trachylepis adamastor*

Introduction

*Trachylepis* Fitzinger, 1843 (Squamata: Scincidae) is one of the most speciose genera of scincid lizards on the planet, occurring across Africa, in the Gulf of Guinea oceanic islands, Madagascar, Indian ocean islands, as well as in Europe, near East and Central Asia, and in the Fernando Noronha archipelago off the coast of Brazil (Bauer 2003; Mausfeld et al. 2000; Uetz 2014). The *Trachylepis* fauna of the three major oceanic islands of the Gulf of Guinea (Príncipe, São Tomé and Annobón) is represented by three different species: *Trachylepis maculilabris* (Gray, 1845) in Príncipe and São Tomé islands; *Trachylepis affinis* (Gray, 1838) in Principe Island; and the endemic *Trachylepis ozorii* (Bocage, 1893) in Anfonbón Island (Manaças 1958; Manaças 1973a; Jesus et al. 2003; 2005). *Trachylepis maculilabris* is a widespread species complex with unclear systematics that ranges throughout most of sub-Saharan Africa, from the Gulf of Guinea islands to Madagascar (Uetz et al. 2014), comprising several highly divergent evolutionary lineages (Mausfeld et al. 2004; Rocha et al. 2010). Following the suggestion of Mausfeld et al. (2004), West African populations are here considered as the nominotypical *maculilabris*, while East Africa populations shall be considered as a different taxon. Jesus et al. (2005) concluded that the populations of *T. maculilabris* from São Tomé and Principe islands represent distinct molecular lineages, with divergence values
higher than those typically found between other distinct species (10.8% in mitochondrial DNA cytochrome b marker between each island population, up to 8.5% between each island population and mainland populations for the same marker). Rocha et al. (2010) have recently reinforced this conclusion. New molecular analyses and an extensive morphological study on the variation observed among species in the *Trachylepis maculilabris* complex are underway, and each island population is currently being described as a new species (Ceríaco et al. unpublished data). Herein, for the purpose of this paper, Príncipe and São Tomé island populations will be referred as *T. cf. maculilabris*.

*Trachylepis affinis* (Gray, 1838) is a widespread species complex distributed across the western part of Africa, ranging from Senegal to Angola (Uetz 2014), and it’s taxonomy and nomenclature have been a subject of many discussions and much confusion as discussed by Hoogmoed (1974). According to Jesus et al. (2005) *T. affinis* from Príncipe Island is considerably divergent (15% in mitochondrial DNA cytochrome b marker) from the single *T. affinis* sample from mainland Africa analyzed (Guinea-Bissau) mainland populations. This result appears to be flawed by a misidentification of the Guinea-Bissau specimen, as recent molecular and morphological studies suggest that the Príncipe Island population of *T. affinis* is a recent colonizer, with a considerably low instraspecific genetic diversity (roughly 1% mitochondrial DNA) within *T. affinis* samples from Cameroon (Ceríaco et al. unpublished data). Regarding the Annobón Island endemic *T. ozori*, the available data suggested that the species has a high level of divergence from all other species in the genus (10.8% mitochondrial DNA divergence), and is not closely related to the other species on the islands of the Gulf of Guinea (Jesus et al. 2005).

The Gulf of Guinea oceanic islands of Príncipe, São Tomé and Annobón, which are the result of volcanic activity of the Cameroon volcanic line and have never been in contact with the mainland (Lee et al. 1994). Deep seawaters and distances of dozens of kilometers separate both islands (Morzali et al. 2000). Those geographical characteristics and isolation of the islands have given origin to rapid speciation processes in its fauna (Melo et al. 2011), which are reflected in its high number of endemics (Drewes 2002). The rate of endemism of amphibians in São Tomé e Príncipe is 100% (Drewes 2002; Measey et al. 2007; Uyeda et al. 2007), having each with unique species found on each island, respectively. The only exception is *Hyperolius mollar* (Bedriaga, 1892), although studies are trying to divulge the relationship between the populations of both islands (Drewes & Stoelting 2004; Drewes & Wilkinson 2004). For reptiles, aside from *Naja melanoleuca* Hallowell, 1857 and *Pelusios castanue* (Schweigger, 1812) on São Tomé, *Trachylepis affinis* (Gray, 1838) in Príncipe, and *Hemidactylus mabouia* (Moreau de Jonnés, 1818) and *Hemidactylus longicephalus* Bocage, 1873 on both islands (Manças 1958), all other reptile species appear to be endemics (Ceríaco et al. unpublished data). For the case of birds, and considering their minute size, these islands present one of the greatest number of endemic species per area in the world (Dallimer et al. 2009; Leventis & Olmos 2009; Melo et al. 2011) A high degree of endemism on both islands is also reported for invertebrates (Mendes & Bívar-de-Sousa 2012) and flora (Figueiredo 2005; Garcia et al. 2012).

