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Article in *Zootaxa* · September 2017

DOI: 10.11646/zootaxa.4324.1.8

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Description of a new flat gecko (Squamata: Gekkonidae: *Afroedura*) from Mount Gorongosa, Mozambique

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Abstract

A new species of flat gecko, *Afroedura gorongosa* **sp. nov.**, is described from Gorongosa National Park, Sofala Province, central Mozambique. The new species is morphologically similar to *A. transvaalica* and *A. loveridgei*, from both of which it is genetically distinct (15–17% divergence; 400 bp of 16S rRNA). Morphologically it can be distinguished from both species by having fewer midbody scale rows (97–101) and a higher number of precloacal pores in males (8–13). The type series was collected on the western flanks of Mount Gorongosa (900 and 1100 m a.s.l.) in comparatively cool and moist microclimates, where it is threatened by illegal deforestation. Additional material was collected as low as 212 m a.s.l. on an inselberg near Mount Gorongosa. The new discovery adds to the growing number of endemic montane reptiles discovered in Mozambique in recent years, and highlights the need for a national conservation assessment of the country's herpetofauna and continued protection of the Mount Gorongosa region.

Key words: *Afroedura gorongosa* **sp. nov.**; *Afroedura loveridgei*; *Afroedura transvaalica*; biodiversity; endemism; lizards

Resumo

Aqui descreve-se uma nova espécie de osga, *Afroedura gorongosa* **sp. nov.**, do Parque Nacional da Gorongosa, na Província de Sofala, centro de Moçambique. Do ponto de vista morfológico, a nova espécie assemelha-se às osgas *A. transvaalica* e *A. loveridgei*, sendo geneticamente distinta de ambas (divergência de 15–17%; 400 bp de 16S rRNA). Distingue-se morfológicamente de ambas as espécies por ter um número inferior de fileiras de escamas na secção mediana (97–101) e um número superior de poros pré-cloacal nos machos (8–13). A série-tipo foi recolhida nos flancos ocidentais da Serra da Gorongosa (900 e 1100 m a.s.l.), em microclimas relativamente mais frios e húmidos, onde se encontra ameaçada pela desflorestação ilegal. Estas osgas foram também recolhidas à altitude de 212 m a.s.l., num inselberg e próximo da Serra da Gorongosa. A nova descoberta junta-se ao crescente número de répteis endémicos de montanha descobertos em Moçambique nos últimos anos, e realça a necessidade de uma avaliação da conservação da herpetofauna do país a nível nacional, bem como a proteção da região do Monte Gorongosa.

Palavras-chave: *Afroedura gorongosa* **sp. nov.**; *Afroedura loveridgei*; *Afroedura transvaalica*; biodiversidade; endemismo; lagartos

Introduction

Geckos have undergone an explosive radiation in southern Africa and are the dominant lizard family in the subcontinent, with over 135 species currently known (Branch 2014 and updates). Despite their well-known digital specializations they are otherwise often morphologically conservative, and the head and body are usually covered with small granular scales, sometimes with scattered tubercles, that offer few opportunities for morphological differentiation. Recent genetic studies, however, have uncovered unsuspected phylogenetic complexity (Bauer *et al.* 1997; Bauer & Lamb 2005; Heinicke *et al.* 2014) and high levels of cryptic diversity within numerous morphologically conservative gecko genera; e.g. *Pachydactylus* (Bauer & Branch 1995; Branch *et al.* 2011; Bauer *et al.* 2006); *Lygodactylus* (Jacobsen 1992a, 1994a; Travers *et al.* 2014); or *Goggia* (Branch *et al.* 1995; Good *et al.* 1996; Bauer *et al.* 1996). This is particularly true of localized, allopatric populations of rupicolous species, exemplified by crevice-dwelling flat geckos of the genus *Afroedura* Loveridge, 1944.

Loveridge (1944) erected *Afroedura* for a radiation of small to medium-sized rupicolous, leaf-toed geckos restricted mainly to southern Africa. He separated them from Australian *Oedura* (Loveridge 1944), with which they had originally been grouped, due to their lower scansor counts (1–3 in *Afroedura*, four or more in *Oedura*) and in usually having a verticillate tail (unsegmented in *Oedura*), although some members of the *Afroedura pondolia*, *A. multiporis* and *A. langi*-groups have been subsequently shown to possess unsegmented tails (Jacobsen 1992b). In the last formal revision of African geckos, Loveridge (1947) recognized seven species and 12 taxa of *Afroedura*. Onderstall (1984) named new taxa from South Africa, and noted further possible undescribed ones. Jacobsen (1992b) presented a preliminary review of Transvaal populations, noting numerous new taxa but not formally naming them. Aware of these reports, and of other problematic populations in the Cape region, the genus was prioritized for further systematic study in the subcontinent (Branch 2006). Subsequently, known diversity within the genus has greatly increased, with the description of nine new species, many with ultra-restricted (< 500 km²) ranges (Jacobsen *et al.* 2014). Phylogenetic studies on the genus (Jacobsen *et al.* 2014; Makhubo *et al.* 2015) placed the 27 currently recognized species in seven monophyletic clades, whilst further undescribed cryptic diversity has also been signalled (Makhubo *et al.* 2015; Branch *et al.* 2017).

All *Afroedura* are considered endemic to southern Africa with the exception of *A. loveridgei* and *A. bogerti*, both of the *A. transvaalica*-group (Jacobsen *et al.* 2014). Hewitt (1925) described *Oedura transvaalica* based on material from “N’jelele River, Zoutpansberg District, Transvaal” (= Nzhelele River, a southern tributary of the Limpopo River, that arises in the Soutpansberg east of Nzhelele (= Thohoyandou, 22°53'0.91"S, 30°29'2.79"E), Limpopo Province, South Africa; Raper 1989). In the same paper Hewitt (1925) treated material from Umtali (= Mutare) and Matopos, both north of the Limpopo River, as a northern race, *O. t. platyceps*, with Umtali as the type locality. This race was distinguished (in part) by “...the form and size of the mental shield, which even at the base is narrower than the first labial.” Loveridge (1947), after earlier transferring African *Oedura* to the new genus *Afroedura* and describing *A. bogerti* from Angola (Loveridge 1944), felt that some features considered diagnostic by Hewitt (1925) for *A. t. platyceps*, e.g. smaller size of mental, more depressed head, and less well-developed distal scansors, were very variable. However, despite these observations, he still continued to recognize the race. Subsequently, Broadley (1962) confirmed Loveridge’s observations and also considered an increase in precloacal pore number in Zimbabwe populations of *A. transvaalica* to be clinal; e.g. 5–6 Beit Bridge (30 specimens), 6–8 Umtali (= Mutare, 48 specimens), 8–10 Mtoko (16 specimens). He, therefore, relegated Hewitt’s race *H. t. platyceps* to the synonymy of *A. transvaalica*. Later, Bauer (2014) noted that a phylogenetic assessment of the isolated populations of *A. transvaalica* was indicated, possibly based on a then unpublished molecular phylogeny of the genus (Jacobsen *et al.* 2014). This paper revealed relatively deep sequence divergence among the widely scattered *A. transvaalica* populations, indicating further potential cryptic diversity.

When describing *A. transvaalica loveridgei* from “five miles west of Tete, Mozambique”, Broadley (1963) differentiated it from the typical race, which was widespread in Zimbabwe and entered South Africa along the Limpopo River valley, by the rostral being excluded from the nostril and its smaller size. He noted that *A. t. loveridgei* was “confined to the Zambezi valley below 1,500 feet” (500 m). *Afroedura t. loveridgei* was not the only record of *Afroedura* from Mozambique, as Broadley (1966) recorded specimens of *A. transvaalica* from Magasso and Mount Gorongosa, but noted that they occurred at higher altitudes than *A. loveridgei*. Branch (1998), subsequently raised *A. t. loveridgei* to species status, and this was later supported by genetic analysis (Jacobsen *et al.* 2014).

Nocturnal and rupicolous, flat geckos usually shelter under exfoliating flakes on hard rock outcrops such as granite, gneiss and some sandstones (Fig. 1). Their distributions are therefore often disjunct, with limited gene flow between isolates. As a consequence the taxonomy of many populations has remained confused, and only recently has the application of molecular assessments, coupled with increased surveys of previously inaccessible regions, brought some resolution to species boundaries and phylogenetic relationships within the genus (Jacobsen *et al.* 2014; Makhubo *et al.* 2015). However, these taxonomic hypotheses require reassessment when new populations are discovered or new genetic material becomes available. Broadley (1966) previously referred flat geckos from Gorongosa National Park in Mozambique to *A. transvaalica*. Additional specimens collected in the park, including genetic material, allowed us to reassess the taxonomic and phylogenetic relationships of this population.

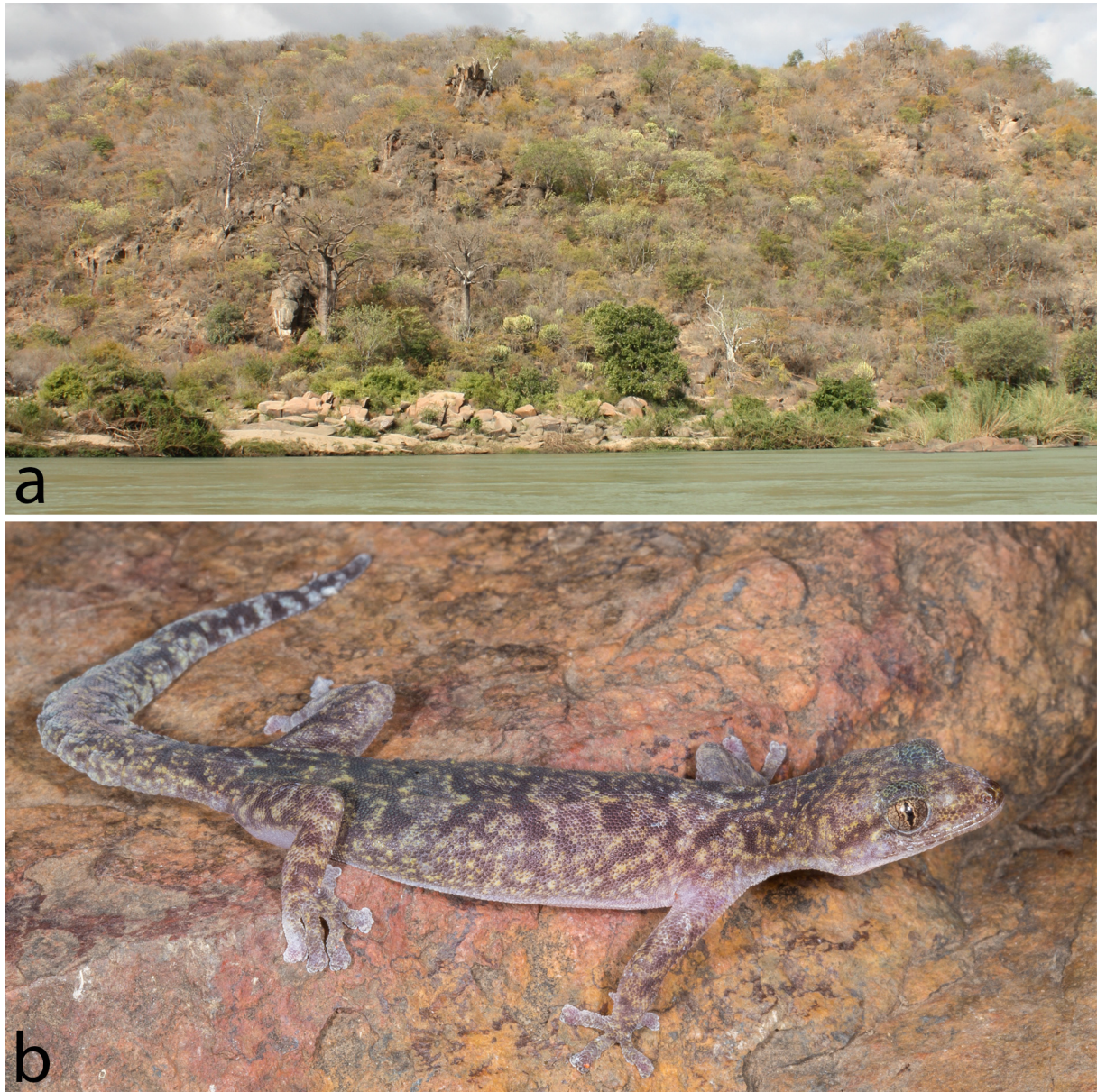


FIGURE 1. *Afroedura loveridgei* (EI 0189) and its rocky habitat along the Zambezi River, just downstream of the Cahora Bassa Dam, Tete Province, Mozambique (Photos: L. Verburgt).

Materials and methods

Species concept. We apply a general lineage-based species concept, treating as species those entities that represent independent historical lineages (Frost & Hillis 1990; de Queiroz 1998). Our operational criteria to infer species boundaries are both tree- and character-based.

Morphology. This study was based mainly on *Afroedura* material in the collections of the Port Elizabeth Museum (PEM) and the Museum für Naturkunde Berlin (ZMB) (see Material Examined). Fresh material was collected during two biodiversity surveys (April to December 2015) in Gorongosa National Park, Mozambique. Specimens were euthanized with benzocaine. After death the geckos were fixed and stored in either 75% ethanol (ZMB) or 55% isopropanol (PEM). Type material of *Oedura transvaalica* Hewitt, 1925 and *Oedura transvaalica platyceps* Hewitt, 1925 was examined.

As with many other gecko genera *Afroedura* is morphologically conservative. Due to their granular scales there are few discrete differences that are diagnostic. The number of paired and enlarged subdigital scancers has been used to differentiate groups within the genus (FitzSimons 1943; Loveridge 1947; Onderstall 1984; Jacobsen 1997), but is invariant among the *A. transvaalica*-group, the only *Afroedura* occurring north on the Limpopo River in south-eastern Africa. The following characters (detailed in Jacobsen 1992b) were assessed: 1: presence or absence of internasal granules between the nasorostral scales; 2: number of postmental scales; 3: number of scales between the eyes over crown of head; 4: number of scales between upper edge of earhole and rear margin of orbit; 5: number of scales between nostril and front edge of orbit, including postnasal; 6: number of supralabials; 7: number of infralabials; 8: number of midbody scale rows; 9: number of scale rows on dorsal surface per tail whorl (counted 3–6 verticils posterior to the cloaca); 10: number of scales rows on ventral surface per tail whorl; and 11: number of precloacal pores in males.

Measurements have been taken by one person (WRB) and included: snout-vent length (SVL), tail length (TL); head length (HL—tip of snout to back of jaw); head width (HW—widest point of head at level of eyes); snout length (SL—tip of snout to front of orbit); ear-eye length (EE—top edge of earhole to back of orbit); and internostril distance (IN—horizontal line between both nostrils).

Genetic analyses. Two recent, large-scale phylogenetic analyses of the genus *Afroedura* (Jacobsen *et al.* 2014; Makhubo *et al.* 2015) have identified robust clades within the known species, and their known distributions are well-documented. We therefore concentrated our genetic analyses on the species known to occur in Mozambique, neighbouring Zimbabwe and adjacent South Africa, as well as the Angolan taxa referred to as *A. bogerti*. These all form part of the previously defined tropical *A. transvaalica-loveridgei-bogerti* clade (Jacobsen *et al.* 2014), to which the Gorongosa population is morphologically allied due to possessing two pairs of terminal scancers and a verticillate tail. Our genetic assessment was therefore restricted to a species-level determination using the 16S rRNA gene of the mitochondrial genome.

We rooted our phylogeny with *Afroedura hawequensis* Mouton & Mostert, 1985 from the southwestern Cape, which is the sole member of the *A. hawequensis*-group *sensu* Jacobsen *et al.* (2014), and seemingly the most basal member of the genus *Afroedura* (Jacobsen *et al.* 2014).

DNA was extracted from tissues using the E.Z.N.A. Tissue DNA Kit (VWR/Omega bio-tek) following the manufacturers protocol. A portion of the mitochondrial genome (16S rRNA gene) was PCR amplified and sequenced following the methods described in Schmitz *et al.* (2005). All sequences have been deposited in GenBank (Table 1).

DNA sequences were aligned using the original chromatograph data in the program BioEdit (Hall 1999), using ClustalX (Thompson *et al.* 1997) and the resulting alignment was manually edited. We managed to unambiguously align 400 bp of the 16S rRNA gene including some fast-evolving, indel-rich loop regions. Bayesian Inference (MrBayes, version 3.12; Huelsenbeck & Ronquist 2001) and Maximum Likelihood (RAxML version 7.0.4; Stamatakis 2006) using the rapid hill climbing algorithm and the GTR+ Γ model of nucleotide substitution following Stamatakis *et al.* (2006) were applied to assess phylogenetic relationships. The best-fit model of sequence evolution for the Bayesian analysis was selected using jModeltest 2.1.7 (Darriba *et al.* 2012), using the Bayesian information criterion (BIC). Bootstrap analyses (BS) with 1000 pseudoreplicates in the ML analysis were used to evaluate the relative branch support in the phylogenetic analysis. Clades with bootstrap values (ML) $\geq 70\%$ were considered strongly supported. Bayesian analyses were run for five million generations using four chains sampling every 1000 generations, with a burn-in of 1000 trees. Clades with posterior probabilities (PP) $\geq 95\%$ were considered strongly supported.

In total, sequences from 38 *Afroedura* specimens were included in the phylogenetic analyses (Table 1) to corroborate our morphological analyses. The distribution of voucher and genetic material examined for species of the *A. transvaalica* complex are shown in Fig. 2. Additional localities for *A. transvaalica* can be found in Broadley (1966), Bauer (2014), and Jacobsen *et al.* (2014).

TABLE 1. *Afroedura* specimens (field and collection numbers), localities and GenBank accession numbers of vouchers used in this study.