Approximately 20 km southwest of Príncipe Island exists two small islets, Tinhosa Grande (N: -1.3413556, E: -7.29151389; WGS-84) and Tinhosa Pequena (N: -1.38241467, E: -7.28316944, WGS-84) (Fig. 1). Tinhosa Grande Islet has a surface of approximately 20.5 ha while Tinhosa Pequena Islet has only 3.3 ha (Leventis & Olmos 2009). Both islets, recently recognized as Wetlands of International Importance and official Waterfowl Habitat (herein RAMSAR sites; RAMSAR 2015), are mostly bare rock with a few sparse herbs but hold some of the most important seabird colonies in West Africa, with tens of thousands of breeding pairs of Sooty Tern, *Onychoprion fuscata* Linnaeus, 1766, Brown Noddy, *Anous stolidus* (Linnaeus, 1758), Black Noddy, *Anous minutus* Boie, 1844, and Brown Booby, *Sula leucogaster* (Boddaert, 1783) (Leventis & Olmos 2009; Birdlife International 2014; Valle et al. 2014). Giving the very small area and harsh environment of Tinhosa Grande, the presence of terrestrial vertebrate species wouldn’t be expected. Although, during a systematic revision of the genus *Trachylepis* from São Tomé e Príncipe (Ceríaco et al. unpublished data), eight unidentified specimens collected from the "Pedras Tinhosas" were found in the collections of the Instituto de Investigação Científica e Tropical (IICT), Lisbon. “Pedras Tinhosas” is another name commonly used to refer to Tinhosa Grande islet. The IICT herpetological collections are a unique and forgotten resource for the study of African herpetology, especially from the former Portuguese colonies of Cape Verde, São Tomé e Príncipe, Guinea-Bissau, Angola and Mozambique. These collections were partially studied by the Portuguese zoologist Sara Manças and published in several papers (Manças 1947, 1949, 1959, 1951, 1952, 1954, 1955, 1958, 1959, 1961, 1963, 1973a, 1973b, 1982), yet several specimens have never been properly identified nor studied. Despite its importance and considerable numbers, the collections, as with many other collections worldwide, are at serious risk due to the uncertainty regarding the
institution future and the lack of conditions and staff for maintaining it. These Trachylepis specimens were collected in 1970 and 1971 in the last expeditions promoted by the Portuguese colonial government to the islets. The presence of the genus on the islet was never mentioned in any know publication until now. Recent expeditions to the islets have confirmed the presence of the skink population, presenting also the existence of an unidentified species of gecko, unknown until now (Nuno Barros pers. comm.; António Castelo pers. comm.). After a morphological comparison with specimens from the adjacent islands and the African mainland, and review of available bibliography on the genus, it is clear that the Tinhosas islet population possess a unique suite of morphological characters that distinguish them from any other known Trachylepis species. Although the Tinhosas Islet populations share some characteristics with species from neighboring islands (Ceríaco et al. unpublished data), other major features distinguish it easily, such as differences in size, scale counts and color patterns. Given that the Tinhosas Islet populations differ in many morphological characteristics from all other congener species, herein, we recognize this population as a new species.

Materials and methods

The eight Trachylepis specimens were found in the collections of the Instituto de Investigação Científica Tropical, Lisbon, Portugal (IICT) during recent investigation regarding the status of the museum’s São Tomé e Príncipe herpetological collections. No scientific name was attached to the specimens. The specimens are preserved in alcohol (unknown %) and are in good condition. After an external examination of the morphometric, scalation and coloration characters, it was impossible to assign the specimens to any known taxa, which indicates that this population represents a hitherto undescribed species.

For comparison, we measured specimens T. cf. maculilabris—Principe, T. cf. maculilabris—São Tomé, the nominotypic T. maculilabris from several locations across it’s known range in West Africa, and other Trachylepis species from the West Africa and adjacent island of Annobón (Appendix 1). The species used for comparison were chosen on the basis of their morphologically similarity, close distribution areas and apparent phylogenetic affinities.

Specimens were measured with a digital caliper and lepidosis was observed with the help of binocular magnifiers. Scale nomenclature, scales counts and measurements used in the description, were mostly based after Broadley (2000). We measured with a digital caliper the following 17 morphometric and scalation characters: snout–vent length (SVL), from the snout to the cloaca; tail length (TL), from the cloaca to the tip of the tail, measured only in specimens presenting complete original tail; head length (HL), from the tip of snout to anterior tympanum border; head height (HH), from the base of the maxilla to the top of the head; Eye-snout distance (ES), from the front of the eye to the tip of the snout; Eye-nostril distance (EN), from the front of the eye to the nostril; Inter-nostril distance (IN), distance between the nostrils; number of scales row at midbody (MSR); number of scales dorsally (SAD), from the nuchal (excluded from count) to base of the tail; number of scales ventrally (SAV), from the mental (excluded from count) to the anal plate (excluded); number of subdigital lamellae under Finger-IV (LUFF); number of subdigital lamellae under Toe-IV (LUFT); number of supralabials (SL), with those widened in subocular position indicated between brackets; number of supraoculars (SC); number of keels on dorsal scales (KDS); kind of contact between parietals (CP); kind of contact between frontoparietal (CFP); kind of contact between supranasals (CSN); kind of contact between prefrontal’s (CPF). Finally, coloration patterns of all specimens were carefully reported, and high-resolution pictures of preserved specimens were taken.

Taxonomic accounts

Trachylepis adamastor sp. nov.
(Figs. 2–4)

Holotype. IICT nº2-1970, Adult female collected in the locality of "Pedras Tinhosas" (N: -1.34135556, E: -7.29151389; WGS-84), Republic of São Tomé e Príncipe, by an unknown collector in 21th March 1970 (Fig. 2).

Paratypes. Seven specimens: IICT nº1-1970, Adult male collected in the same locality of the holotype, also by

**FIGURE 1.** Geographical location of Tinhosas islets and aerial photo of Tinhosa Grande and Tinhosa pequena (Photo by Luis Ceríaco). Each colored region corresponds to the geographical distribution of different *Trachylepis* species. Brown areas: Nominotypic *T. maculilabris* and *T. affinis*; Green area: *T. cf. maculilabris*—Príncipe; Orange area: *T. cf. maculilabris*—São Tomé; Blue area: *T. ozorii*; Red area: Tinhosas population.
FIGURE 3. Live photo of *Trachylepis adamastor* sp. nov. (specimen not collected), from Tinhosa Grande. Photo by Ross Wanless.

**Diagnosis.** A large and robust species of *Trachylepis* identified to the genus by the following combination of characters: four-limbed lizard, body covered with relatively large scales, dorsal and ventral scales polished, dorsal and ventral scales not highly differentiated (i.e. no great variation in size or structure), nostril well separated from the rostral shield, eyelids fully moveable and capable of closing the eye, lower eyelid with a large transparent disc; dorsal scales keeled, limbs pentadactyl and well developed, femoral pores absent. The new species can be easily distinguished from all other *Trachylepis* species by the following combination of characters: (1) large and robust body size, up to at least 112.0 mm SVL; (2) color pattern consisting of dark-brown dorsal coloration, with subtle black and white speckles, venter grayish; (3) MSR 31–34, SAD 49–54, SAV 63–66; (4) KDS 5 or 6; (5) scales on sole of feet and hands smooth; (6) one pretemporal scale; (7) very small ear opening.

**Description of the holotype.** Adult female in perfect shape but mutilated tail. Arrangement and relative size of head, body, and tail scales typical for *Trachylepis*. Robust and cylindrical body with robust legs. SVL 105.6 mm, TL 140 mm, HL 19.4 mm, with relatively acuminate snout (HL 153.5% HW). Other relevant measures are presented in Table 1. Rostral as wide as high. Fore- and hind limbs easily touching each other when addressed against body. Rostral visible from above, nostrils set posteriorly so that postnasal effectively borders nostril, supranasals in small contact. Frontonasal almost hexagonal, wider than long, laterally in contact with loreal scale. Pair of quadrilateral prefrontals, forming median suture, in contact with frontonasal, loreal, first and second supraoculrars, first supraocular, and frontal. Frontal rhomboid, in contact with length of second SO. Frontoparietals two, each in contact with frontal, third and fourth supraoculars, parietal and interparietal. Supraoculars five, second largest. Supralabials seven, fifth subocular. Infrafalabials six. Transparent scale present in lower eyelid, as usual for *Trachylepis*. Interparietal rhomboid, separated from nuchals by parietals; parietal eye small, almost invisible. Pretemporal one. Parietals in contact. Dorsal scales shiny, highly polished, most dorsal scales have five keels, the three central keels more pronounced than the outer. Ventral scales smooth. MSR 36, SAD 50, SAV 63. Limbs with five digits; scales on soles of hands and feet smooth, not keeled. Relative length of fingers II>III>IV>V>I, relative length of toes IV>I>III>V>II>I. Finger-IV lamellae 16 (right side), Toe-IV lamellae 18.
(right side). Tail long, robust and tapers smoothly. In preservative, background color of flanks and upper side of head, neck, dorsum, legs and tail very dark-brown, with many subtle white speckles in dorsum starting in neck and running through entire dorsum to base of tail. Very subtle darker lateral band, starting in extremities of nuchals continues until arm insertion. Lateral area of body greyish, with some darker brown pigmentation. Venter uniformly yellowish-white. Supralabials present whitish area in the base, black in top.