Species	Locality	Sample number	GenBank
<i>A. hawaquensis</i>	Limietberg, Western Cape Province, South Africa	KTH10.09	LM993779
<i>A. transvaalica</i>	Near border to Zimbabwe, Limpopo Province, South Africa	MBUR 01714	LM993792
<i>A. loveridgei</i>	Near Moatize, Tete Province, Mozambique	EI 123	MF565446
<i>A. loveridgei</i>	Near Moatize, Tete Province, Mozambique	EI 189	MF565447
<i>A. loveridgei</i>	Near Moatize, Tete Province, Mozambique	EI 191/PEM R21992	MF565448
<i>A. gorongosa</i> sp. nov. (paratype)	Gorongosa National Park, Sofala Province, Mozambique	ZMB 83290	MF565449
<i>A. gorongosa</i> sp. nov. (holotype)	Gorongosa National Park, Sofala Province, Mozambique	ZMB 83293	MF565450
<i>A. gorongosa</i> sp. nov. (paratype)	Gorongosa National Park, Sofala Province, Mozambique	PEM R22220	MF565451
<i>A. bogerti</i> 1	Omauha Lodge, Iona National Park, Namibé Province, Angola	KT 196	MF565452
<i>A. bogerti</i> 1	Omauha Lodge, Iona National Park, Namibé Province, Angola	KT 197	MF565453
<i>A. bogerti</i> 1	Omauha Lodge, Iona National Park, Namibé Province, Angola	KTH09-197	LM993777
<i>A. bogerti</i> 1	Omauha Lodge, Iona National Park, Namibé Province, Angola	KTH09-196	LM993776
<i>A. bogerti</i> 2	50 km E Namibé on main tar road to Leba, Namibé Province, SW Angola	ANG 289	MF565454
<i>A. bogerti</i> 2	Meva Beach, Benguella Province, Angola	"30"	MF565455
<i>A. bogerti</i> 2	20 km S Bentiaba, Namibe Province, Angola	samp 62/E260.15	MF565456
<i>A. bogerti</i> 2	10.4 km S of Rio Makonga on tar road to Bentiaba, Namibe Province, Angola	samp 58/E260.14	MF565457
<i>A. bogerti</i> 2	10.4 km S of Rio Makonga on tar road to Bentiaba, Namibe Province, Angola	samp 57/E260.13	MF565458
<i>A. bogerti</i> 2	10.4 km S of Rio Makonga on tar road to Bentiaba, Namibe Province, Angola	samp 39/E260.12	MF565459
<i>A. bogerti</i> 2	1 km E of Farm Mucongo, Namibe Province, SW Angola	AG 1 37	MF565460
<i>A. bogerti</i> 2	52 km N on tar road on road to Lucira, Namibe Province, Angola	ANG 311	MF565461
<i>A. bogerti</i> 2	1 km E of Farm Mucongo, Namibe Province, SW Angola	AG 141	MF565462
<i>A. bogerti</i> 2	1 km E of Farm Mucongo, Namibe Province, SW Angola	AG 1 38	MF565463
<i>A. bogerti</i> 3	400 m N of Mission de Namba grounds, Kwanza Sul Province, Angola	samp 28/E260.5	MF565464

.....continued on the next page

TABLE 1. (Continued)

Species	Locality	Sample number	GenBank
<i>A. bogerti</i> 3	400 m N of Mission de Namba grounds, Kwanza Sul Province, Angola	samp 27/E260.4	MF565465
<i>A. bogerti</i> 3	Farm Namba, Kwanza Sul Province, Angola	samp 25/E260.3	MF565466
<i>A. bogerti</i> 3	Farm Namba, Kwanza Sul Province, Angola	samp 23/E260.1	MF565467
<i>A. bogerti</i> 3	Farm Namba, Kwanza Sul Province, Angola	samp 24/E260.2	MF565468
<i>A. bogerti</i> 4	Fm Victoria-Verdun, 2 km S of Mt Sandula, Kwanza Sul Province, Angola	samp 34/E260.9	MF565469
<i>A. bogerti</i> 4	Fm Victoria-Verdun, 2 km S of Mt Sandula, Kwanza Sul Province, Angola	samp 31/E260.6	MF565470
<i>A. bogerti</i> 4	Fm Victoria-Verdun, 2 km S of Mt Sandula, Kwanza Sul Province, Angola	samp 33/E260.8	MF565471
<i>A. bogerti</i> 4	5 km SW Lepi, Huambo Province, Angola	samp 37/E260.11	MF565472
<i>A. bogerti</i> 4	Candumbo Roacks Memorial, 20 km E Humana, Huambo Province, Angola	samp 35/E260.10	MF565473
<i>A. bogerti</i> 4	Candumbo Rocks, Huambo Province, Angola	WC 4037	MF565474
<i>A. bogerti</i> 4	Candumbo Rocks, Huambo Province, Angola	WC 4038	MF565475
<i>A. bogerti</i> 4	Maka-Mombolo, NE of Balomba, Benguela Province, Angola	samp 70/E260.16	MF565476
<i>A. bogerti</i> 4	5 km west of Maka-Mombolo, Benguela Province, Angola	samp 71/E260.17	MF565477
<i>A. bogerti</i> 4	5 km west of Maka-Mombolo, Benguela Province, Angola	samp 72/E260.18	MF565478
<i>A. bogerti</i> 4	5 km west of Maka-Mombolo, Benguela Province, Angola	samp 73/E260.19	MF565479

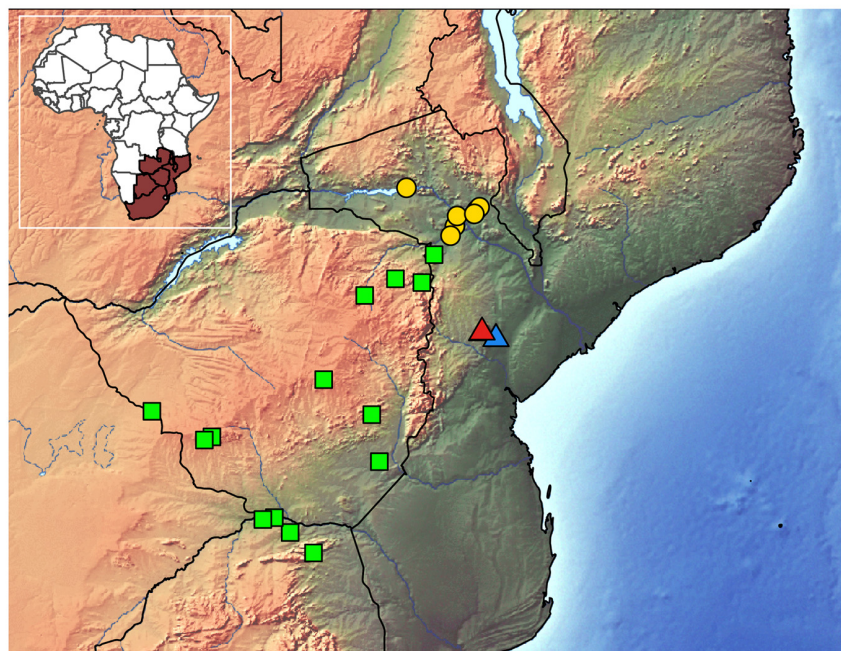


FIGURE 2. Distribution of the *Afroedura transvaalica*-complex in south-eastern Africa (excluding the Angolan *A. bogerti*-complex); orange circles: *A. loveridgei*; green squares: *A. transvaalica*; red triangle: Mount Gorongosa, the type locality of *A. gorongosa* **sp. nov.**; blue triangle: Bunga Inselberg, the location of additional *A. gorongosa* **sp. nov.** specimens. Localities plotted only depict voucher and genetic material examined; additional localities for *A. transvaalica* can be found in: Broadley (1966), Bauer (2014), and Jacobsen *et al.* (2014). The inset map shows in brown the African countries included in the distribution map.

Results

Morphology. Results for the morphological analysis are summarised in Table 2 and discussed in the species description below.

Molecular data. For the genetic dataset both the Bayesian and Maximum Likelihood analyses agreed fully in the topology of the recovered phylogram (Fig. 3). The methods differed only in the degree of support recovered for the individual nodes. These results fully corroborated those derived from the morphological analysis, and confirmed that the Gorongosa population was not conspecific with any other members of the *A. transvaalica*-group, including *A. loveridgei* and *A. transvaalica* (Table 3).

Our molecular assessment showed that the Gorongosa population forms part of the *A. transvaalica*-*loveridgei* clade (*sensu* Jacobsen *et al.* 2014), which currently includes the species *A. transvaalica* (Hewitt 1925), *A. loveridgei* Broadley, 1963, and *A. bogerti* Loveridge, 1944. Within this clade *A. transvaalica* is basal, corresponding well to its proposed most basal phylogenetic position in previously published data on the genus *Afroedura* (Makhubo *et al.* 2015). *Afroedura bogerti* is restricted to Angola, with a single Namibian record of problematic status (Branch 1998; Griffin 2003). Although Angolan *A. bogerti* is now known to contain cryptic diversity (Branch *et al.* 2017; this study), all known populations (1–4) form a subclade that is sister to *A. loveridgei* and the Gorongosa population (Fig. 3).

All three Gorongosa *Afroedura* sequences were identical, and showed large uncorrected p-distances of ca. 15.7–17.7% to *A. loveridgei*, in which intraspecific variation was low at ca. 0.3–3.5% (Table 3). Similarly large genetic distances of ca. 15% was revealed between the Gorongosa geckos and *A. transvaalica*, as well as between *A. transvaalica* towards the different *A. bogerti* populations (13.1–17.3%; but see below) and *A. loveridgei* (16.9–18.0%). The latter species was genetically even less similar to the different *A. bogerti* populations 1–4 (21.4%; see below). These genetic distances correspond very well to the level of genetic differences found between other well established species within the genus *Afroedura* for the same gene (Makhubo *et al.* 2015; this study, Table 3).

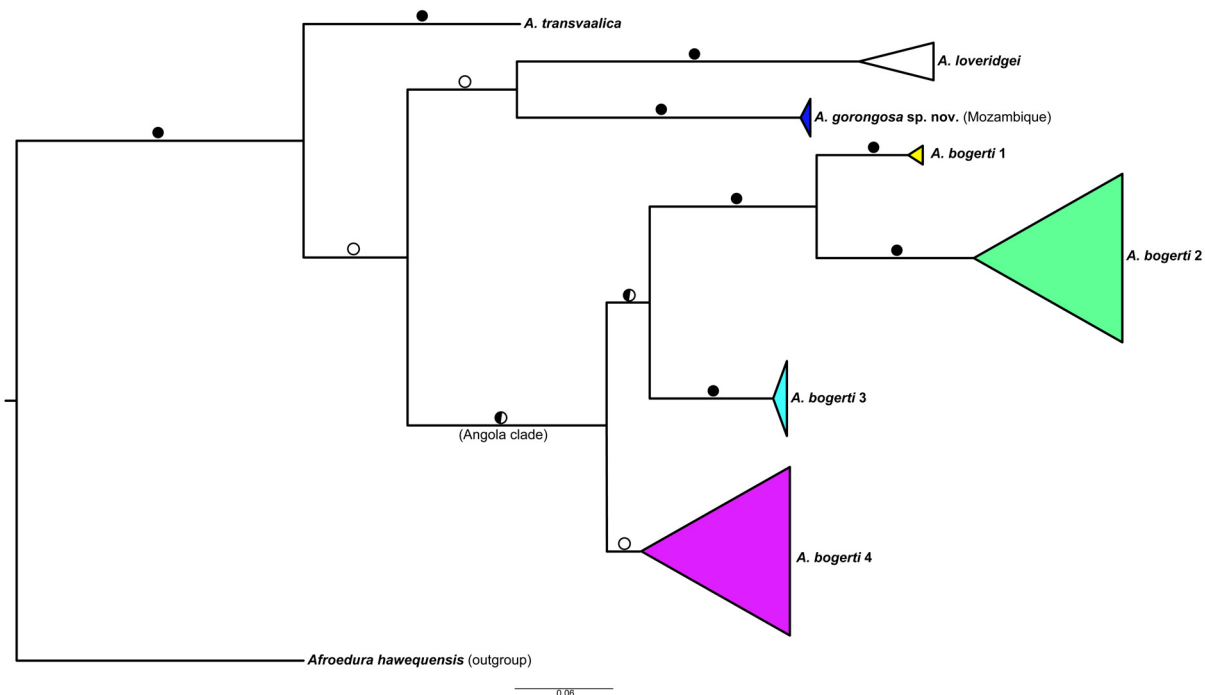


FIGURE 3. Phylogenetic tree topology for the 16S gene (identical for Bayes and ML) using *Afroedura hawequensis* as outgroup. Support values for posterior probabilities and bootstraps are indicated by circles (PP: >0.95 / ML: >70%) : full black circles indicated support by both methods and full open circles indicate no strong support by either method.

Similar to previous findings of clear and well supported phylogenetic substructure in *A. transvaalica* (Jacobsen *et al.* 2014), our analyses revealed that Angolan *Afroedura bogerti* populations comprise four species-level subclades, indicating the existence of three undescribed Angolan *Afroedura* species (Fig. 3). While the genetic distances found between those taxa are lower than between the other analysed *Afroedura* species in this study, all

are mostly well supported. They form fully allopatric sub-clades which show consistently high inter- and lower intrapopulation genetic distances, which roughly correspond to the distances within the *A. transvaalica* sub-clades (see Jacobsen *et al.* 2014; Table 3), indicating prolonged reproductive isolation. A more detailed analysis of the *A. bogerti* candidate species, including identification of the nominate population, will be presented elsewhere.

TABLE 2. Summary of morphological comparison of *Afroedura transvaalica* (Eastern Zimbabwe populations), *A. loveridgei* and *A. gorongosa* **sp. nov.**; given is sample size (number), morphological characters (compare material & methods); values are provided as range, mean (\bar{x}) \pm standard deviation (in parenthesis); M= male, F= female, N= sample size.

Character	<i>A. transvaalica</i> (N= 22)	<i>A. loveridgei</i> (N= 12)	<i>A. gorongosa</i> sp. nov. (N= 6)
Snout vent (max)	M 71 mm, F 68 mm	M 59 mm, F 57 mm	M 57 mm, F 61 mm
HL / HW	(1.1 \pm 0.04)	(1.2 \pm 0.06)	(1.32 \pm 0.05)
Snout / Eye	(1.8 \pm 0.15)	(1.5 \pm 0.22)	(1.48 \pm 0.10)
Snout / Ear-eye	(1.1 \pm 0.14)	(1.1 \pm 0.12)	(1.34 \pm 0.05)
Precloacal pores (males)	6–10 (7.9)	8–10 (8.8)	8–13 (10)
Dorsal rows tail whorl	6–8 (7.2 \pm 0.34)	7–8 (7.8 \pm 0.32)	7–8 (7.2 \pm 0.45)
Ventral rows tail whorl	5–5 (5.15 \pm 0.34)	5–6 (5.8 \pm 0.41)	5 (5)
Scales below 4 th toe	8–13 (9.86 \pm 1.17)	8–10 (9 \pm 0.78)	10–12 (11 \pm 0.84)
Midbody scale rows	108–119 (114.3 \pm 3.5)	113–120 (116.6 \pm 2.07)	97–101 (99.6 \pm 1.67)
Scales between eyes	15–19 (17.9 \pm 1.27)	15–19 (17.2 \pm 1.12)	19–21 (20.2 \pm 0.75)
Scales—nostril to eye	10–13 (11.45 \pm 0.74)	10–12 (11.1 \pm 0.67)	12–13 (12.5 \pm 0.55)
Scales—ear to eye	16–21 (19.2 \pm 1.27)	17–21 (18.9 \pm 1.38)	21–24 (22.7 \pm 1.03)
Scales around nostril	5 (5)	3–5 (4.2 \pm 0.58)	5 (5)
Contact anterior nasals	82% (4 with single granule)	0%	100% (1+2 to 2+3)
Upper labials	10–13 (11.7 \pm 0.73)	9–10 (9.6 \pm 0.52)	9–11 (10.0 \pm 0.63)
Lower labials	9–12 (10.5 \pm 0.89)	9–11 (9.4 \pm 0.67)	9–10 (9.5 \pm 0.55)

TABLE 3. Uncorrected pairwise genetic distances of *Afroedura gorongosa* **sp. nov.** with other members of the *Afroedura transvaalica-loveridgei-bogerti* clade and *A. hawaquensis* for 16S rRNA (compare text, Table 1 and Fig. 3). Given are minimum (MIN), maximum (MAX) and \bar{x} values of uncorrected pairwise sequence divergence, presented in % of 400 bp of the 16S rRNA gene; SD= standard deviation; N= number of vouchers per clade; Nc= number of direct sequence comparisons.

Species	MIN (with <i>bogerti</i> s.l. intra-clade distances)	MIN (without <i>bogerti</i> s.l. intra-clade distances)	max	\bar{x} (with/without <i>bogerti</i> s.l. intra-clade distances)	SD (with/without <i>bogerti</i> s.l. intra-clade distances)	intra-clade distances	N	Nc
<i>Afroedura hawaquensis</i>	18.70	18.70	22.00	20.41	0.95	-	1	37
<i>A. transvaalica</i>	13.12	13.20	19.37	15.75	1.56	-	1	37
<i>A. loveridgei</i>	15.59	15.59	22.02	17.97	1.50	0.27–3.49	3	105
<i>A. gorongosa</i> sp. nov.	14.47	14.47	19.53	16.72	1.33	0	3	105
<i>A. bogerti</i> 1	7.68	17.16	21.38	12.31/19.03	3.88/1.51	0	4	136
<i>A. bogerti</i> 2	7.68	16.44	20.96	13.56/18.26	3.15/1.19	0–4.60	10	296
<i>A. bogerti</i> 3	6.64	16.10	21.93	12.07/17.91	4.11/1.67	0	5	165
<i>A. bogerti</i> 4	6.64	13.12	20.63	12.25/16.10	3.24/1.77	0–4.61	11	297

In summary, both genetics and morphology (particularly diagnostic features such as the rostral and nasal condition, and the number of midbody scale rows and precloacal pores) confirmed that the Gorongosa population should be considered as a new, undescribed species within the genus *Afroedura* which is described below.

***Afroedura gorongosa* sp. nov.**

(Figs. 4–5)

Afroedura transvaalica (part) Broadley 1966, p. 111.

Holotype. ZMB 83293 (GNP 484), adult male, western flank of Mount Gorongosa, Gorongosa National Park, Sofala Province, Mozambique (1038 m a.s.l., 18°28'04.3"S, 34°02'53.2"E), collected by M.-O. Rödel and M.F. Barej, 11 December 2015.