**Variation.** Variation in scalation and body measurements of paratypes of *T. adamastor* are reported in Table 1. All paratypes are in accordance with the holotype, in both measurements and scalation. All paratypes present parietal scales in contact and forming a suture, with exception of IICT 5-1971, in which parietals are in contact in a single point; frontoparietals in contact forming suture in all paratypes; supranasals always in contact forming suture, with exception of IICT 3-1971, in which supranasals are in contact in a single point; prefrontals in contact forming suture in three paratypes (IICT 2-1971, IICT 3-1971, IICT 5-1971) and in contact in single point in four specimens (IICT 1-1970, IICT 1-1971, IICT 4-1971, IICT 6-1971). Coloration generally agree with that of the holotype: paratypes IICT 1-1970, IICT 1-1971 and 2-1971 presents several pale white speckles in the dorsum, while in the remaining paratypes the dorsum is darker with less distinct (IICT 4-1971, IICT 6-1971) or totally absent speckles (IICT 3-1971, IICT 5-1971).

**Coloration.** Color in life varies from dark-grey on flanks and venter to almost black on upper side of head, neck, back, legs and tail, with subtle black and white speckles on dorsum (Fig. 3). Venter, lower side of head, neck, lower side of limbs and tail greyish (Fig. 3).

**Comparison with other Gulf of Guinea oceanic island species.** Table 2 summarizes the most important distinguishing characteristics between *T. adamastor* and all other Gulf of Guinea oceanic islands *Trachylepis*. Comparing *T. adamastor* with *cf. maculilabris*—Príncipe, the new species presents a considerably longer SVL, a lower TL/SVL ratio, a higher number of SAV, and a lower number of LUFT (Table 2). Also *T. adamastor* only have one pretemporal (two in *T. maculilabris*—Príncipe), prefrontal scales in contact forming a suture (separated or in contact in just a single point in *T. cf. maculilabris*—Príncipe), and the very dark-brown and white-speckled dorsum and grayish ventrum coloration of *T. adamastor* contrasts with the uniformly brown dorsum and greenish ventrum of *T. cf. maculilabris*—Príncipe (Table 2). Comparing *T. adamastor* with *cf. maculilabris*—São Tomé, several other characteristic differ considerably, as *T. adamastor* higher SVL, lower number of SAD, higher number of SAV, lower number of LUFT, the presence of just on pretemporal (vs. two in *T. cf. maculilabris*—São Tomé), and it's coloration differs considerably from the olive-brown with black and white speckles dorsum and yellowish ventrum coloration of *T. cf. maculilabris*—São Tomé (Table 2). Comparing *T. adamastor* with *T. affinis* from Príncipe Island leaves no possible confusion. *T. adamastor* presents a much higher SVL, lower TL/SVL ratio, higher number of MSR, lower number of LUFT and LUFF, five KDS (vs. 3 to 4 in *T. affinis*), only one pretemporal (vs. two in *T. affinis*), prefrontal scales in contact forming a suture (always separated in *T. affinis*), supranasals in contact forming a suture (in contact in just a single point in *T. affinis*), and the coloration pattern is also considerably different, with *T. affinis* presenting a marked dorso-lateral white stripe, absent in *T. adamastor* (Table 2). Comparing *T. adamastor* with *T. ozorii*, the new species presents a higher SVL, lower TL/SVL ratio, lower SAD, LUFF and LUFT, only one pretemporal (vs. two in *T. ozorii*), a higher number of KDS (5 in *T. adamastor* vs. 3 in *T. ozorii*), and supranasals in contact forming a suture (always separated in *T. ozorii*) (Table 2). The coloration pattern is also different between the two species (Table 2). Ecologically, the species differs considerably from all other Gulf of Guinea oceanic island species. *Trachylepis adamastor* is adapted to the harsh and non-vegetated environment of the Tinhosa Grande islet, while *T. cf. maculilabris*—Príncipe, *T. cf. maculilabris*—São Tomé, *T. affinis*, and *T. ozorii* mostly occur in areas with vegetation, sometimes even being arboreal (Jesus et al. 2003; Ceriaço et al. personal observation). One character that differentiates the new species from the other São Tomé and Príncipe species is the size of the ear opening, which is very small in *T. adamastor*.

Comparing *T. adamastor* with *T. maculilabris* from West Africa, the new species presents a considerably larger SVL (96.1–112.0 vs. 48.1–85.9 mm in *T. maculilabris*), a higher number of SAV (63–66 vs. 57–61 in *T. maculilabris*) and only one pretemporal (vs. two in *T. maculilabris*). The coloration pattern is also considerably different. Dorsolateral bands or lightly colored lines starting in the eye and reaching the forelimbs are completely absent in *Trachylepis adamastor*, but always present in *T. maculilabris*.

**Distribution.** As far as presently known, the species distribution is restricted to Tinhosa Grande Islet, Republic of São Tomé e Príncipe, West Africa (Fig. 1).
TABLE 1. Measurements and scale counts of the holotype and paratypes of *Trachylepis adamastor* sp. nov. See Materials and Methods for abbreviations.

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### TABLE 2. Most important distinguishing characteristics between *Trachylepis adamastor* sp. nov. and other Gulf of Guinea islands *Trachylepis*. See Materials and Methods for abbreviations.

<table>
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<th>Characteristic</th>
<th><em>T. adamastor</em> sp. nov. (n = 8)</th>
<th><em>T. cf. maculilabris</em>—Príncipe (n = 10)</th>
<th><em>T. cf. maculilabris</em>—São Tomé (n = 33)</th>
<th><em>T. affinis</em> (n = 11)</th>
<th><em>T. ozorii</em> (n = 14)</th>
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<td>Geographic distribution</td>
<td>Tinhosa Grande islet</td>
<td>Príncipe Island</td>
<td>São Tomé Island and Rolas islet</td>
<td>Príncipe Island</td>
<td>Annobón</td>
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<tr>
<td>SVL (mm)</td>
<td>96.06–112.04</td>
<td>58.48–88.27</td>
<td>60.32–98.18</td>
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<td>1.20–2.10</td>
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<td>Supraciliaries</td>
<td>Usually 5, sometimes 6</td>
<td>5</td>
<td>5</td>
<td>5–7</td>
<td>5–7</td>
</tr>
<tr>
<td>SAD</td>
<td>49–54</td>
<td>47–51</td>
<td>54–60</td>
<td>47–51</td>
<td>57–61</td>
</tr>
<tr>
<td>LUFT</td>
<td>18–20</td>
<td>21–22</td>
<td>19–22</td>
<td>18–20</td>
<td>20–23</td>
</tr>
<tr>
<td>Keels in the dorsal scales</td>
<td>5–6</td>
<td>5–6</td>
<td>5–7</td>
<td>3–4</td>
<td>3</td>
</tr>
<tr>
<td>CP</td>
<td>Always in contact, or in contact in a single point</td>
<td>Always in contact, or in contact in a single point</td>
<td>Usually in contact, or in contact in a single point</td>
<td>Usually separated or in contact in a single point</td>
<td>Always in contact or in contact in a single point</td>
</tr>
<tr>
<td>CFP</td>
<td>Always in contact</td>
<td>Always in contact</td>
<td>Always in contact</td>
<td>Always in contact</td>
<td>Always in contact</td>
</tr>
<tr>
<td>CPF</td>
<td>Prefrontals usually in contact in a single point, or forming a short suture</td>
<td>Prefrontals usually separated on in contact in a single point, or forming a short suture</td>
<td>Prefrontals usually in contact in a single point, or forming a short suture</td>
<td>Prefrontals always separated</td>
<td>Prefrontals always in contact</td>
</tr>
<tr>
<td>CSN</td>
<td>Supranasals always in contact forming a suture</td>
<td>Always in contact, or in contact in a single point forested areas</td>
<td>Always in contact, or in contact in a single point forested areas and urban areas</td>
<td>Supranasals in contact in a single point forested areas</td>
<td>Supranasals always separated forested areas</td>
</tr>
<tr>
<td>Habitat</td>
<td>Rocky outcrops</td>
<td>Back uniformly brownish and belly light blush on alcohol preserved specimens, and blush to greenish in life specimens</td>
<td>Back brownish, with some dark and white speckles and belly light orange–yellow in alcohol preserved specimens, pinkish–yellow in live specimens. A thin horizontal line composed by approximately seven to eight white speckles from the back of the eye to the top of the tympanum.</td>
<td>Coloration infralabials blush and supralabials blush of the base but getting brown to the top, mental plate light blue; absence of distinct longitudinal or transversal dorsal bands. Back uniformly brownish and belly light blush on alcohol preserved specimens, and blush to greenish in life specimens, with a lower white stripe on the lower part of the flanks.</td>
<td>Back olive-brown, with subtle blush-greenish reflexes. Dorso lateral greenish. Venter greenish-yellow. Some small black dots on the back.</td>
</tr>
<tr>
<td>Coloration</td>
<td>In preservative, the background color of the flanks and the upper side of head, neck, back, legs and tail is very dark-brown, with many subtle white speckles on the dorsum starting on the neck and running through the entire dorsum to the base of tail. A very subtle darker lateral band, starting on the extremities of the nuchal's continues until the arm insertion. Lateral area of the body greyish, with some brown stains. Venter uniformly whitish. Supralabials present a whitish area on the base, black on the top</td>
<td>Back uniformly brownish and belly light blush on alcohol preserved specimens, and blush to greenish in life specimens</td>
<td>Back brownish, with some dark and white speckles and belly light orange–yellow in alcohol preserved specimens, pinkish–yellow in live specimens. A thin horizontal line composed by approximately seven to eight white speckles from the back of the eye to the top of the tympanum.</td>
<td>Coloration infralabials blush and supralabials blush of the base but getting brown to the top, mental plate light blue; absence of distinct longitudinal or transversal dorsal bands. Back uniformly brownish and belly light blush on alcohol preserved specimens, and blush to greenish in life specimens, with a lower white stripe on the lower part of the flanks.</td>
<td>Back olive-brown, with subtle blush-greenish reflexes. Dorso lateral greenish. Venter greenish-yellow. Some small black dots on the back.</td>
</tr>
</tbody>
</table>
Habitat and natural history notes. The habitat used by the species is the rocks and rock outcrops of the islet. The trophic ecology of the species is currently unknown. The habitat is almost deprived of any type of vegetation and very few invertebrates occur in the islet, although live specimens were observed eating the yolk of recently broken bird eggs (Nuno Barros & Simon Valle pers. comm.; Fig. 4). The population appears stable and reaching high densities (Nuno Barros & Simon Valle pers. comm.). The ecological relations between the newly-described species and the nesting birds is unknown, but trophic relationships can be suspected, namely the predation of arthropods associated with bird nests, as the case of other reptiles from small oceanic islands and atolls (Ineich et al. 2009). The species appear to share the islet with another reptile, a still unidentified Hemidactylus sp. (Nuno Barros, António Monteiro pers. comm.).