Paratypes (three specimens). ZMB 83290 (GNP 438), adult female, with incision in left thigh; PEM R22220 (GNP 439, previously ZMB 83291), adult female, with incision in left thigh; ZMB 83292 (GNP 440; will later be deposited in the zoological collection of the E.O. Wilson Laboratory in Gorongosa National Park), adult male, with everted hemipenes and incision in left thigh; collected on 22 May and 21 July 2015 by J.A. Guyton and P. Naskrecki from gallery forest near Murombodzi Waterfall, Mount Gorongosa, Gorongosa National Park, Sofala Province, Mozambique (842 m a.s.l.; 18°29'0.1"S, 34°2'34.6"E).

Additional material (two specimens). ZMB 83288 (GNP 433), adult male, ZMB 83289 (GNP 434), adult female; both collected in April 2015 by H. Farooq, P. Naskrecki and J.A. Guyton from the top of Bunga Inselberg, Gorongosa National Park, Sofala Province, Mozambique (approx. 200 m a.s.l., 18°35'58.1"S, 34°20'34.8"E).

Etymology. The specific name refers to Mount Gorongosa and Gorongosa National Park in Central Mozambique, to which the species is endemic. We suggest Gorongosa Flat Gecko is a suitable common name. *Afroedura*, based on *Oedura*, is feminine and the specific epithet is treated as a noun in apposition.

Diagnosis. A member of the *A. transvaalica*-complex in possessing two pairs of enlarged scansors per digit and a strongly verticillate and flattened tail (Jacobsen *et al.* 2014). Differs from other members of the complex by having 97–102 midbody scale rows (less than 95 in *A. bogerti*-complex, 113–120 (\bar{x} = 117) in *A. loveridgei* and 102–119 in *A. transvaalica* (102–118, \bar{x} = 109 in South Africa—Jacobsen *et al.* 2014; 108–119, \bar{x} = 114 in Zimbabwe adjacent to Mount Gorongosa); by the rostral bordering the nostril (nostril excluded from rostral in *A. loveridgei*); by the anterior nasals being separated by 1–3 granules (always in broad contact in *A. loveridgei*; usually in broad contact in *A. transvaalica* - <3% in South Africa populations, 18% separated by a single granule in Zimbabwe adjacent to Mount Gorongosa); in having 19–22 scales between the anterior borders of the eyes (15–19 in *A. loveridgei*; 17–20 in South African *A. transvaalica*, and 15–19 in Zimbabwe populations adjacent to Mozambique); and in having a higher average number of precloacal pores in males (8–13, \bar{x} = 10; 6–10, \bar{x} = 8 in *A. transvaalica*; 8–10, \bar{x} = 9 in *A. loveridgei*).

Holotype description.

Morphology. Adult male; SVL 50.8 mm; tail 52.2 mm (partly regenerated), with a small incision in the left thigh for the removal of muscle tissue. Head and body dorsoventrally depressed; HL 12.3 mm, HW 9.0 mm, broadest at mid-eye and 1.37x longer than wide. Eye large (3.7 mm wide), pupil vertical with indented margins; circumorbital scales small and granular, becoming elongate, almost ciliate, at upper posterior margin. Snout rounded, 4.9 mm long, longer than distance between eye and ear openings (3.6 mm). Scales on top of snout granular, rounded and convex, the largest being 2/3rds the width of the scales on the back, which are granular and juxtaposed, with no intervening minute granules. Scales on snout almost twice as large as those on crown and throat. Scales on belly flattened, imbricate, more-or-less ovate at mid-ventrum, and twice the size of lateral granules and 1.5x those along backbone. Ear opening deep, oblique and roughly oval, only half as high as wide.

Limbs well developed, hindlimbs slightly longer than forelimbs, both without obvious mite pockets at posterior margin of limb insertions. All digits with a large pair of distal scansors, separated by a large, curved claw, and followed after a large gap (twice length of terminal scansor) by a smaller pair of scansors; infero-median row of digital scales enlarged transversely, particularly towards the scansors, where the terminal scale adjoining the first pair of scansors may be medially constricted, swollen and scansor-like; 12 scale rows under 4th toe.

Nostril pierced between rostral, 1st supralabial and three nasal scales; the supranasal being much larger than the subequal postnasals and separated by a granule bordering the rostral, followed behind by two smaller granules. Rostral roughly rectangular but with its upper edges elongated due to extensions into the nostril. Nine supralabials on each side, the labial margin flexing dorsad at the rictus, with 1–2 minute scales proximal to the flexure. Nine infralabials on either side, with a small scale proximad to the flexure. At the lip, mental slightly narrower than adjacent infralabial, only 2/3rds the width of rostral, and in contact with two distinctly elongate postmental scales.

Approximately 20 scales across crown at level of front of eye; 13 scales between nostril and front of eye; 23 scales from front of ear to back of eye; 99 scales around midbody.

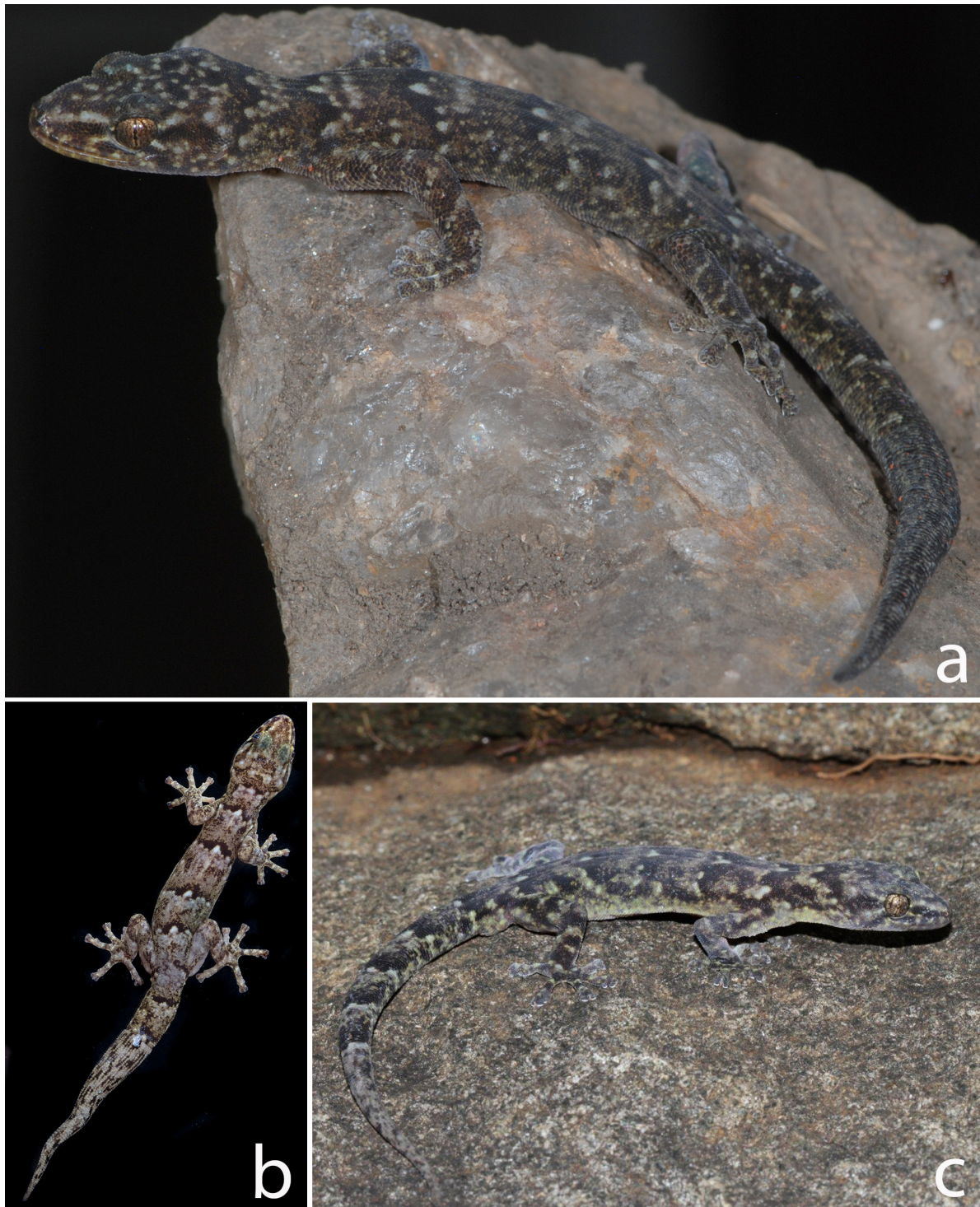


FIGURE 4. *Afroedura gorongosa* sp. nov. a) male holotype (ZMB 83293, Mount Gorongosa, Mozambique; photo: M.-O. Rödel); b) female paratype (ZMB 83292, Mount Gorongosa, Mozambique; photo: P. Naskrecki) showing dorsal pattern and regenerated tail; c) *Afroedura gorongosa* (ZMB 83289, Bunga Inselberg, Gorongosa National Park, Mozambique; photo: C. Dorse).