Etymology. The specific epithet 'adamastor' refers to the mythical giant inhabiting a rock "in the end of the sea" present in the Luís de Camões famous odyssey 'Os Lusíadas', and is applied here as a substantive in apposition. We propose the Portuguese common name Lagartixa-adamastor and the English common name of Adamastor Skink.

Discussion

Despite that this description is based on few specimens, the amount and combination of morphological diagnostic characters provides sufficient evidence supporting its specific identity. Trachylepis adamastor is morphologically distinct to any other Trachylepis species known for Central and West Africa (Trape et al. 2012).

Given the age of the specimens (collected on 1970 and 1971) and the information that it has been preserved in formalin, tissue sampling was not attempted, as past attempts with specimens from this collection has proven unsuccessful. Future molecular studies are needed to fully understand the phylogenetic and phylogeographic relationships of the genus and how T. adamastor relates to congeners as well as to estimate its divergence time from its putative sister taxon. Given some synapomorphic characters, as the smooth plantar scales, and the scales
counts very similar to *T. maculilabris* species complex, we hypothesize that *T. adamastor* belong to the same monophyletic lineage. Jesus *et al.* (2005) presented evidence for monophyly of the *T. maculilabris* group from the Gulf of Guinea oceanic islands and mainland. The other hypothesis is that these alleged synapomorphies are nothing more than evolutionary convergence, as it is an usual pattern in island speciation (Losos 1992; Grant *et al.* 2004; Blackledge & Gillespie 2004). Although, given the presence of populations of the *T. maculilabris* species complex on neighboring islands, it is anticipated that the Tinhosas Islet species may have resulted from an “island hopping colonization” from São Tomé or Príncipe island, as this pattern is known from other amphibian (Drewes & Wilkinson 2004) and reptile species (Jesus *et al.* 2007) in the area.