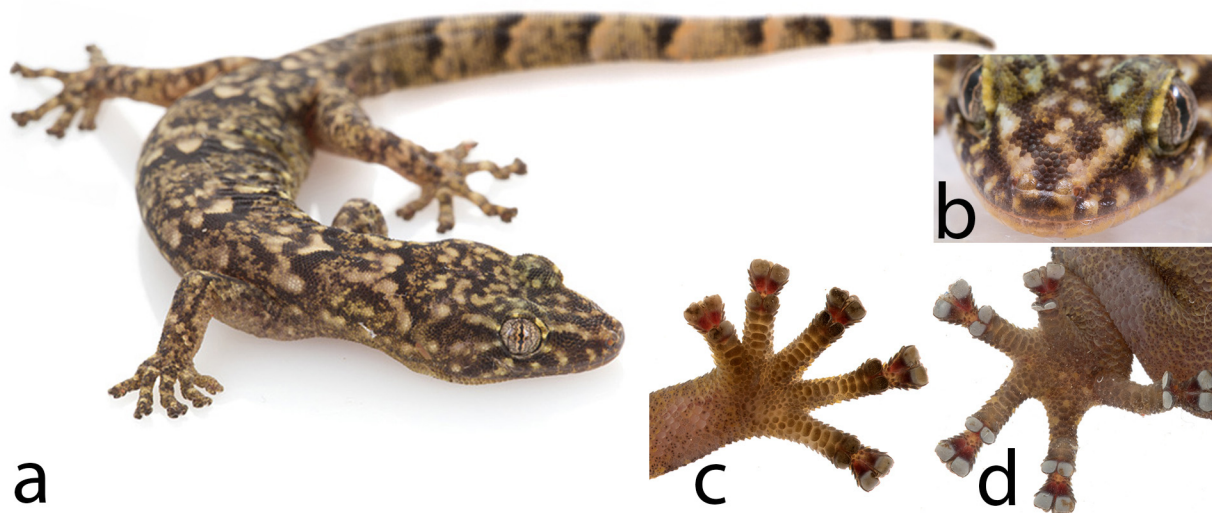


FIGURE 5. *Afroedura gorongosa* sp. nov. female paratype (PEM R22229, previously ZMB 83291, Mount Gorongosa, Mozambique; photos: P. Naskrecki); a) general habitus and dorsal coloration; b) close up of nasal region showing diagnostic features of: presence of internasal granules, and posterior projection of rostral to border the nostril; c) close up of lower side of left forelimb; and d) close up of right hind foot showing two paired scensors.

A roughly V-shaped row of 13 precloacal pores occurs eight scale rows anterior to the cloacal lip, with these scales more imbricate and triangular adjacent to the precloacal pores. Original portion of tail slightly dorsoventrally flattened and indistinctly verticillate, without obvious lateral constrictions; each verticil comprising 6–7 imbricate rows of scales dorsally and 5 imbricate scale rows ventrally, and with ventral scales approximately twice the size of those on dorsal surface. Hemipenial pouches well-developed, with an angular, ventro-lateral series of 3 enlarged tubercular scales on each side (largest nearest cloaca), and with two openings of the cloacal sacs on the posterior lip of the cloaca.

Colour in life (from photographs, Fig. 4a and unpublished). Dark black-brown above with a series of five white dorsal spots (4–5 scales across) between the fore- and hind-limb insertions, that are surrounded by a chocolate brown zone that encompasses a series of 2–4 laterally arranged smaller pale spots (2–3 scales wide), and posteriorly by a diffuse pale region that forms an irregular band across the mid dorsum. Top of head, flanks and upper surfaces of limbs with small, scattered pale spots. Head with a dark brown band across the posterior edge of crown encompassing a small central pale spot; a vague, thin pale canthal stripe, extends on both sides from the nasal region to front of eye; upper and lower labials grey-brown with diffuse yellowish bars; iris reddish brown with a heavy dark brown reticulation, and pupil with crenulated edge. Original segment of tail mottled in dark brown and pale blotches; regenerated tail grey with vague darker blotches. Ventrums mottled grey-cream.

Colour in preservative. Dark black-brown above with irregular markings on back, comprising four equally spaced dark bars, each with a central white spot 4–5 scales wide, and an irregular, paler brown bar behind; top and sides of head, flanks and upper surfaces of limbs with small, irregular pale spots; ventral surface of throat, neck, belly, limbs and tail uniform dark grey. Side of head and labials dark brown, with a few scattered pale spots on upper labials, and vague pale edges to lower labials.

Variation in paratypes and additional material (Figs. 4b, 4c, 5; Tables 3–4).

Morphology. SVL from 54.6 mm (ZMB 83289) to 61.2 mm (PEM 22220); head length 1.24–1.38 times head width (max. in paratypes 1.38); snout only 1.5 times diameter of eye in one specimen. The supranasals always separated by granules, usually with a single large granule in contact with the rostral between the supranasals, followed by 2–3 smaller granules in lateral contact; the first upper labial and rostral always enters the nostril, and the width of the rostral at the lip margin is always wider than that of the mental (except in ZMB 83290 where they are subequal); always two postmental scales; supralabials more than in holotype (10–11), infralabials (9–10); scales between anterior edge of eye 19–21; scales between nostril and anterior edge of orbit 12–13; scales between

anterior edge of ear and rear margin of orbit 21–24; scales around mid-body 97–101; subdigital lamella beneath 4th toe 10–11; dorsal scales per tail verticel 7–8; ventral scales per tail verticel 5.

In one female (ZMB 83290) the terminal, medially-constricted subdigital lamella of the 3rd toe of left foot is swollen and scissor-like, bearing small setae. Precloacal pores 8–13 in males, females without dimples in precloacal scales (as in *A. transvaalica*, but unlike *A. loveridgei* where five females had 5–9 dimpled precloacal scales, that lacked secretory activity, and only one had none).

Colour in life (based on female paratype PEM R22229). Boldly patterned, with six dorsal dark transverse bands, posteriorly edged with cream, the first on the neck, the second and sixth at the fore- and hindlimb insertions, respectively, and with three thin bands equally spaced between them on the body; background colour of body, head and upper surfaces of limbs flecked on light brown and cream with occasional pale spots 2–4 scales wide; a dark canthal stripe runs through the rostral to the front of the eye, with a paler zone above; the scales of the anterior-dorsal region of the orbital rim are bright yellow, with a faint yellowish infusion of the crown scales between the eyes; the original tail is boldly barred dorsally with seven, subequally-spaced, dark brown-black bars with a yellow posterior edge; belly uniform cream with scattered yellowish scales, greyer on ventral surfaces of limbs and tail.

Colour in preservative. Similar to holotype, but dorsum pale brown to grey; larger dorsal markings usually reticulated, occasionally forming irregular transverse bands (6–7 from occiput to between hindlimbs); smaller dorsal markings vary from vague to distinct. A few specimens have irregular pale blotches along the posterior edges of the darker dorsal patches/bands, and also scattered on the dorsal surfaces of the limbs and back. Dorsal surface of regenerated tails usually with irregular pale and dark blotches that may form wavy bands, and which become flecks or grey blotches below.

Size. Largest male (ZMB 83288)—SVL 56.5 mm, tail (partially regenerated) 55.7 mm; largest female (PEM R22220)—SVL 61.2 mm, tail (original) 64.0 mm. It is thus intermediate in size between *A. transvaalica* (male—max. SVL 72 mm, female—max. SVL 64 mm) and *A. loveridgei* (male—max. SVL 59 mm, female—max. SVL 58 mm). Only one of six specimens had an original tail (105% SVL).

Hemipenis (based on ZMB 83292). Approximately 5 mm long, with a simple, smooth, possibly longitudinally flounced pedicel; capped with two large cups covered with fine calyculate ornamentation; sulcus simple and draining into the conjoined base of the distal cups.

Distribution. Known from only three localities in the Mount Gorongosa region (Fig. 2). The holotype and paratypes, plus various non-collected individuals, have been found on the western flanks of Mount Gorongosa between about 900 and 1100 m a.s.l. (Figs. 6a–c). Access to further potential areas on the mountain, i.e. rock faces at the eastern slopes, was not possible due to security concerns. The additional material and various non-collected specimens have been observed at a lower altitude on the Bunga Inselberg (about 212 m a.s.l.) in the north-western corner of the National Park, approximately 40 km from the type locality (Fig. 6d). No tissue samples from the Bunga individuals were available, and the assignment of these individuals to the new species was thus based on morphological similarity.

Natural history. The Gorongosa National Park is situated in Central Mozambique approx. 100 km south-west of the Zambezi River, and is in the southern part of the great African Rift Valley. Mount Gorongosa is an isolated granite mountain massif rising to 1863 m a.s.l., north-west of the National Park's plains. At its highest elevations the massif's plateau is covered with montane grasslands and forest patches dominated by cypresses (*Widdringtonia nodiflora*); the upper slopes of the mountain (900–1600 m) support a belt of moist evergreen forest. The type series was collected in an area between 900 and 1100 m on the western flanks of the mountain (Figs. 6a–c, 7). The paratypes were collected in a small alcove beneath a boulder pile in the closed-canopy riverine forest beside the Murombodzi Waterfall, and thus in comparatively cool and moist microclimates (Figs. 6c, 7). Some rocks with lizards present were located within the splash zone of the waterfall. Other specimens were observed but not collected at this site. The holotype was collected from a deep narrow crack in a large granite rock (i.e. 8 m³) in highly degraded grassland below the edge of the rainforest and almost fully exposed to the sun (Fig. 6b). It was the only specimen seen at that site. At both sites the new species lived in syntopy with the cordylid *Smaug mossambicus* (FitzSimons, 1958).

The additional non-type material comes from the Bunga Inselberg (Fig. 6d), a partly eroded inselberg composed mostly of trachyte in the north-western corner of the national park, covered and surrounded by dense Miombo woodland at a relatively low altitude (approx. 212 m a.s.l.). Here the geckos were observed during the day and at night in several places in deep cracks between very large boulders. No geckos were observed outside of

these cracks. Syntopic lizards were *Smaug mossambicus*, the skink *Trachylepis margaritifera* (Peters, 1854) and the gecko *Hemidactylus platycephalus* Peters, 1854. Further sympatric, but not syntopic geckos were: *Lygodactylus* cf. *capensis* (Smith, 1849), *Pachydactylus punctatus* Peters, 1854 and *Chondrodactylus turneri* (Gray, 1864).

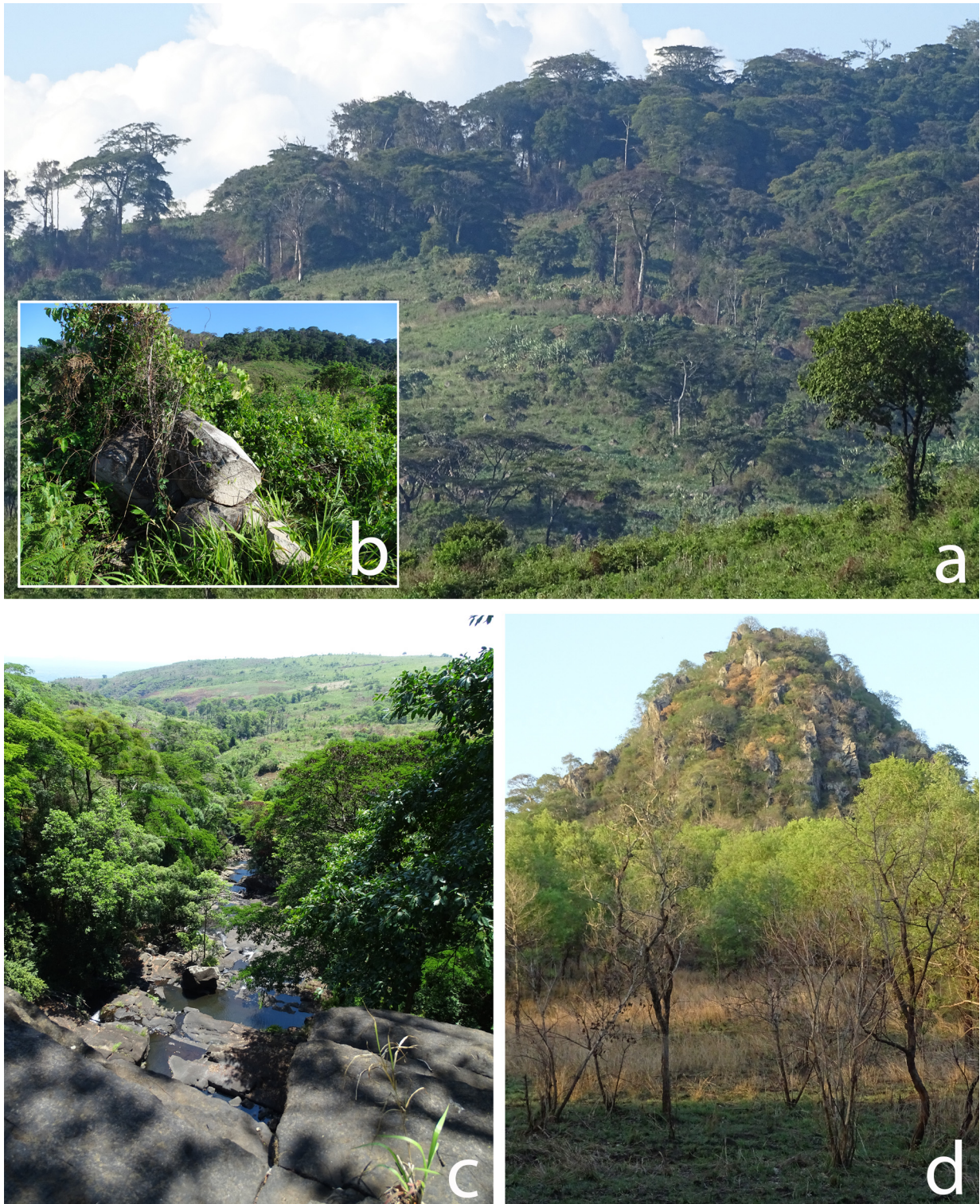


FIGURE 6. Habitats of *Afroedura gorongosa* sp. nov. on Mount Gorongosa (a–c); a) edge of rainforest on Mount Gorongosa, the holotype was collected in a rock-crack of an isolated boulder in an open area close to the rainforest at 1038 m a.s.l. (b) and in rocky areas of the Murombodzi river (c; compare Fig. 7); d) rocky habitat on the top of Bunga Inselberg, Gorongosa National Park, Mozambique (photos: M.-O. Rödel).

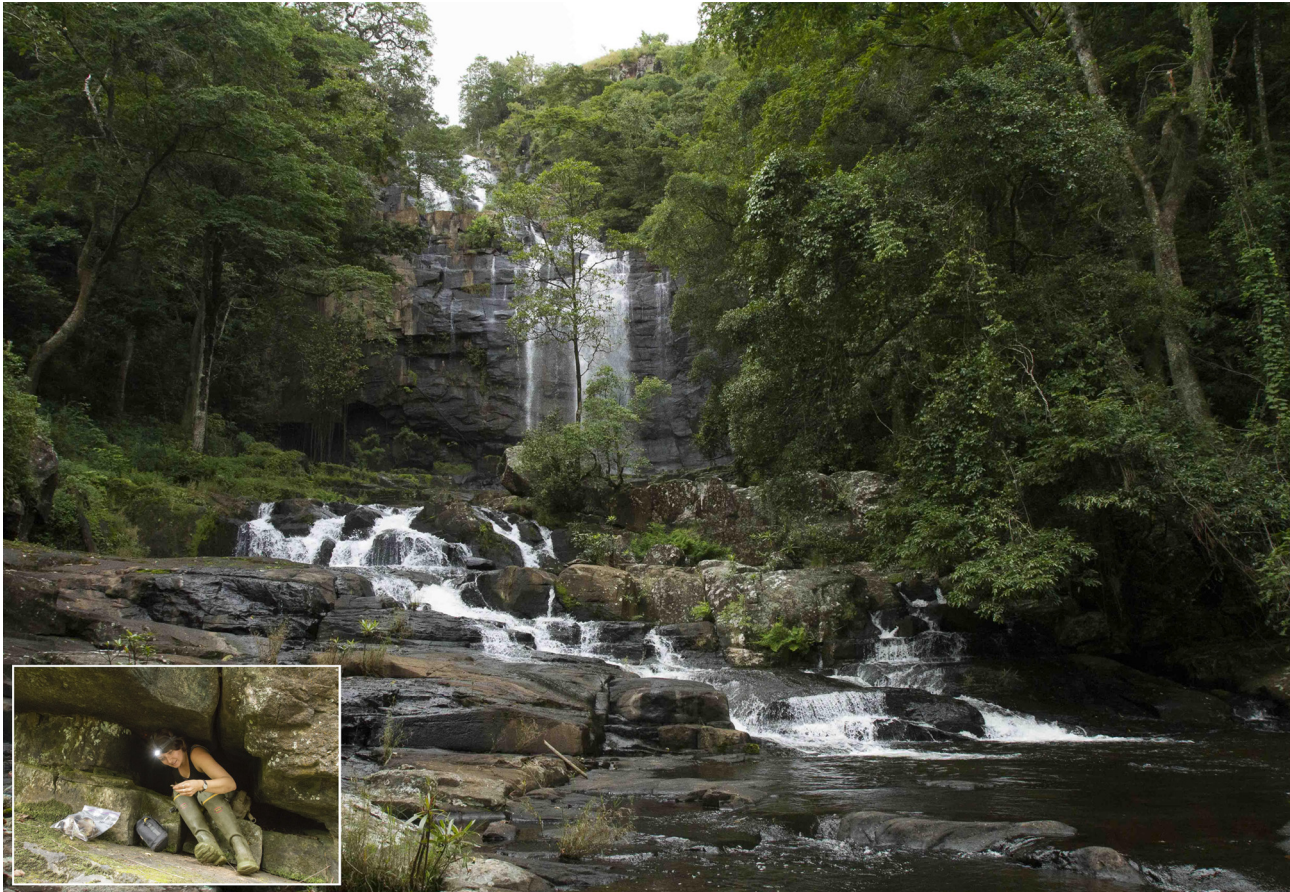


FIGURE 7. Habitat of *Afroedura gorongosa* sp. nov. paratypes around Murombodzi waterfall, Mount Gorongosa; inset figure: J.A. Guyton collecting one of the paratypes (photos: J. Poole).