For its size, *T. adamastor* appears to be one of the largest species of the genus, only matched or surpassed by *Trachylepis sparsa* (Mertens, 1954) (Maximum SVL 108 mm), *Trachylepis striata* (Peters, 1844) (Maximum SVL 113 mm), *Trachylepis margaritifera* (Peters, 1854) (Maximum SVL 120 mm), *Trachylepis capensis* (Gray, 1831) (Maximum SVL 117 mm), *Trachylepis wahlbergii* (Peters, 1870) (Maximum SVL 107 mm), *Trachylepis perroteti* (Duméril & Bibron, 1839) (Maximum SVL 157 mm) and *Trachylepis makolowodei* Chirio *et al.*, 2008 (Maximum SVL 121 mm) (Broadley 2000; Chirio *et al.* 2008; Trapé *et al.* 2012, but given its morphological differences, none of the above can be confused with *T. adamastor*. Assuming that *T. adamastor* belongs to the *T. maculilabris* species complex, whose individuals are usually medium sized skinks with a maximum SVL of approximately 98 mm, it is possible that the great size *T. adamastor* represent an adaptation to life on islands. Phenotypical adaptations, such as gigantism or dwarfism, are often exhibited by reptile populations living in isolated areas such as oceanic islands (Case 1978; Andreone & Gavetti 1998; Andreone 2000; Barahona *et al.* 2000; Carranza *et al.* 2001; Filin & Ziv 2004; Keogh *et al.* 2005; Meik *et al.* 2010). These types of transformations in island forms are usually more than just shifting to occupy the fundamental niche and size of some vacant group species, but rather involved development towards niches and bauplans novel to those insular forms (Lomolino 2005). The available habitat in Tinhosa Grande islet and the scarcity of food sources in comparison with the luxuriant and invertebrate abundant Islands, pushed the species to a radical adaptation, and the larger and more robust body size may represent an adaptation not only to low-food periods, but also for living in an unsheltered and exposed environment. Although more studies on the ecology and trophic relations of the species, as well as studies on its phylogeny, are needed to confirm these assumptions.

These adaptations sometimes lead to a lack of capacity to respond to sudden disturbances, making those species considerably vulnerable (Barahona *et al.* 2000). The history of several other endemic "giant" squamates from small islands, as the case of the extinct *Chioninia cocetei* (Duméril & Bibron, 1839), from the Cape Verde archipelago, or the critically endangered *Gallotia simonyi* (Steindachner, 1889) from El Hierro in the Canaries archipelago, is tragic. The introduction of invasive predators, or any other stochastic event can rapidly bring the population of small islands to the verge of extinction (Case & Bolger 1991; Barahona *et al.* 2000; Andreone 2000; Andreone & Gavetti 1998). In this particular case, given the very small area of Tinhosa Grande islet, the risk of extinction for *Trachylepis adamastor* is particularly high. It is legitimate to state that, given the area of Tinhosa Grande islet, less than 20.5 ha, this species appears to have one of the world smallest distribution area, among the known species of reptiles, and apparently belongs to one of the most vulnerable vertebrate species of the world. A fully dedicated investigation regarding its population numbers, ecology, genetic and morphological variation is urgent, not only to deepen our knowledge in this odd species, but also to establish effective conservation program. Despite the fact that Tinhosas islets are a RAMSAR site and are integrated in the Biosphere Reserve of Príncipe, the main islet is visited from times to times by local fishermen, who use the islet waters for fishing and the land for drying fish (Nuno Barros pers. comm.). As far as we know, fishermen don't target *T. adamastor*, although the possible introduction of external predators, like rodents, cats or dogs, can exterminate such an isolated population. Given the risks of extinction of the single known population in the wild, an *ex situ* conservation program should be planned to secure the survival of the species in the future, as well as the present preservation strategies regarding the islet should be reinforced.

The discovery of these specimens in an almost abandoned collection, and the subsequent description of them as a new species for science is a fine example of the importance natural history collections, and ring the alarm for the risks and losses of neglecting these institutions. The description of new vertebrate species based on specimens housed in natural history collections has been recurrent in the last years (Gippoliti & Amori 2011; Helgen *et al.* 2013; Velazco & Patterson 2014; Longrich 2014). Fontaine *et al.* (2014) recently showed that many new taxa wait decades on museum shelves since their collection in the field until their formal description as new to science. Natural
History collections are one of the most important tools for the study and conservation of biodiversity, as major repositories of data and sources for uncovering new knowledge (Suarez & Tsutsui 2004; Lister & Climate Change Group 2011). Despite their importance, many of these institutions are currently on the verge of collapse (Andreone et al. 2014). Also, the debate on specimen collecting menaces the future of these institutions, with some opinions suggesting that the traditional collecting should be replaced by other non-lethal techniques as digital photography or tissue sampling (Minteer et al. 2014).