TABLE 4. Museum accession numbers and measurements (mm) for the type series and additional material (AM) of *Afroedura gorongosa* sp. nov.

Mus. No	Status	Sex	SVL	Tail	Head length	Head width	Snout	Eye	Ear-eye	Internostril distance
ZMB 83293	Holotype	M	50.8	52.2	12.3	9.0	4.9	3.7	3.6	
PEM R22220 (ZMB 83291)	Paratype	F	61.2	64.0	14.8	11.2	6.1	3.8	4.4	2.2
ZMB 83290	Paratype	F	61.1	49.3	15.0	10.9	6.1	3.9	4.7	2.1
ZMB 83292	Paratype	M	56.4	45.6	13.0	10.3	5.2	3.5	4.1	1.9
ZMB 83288	AM	M	56.5	55.7	14.2	11.1	6.0	4.2	4.3	1.6
ZMB 83289	AM	F	54.6	na	13.8	10.7	5.5	3.8	4.4	1.8

The new species was observed regularly between April and December 2015. Like *A. transvaalica*, it is tolerant of conspecifics and frequently several specimens, and sometimes as many as over 20, were observed sheltering in deep rock crevices. One adult female (ZMB 83290) contained two eggs of approximately 11.5 x 7.5 mm.

Conservation Status. The population of the new gecko present on the lower slopes of Mount Gorongosa is threatened by illegal deforestation taking place within the riverine forest adjacent to Murombodzi Waterfall. Slash-and-burn removal of tall, old growth trees around the rocks may cause changes to the humidity and water availability in these currently very moist, shaded microhabitats that seem to be preferred by the lizards. Reforestation efforts led by Gorongosa National Park and introduction of shade-grown coffee as an alternative to slash-and-burn agriculture still practiced around the mountain will hopefully slow or halt the loss of the native riverine and evergreen vegetation in that area. On Bunga Inselberg the population of *A. gorongosa* is currently

protected within the core area of the National Park and no immediate threat to its survival exists, though deforestation for agriculture is slowly encroaching on the area. However, based on the existence of only a few known sites and small area of occupancy, i.e. the presumed restriction to a fragmented range on Mount Gorongosa and potentially some rocky areas surrounding the mountain, as well as the ongoing high rate of habitat degradation and conversion on the mountain, the species may be considered highly threatened, potentially justifying an assessment as Endangered or even Critically Endangered. Further surveys and formal IUCN Red List assessment are required to confirm this.

Key to the *Afroedura transvaalica*-group

1. Midbody scale rows more than 95 2
- Midbody scale rows less than 95; Angola. *A. bogerti* (*sensu lato*)
2. Rostral bordering nostril 3
- Rostral excluded from nostril *A. loveridgei*
3. Anterior nasals in contact (very rarely separated); scales around midbody-South Africa 102-118 (\bar{x} = 109), northern Zimbabwe 108-119 (\bar{x} = 114). *A. transvaalica*
- Anterior nasals separated by 1-3 granules; scales around midbody 99-101 (\bar{x} = 100) *A. gorongosa* **sp. nov.**

Discussion

The molecular phylogeny of *Afroedura* (Jacobsen *et al.* 2014) revealed cryptic diversity in the diverse populations of *A. transvaalica* studied. They noted “There is clear and well supported genetic substructure within ... *A. transvaalica*”, and this presumably led Bauer (2014) to note that cryptic diversity in *A. transvaalica* deserved further study. Broadley (1962) noted a clinal increase in precloacal pore number within populations of *A. transvaalica*, with the lowest counts occurring on both sides of the Limpopo River. This was confirmed by Jacobsen *et al.* (2014), and is also reflected in midbody scale row counts, which are also higher in northern Zimbabwe (see Table 3) compared with South Africa (Jacobsen *et al.* 2014). This morphological variation correlates with genetic substructure and supports Bauer’s (2014) call for further study on the species. We do not, however, consider Hewitt’s name *Oedura transvaalica platyceps*, based on material from Umtali (= Mutare), eastern Zimbabwe, to be available for the Gorongosa population due to their high midbody scale counts. It may, however, be available for northern populations of *A. transvaalica*, should future studies on the species confirm species-level divergence.

Mount Gorongosa and its surroundings exhibit high levels of biodiversity and represent an important centre of regional endemism, of which *A. gorongosa* **sp. nov.** is the most recent addition. As noted by Jacobsen *et al.* (2014), the major clades of *Afroedura* are generally restricted geographically, with the largest disjunction occurring within the *A. transvaalica* clade, where *A. bogerti* occurs in western Angola. The inclusion of the latter within the *A. transvaalica* clade is well-supported morphologically, as well as genetically, in both this study and that of Jacobsen *et al.* (2014). Similar east-west disjunctions are known in other rupicolous groups, including the cordylid genera *Cordylus* (Stanley *et al.* 2011, 2016) and *Platysaurus* (Branch & Whiting 1997; Whiting *et al.* 2015), and where previously associated with movement of Aeolian Kalahari sands in the Plio-Pleistocene (Broadley 1978; Jacobsen 1994b). However, recent phylogenetic studies of these and related genera (Bauer & Lamb 2002; Broadley *et al.* 2014) indicate that initial ancestral isolation was associated with earlier cladogenic events (Scott *et al.* 2004), although later climatic oscillations may have driven subsequent speciation in these genera (Whiting *et al.* 2015; Stanley *et al.* 2016; Branch *et al.* 2017). Moore *et al.* (2017) discuss the effect on plant diversity and endemism of widespread erosion along the eastern margin of southern and eastern Africa from the Late Palaeogene to the present. This accentuated the relief of the eastern escarpment bordering the Manica Highlands, Zimbabwe, and gave rise to the characteristic regional bornhardt or inselberg topography, of which Mount Gorongosa is the most prominent survivor.

The close relationship of *A. gorongosa* **sp. nov.** to adjacent congeners in the eastern highlands of Zimbabwe is reflected in other endemic taxa from Mount Gorongosa, e.g. the freshwater crab *Potomonautes gorongosa* (Cumberlidge *et al.* 2016), the forest shrew *Myosorex meesteri* (Taylor *et al.* 2013), and the dwarf leaf chameleon *Rhampholeon gorongosae* (Broadley 1971). All of these examples involve genera with species diversity associated

with the archipelago of montane isolates in adjacent Zimbabwe, Malawi and central Mozambique (freshwater crabs: Daniels & Bayliss 2012; Phiri & Daniels 2012; shrews: Taylor *et al.* 2013; chameleons: Branch & Tolley 2010; Branch *et al.* 2014).

Acknowledgements

We thank the following curators/collections managers for support and/or access to material in their care: Werner Conradie and Gill Watson, Port Elizabeth Museum; Frank Tillack, Museum für Naturkunde Berlin; Denise Hamerton, IZIKO Museum (= South African Museum) for forwarding images of the type of *A. t. platyceps*; Chris Dorse for images of the new species used in Figs. 4c and 5c, Joyce Poole for inset picture in Fig. 7 and Ninda Baptista for the Portuguese Resumé. Travel costs to Berlin by WRB were supported by Incentive funding from the National Research Foundation, South Africa. Travel and maintenance costs for JAG were supported by a U.S. National Science Foundation Graduate Research Fellowship, a National Geographic Young Explorers Grant, and Princeton University. Support for biodiversity surveys that resulted in the discovery of the new species was provided by Greg Carr, Gorongosa Restoration Project, and the Prager Family. We also thank Mateus Mutemba, Marc Stalmans, and Pedro Muagura for research and collecting permits, and Lucilia Chuquela from the Natural History Museum, Maputo (MHN) for specimen export permits.

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MATERIAL EXAMINED

(not listed in type description)

Afroedura transvaalica: **ZIMBABWE**: PEM R10069, R10071, R10081-82 (AM 7317, 4 specimens), R10070 (AM 7406), R10072-79 (AM 6695, 8 specimens), 'Musami, near Salisbury' (= 57 km E Harare, 1731DB, 17°44'S, 31°34'E); PEM R10082-97 (AM 7512, 15 specimens), R12952, Bikita, Masvingo District (2031DB, 20°07'S, 31°43'E); PEM R10098-111 (AM 7250, 13 specimens), Mtoko (= Mutoko, 1732AC, 17°24'S, 32°13'E); PEM R12953-55 (AMR 0155, 3 specimens), Mtoko (17°02'S, 32°01'E), PEM R12956-57 (AMR 0155, 2 specimens), Empandeni (20°03'S, 27°04'E); PEM R10112 (AM 7250), Driefontein (Mission), Gweru District (19°25'S, 30°42'E, 1930BD). **SOUTH AFRICA**: PEM R16072-73 (AM 5114, 2 specimens, co-types *Oedura transvaalica* Hewitt, 1925), 'Nijelele River, Soutpansberg', Limpopo Province (2229CC); PEM R20786, 10 km south of Messina, Limpopo Province (22°28'27"S, 29°59'25"E).

Afroedura loveridgei: ZMB 74437, 74384-85, "Mozambique"; PEM R8208-09, 8334-39 (eight specimens), 7 km west Songa turn-off, Tete Province, Mozambique (16°20'49"S, 33°27'89"E, 271 m asl); PEM R21992 (EI 0191), 15 km east Moatize, Mozambique (16°06'01" S, 33°53'04.52" E).