The IICT Zoological collections are a tool of uttermost importance for our knowledge about African biodiversity, as those collections cover areas and taxonomic areas poorly represented in world collections. Besides the discovery of new taxa, these collections can be used as an invaluable resource for many different studies and investigations, and several studies using them are currently underway. Unfortunately, without curators and appropriate research staff, a paucity of materials and facility infrastructure to conserve it, and uncertainty regarding institutional futures in many cases, small natural history collections worldwide with unique collections, such as the IICT, are under considerable threat. The description of T. adamastor, possible one of the most endangered vertebrate species on the planet, based on eight forgotten specimens on a shelf of the IICT zoological collections recalls all of us about the urgency to save these repositories of biodiversity data. Along with the risk of never knowing some species before they go extinct in the wild, we risk ourselves to lose the opportunity to discover these new taxa in our own museums.

Acknowledgments

The author want to thank Luis Mendes, director of the zoological section of IICT for the access to the collections, the loan of the type series, as well as to CAS herpetological collections manager Jens Vindum, and MNHN curator of Squamates Ivan Ineich for access to their rich collections. A special thank is owed to Mariana Marques for her support during all the museum work and writing of the manuscript, contributing with pertinent observations and suggestions. Carlos Vila-Viçosa, Aaron Bauer, Philipp Wagner, Ivan Ineich, and Roger Bour contributed with useful comments and corrections to the manuscript. Cameron Siler and two anonymous referees reviewed the manuscript and contributed to its improvement. All analyses were conducted in the facilities of Museu Nacional de História Natural e da Ciência, which the author wants to thanks all of his colleagues and friends for their support. Very important data regarding the current status of the population and the species ecology was gently given by Nuno Barros, António Castelo, Simon Valle and Ross Wanless. Both Nuno Barros and Ross Wanless provided the author with life pictures of the Tinhosa Grande islet herpetofauna and gave the permission for reproducing them, to which the author is extremely indebt. This research received support from the SYNTHESYS Project (http://www.synthesys.info/) financed by European Community Research Infrastructure Action under the FP7 "Capacities" Program.

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NEW SPECIES OF TRACHYLEPIS FROM TINHOSA GRANDE

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série. Estudos de Zoologia, 23, 143–163.


APPENDIX. Material examined

**Trachylepis cf. maculillabris:**


**Trachylepis maculillabris:**

"West Africa": Natural History Museum: NHM 1946.8.18.17 (Holotype)


**Ghana:** Museum of Vertebrate Zoology: MVZ 75591; MVZ 75591; MVZ 75587; MVZ 75586; MVZ 245343; MVZ 245344; MVZ 249672; MVZ 249749; MVZ 249750; MVZ 252621; MVZ 253443.

**Nigeria:** Museum of Vertebrate Zoology: MVZ 253443.

**Benin:** Museu nacional d’Histoire naturelle: MNHN 1917.0057; MNHN 1917.0058; MNHN 1917.0060; MNHN 1917.0060A; MNHN 1917.0061; MNHN 1917.0061A.

**Togo:** California Academy of Sciences: CAS 0136123.

**Angola:** Museu nacional d’Histoire naturelle: MNHN 1888.0065; MNHN 1891.0429; MNHN 1891.0430; MNHN 1891.0431; MNHN 1896.0203; MNHN 1899.0123; BMNH 1900.0488; MNHN 1900.0489; MNHN 1904.0163; MNHN 1904.0017X; MNHN 1904.0173; MNHN 1907.0256.

**Guinea:** Museu nacional d’Histoire naturelle: MNHN 1921.0325; MNHN 1921.0326; MNHN 1921.0327; MNHN 1921.0328; MNHN 1921.0330; MNHN 1921.0331; MNHN 1921.0332; MNHN 1921.0333; MNHN 1921.0334; MNHN 1921.0335; MNHN 1921.0337; MNHN 1921.0338; MNHN 1951.0103; MNHN 1951.0104; MNHN 1951.0106; MNHN 1951.0107; MNHN 1951.0159; MNHN 1967.0246. *California Academy of Sciences:* CAS 55085; CAS 55086; CAS 55087.

Rwanda: Muséum national d'Histoire naturelle: MNHN 1940.0109; MNHN 1940.0110; MNHN 1940.0111; MNHN 1940.0112; MNHN 1940.0113; MNHN 1940.0114; MNHN 1940.0115.

Trachylepis ozorii:


Trachylepis polytropis:

Cameroon: Muséum national d'Histoire naturelle: MNHN 1930.0048; 1996.2350.


Trachylepis makolowodei:


Trachylepis affinis: