New distribution records of herpetofauna in Mozambique south of the Zambezi River, including additional records from Parque Nacional de Banhine

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The herpetofauna of Mozambique remains poorly documented despite several recent surveys. This paper presents additional distribution records for a number of species from Mozambique, based on recent field excursions and older material at the Ditsong National Museum of Natural History. The new records suggest that a number of taxa are more widely distributed in southern Mozambique than is currently known while the additional material suggests that the taxonomy of some species requires further research.

Keywords: Reptiles, Amphibians, Distribution.

INTRODUCTION

Mozambique remains relatively unexplored herpetologically despite the works of Peters (1854, 1882). Little extensive fieldwork was subsequently conducted, with major works which incorporated Mozambique herpetofauna such as FitzSimons (1962), Poynton (1964), Broadley (1990*b*), Poynton and Broadley (1985*a*,*b*, 1987, 1988, 1991), Channing (2001) and Du Preez and Carruthers (2009), based on incidentally collected specimens housed in various museums.

More recently Broadley (1990*a*, 1992) surveyed the herpetofauna of the islands off the Mozambican coast, describing a number of additional taxa, particularly insular forms. Other recent contributions include Downs and Wirminghaus (1997), Branch *et al.* (2005), Bates and Maguire (2009), Branch and Tolley (2010), Jacobsen *et al.* (2010), Bates and Broadley (2012) and Pietersen *et al.* (2013). Despite this, much of the interior of the country still remains herpetologically unexplored, hampering determination of distribution patterns and relationships.

This study contributes to the growing volume of data on the herpetofauna of Mozambique by reporting on recent field observations and undocumented specimens lodged in the Ditsong National Museum of Natural History (formerly Transvaal Museum) (TMSA).

MATERIAL AND METHODS

The records of the Ditsong museum were perused to identify specimens collected south of the Zambezi River in Mozambique and additional material was collected and/or photographed during recent fieldwork in Mozambique. Collecting localities were compared to the distribution maps for each species as depicted in major reference works (Broadley, 1990*b*; Branch, 1998; du Preez and Carruthers, 2009) as well as other recent publications (Broadley and Broadley, 1997; Jacobsen *et al.*, 2010; Pietersen *et al.*, 2013). Range extensions in many cases are approximate due to the distribution maps used in these publications often being the personal approximations of those authors. Additional material from Parque Nacional de Banhine housed in the National Museum of Zimbabwe (NMZB) that was overlooked during the compilation of the preliminary checklist (Pietersen *et al.*, 2013) is incorporated herein as Appendix 1.

Reptile nomenclature follows the most recent list available from The Reptile Database (available online at www.reptile-database.org) and amphibian nomenclature follows du Preez and Carruthers (2009). Photographs taken of reptiles and amphibians have been lodged online on the University of Cape Town's Animal Demography Unit Virtual Museums (vmus.adu.org.za).

Measurements of specimens were taken to the nearest millimetre using a Vernier calliper or material rule, and are presented as SVL + tail length. Scale counts were made using the methods outlined in Pietersen *et al.* (2013). Specimens that were collected have been deposited in the Ditsong National Museum of Natural History in Pretoria (TMSA) or the National Museum Bloemfontein (NMB).

SYSTEMATIC ACCOUNT

REPTILIA
SQUAMATA
SERPENTES
LAMPROPHIIDAE
Aparallactinae

Aparallactus nigriceps (Peters, 1854)

A specimen (TM 86148) was collected in *Brachystegia* woodland near Panda (24°10′38″S, 34°38′05″E, 20 m a.s.l.) by Greg Davies on 15 June 2011. It measured 104 mm SVL + 23 mm tail length and had five supralabials, the 2nd and 3rd entering orbit, 4th and 5th in contact with parietal. Five infralabials, 15 scale rows at midbody, 125 ventrals, 40 subcaudals. The black nape extends six scale rows posterior to the parietals along the dorsal midline and is bordered posteriorly by a narrow (one scale-wide) pale yellow band. The back is light brown in colour and the venter pale yellow. The ventral count (125) extends the known range slightly upwards, while the subcaudal count (40) is also higher than that previously recorded for *A. nigriceps* (20–35). This locality is 85 km from the only known locality of *A. nigriceps* at Inhambane (Broadley, 1990*b*).

COLUBRIDAE
Colubrinae

Dipsadoboa flavida broadleyi Rasmussen, 1989

A specimen was collected in Maputo Special Reserve in 1956 (TM 25045). This record is approximately 50 km SSE of the population known to occur around Maputo (Branch, 1998).

ELAPIDAE
Elapinae

Dendroaspis angusticeps (A. Smith, 1849)

A specimen was collected at Praia Morrungulo (TM 82116), while the author and Greg Davies observed a dead individual on a dirt road between Massinga and Sitila (23°13′20″S, 35°11′24″E, 91 m a.s.l.), Inhambane Province, on 18 June 2011. The latter individual was readily identified by the coffin-shaped head, pale mouth lining, presence of front fangs and having 19 scale rows at midbody. It measured 1083 mm SVL + 325 mm tail length. These records substantiate the previous isolated record from this area (Broadley, 1990*b*; Branch, 1998).

AMPHISBAENIA
Amphisbaenidae

Zygaspis vandami arenicola Broadley & Broadley, 1997

A specimen was collected at Sao Jorge de Limpopo, Gaza Province (NMB R9593) (22°51′56″S, 32°08′37″E, 228 m a.s.l.). This specimen measured 156 mm SVL + 33 mm tail and had 203 body annuli, 48 caudal annuli and four pre-cloacal pores. The specimen was collected in the top layer of sand and leaf litter in sandveld habitat beneath a Panga Panga *Xeroderrhis stuhlmannii* tree.

Another specimen (NMB R10356) was collected in open mixed *Julbernardia* woodland 2.8 km NNW of Mabaiane (23°33′39″S, 34°47′00″E, 116 m a.s.l.), while a third individual captured at this site was released.

The Sao Jorge de Limpopo specimen is 110 km SE of the nearest recorded locality in Gonarezhou National Park, Zimbabwe (Broadley and Broadley, 1997). The Mabaiane specimen is 145 km south of the nearest known locality of Mapinhane, Vilanculo District, Mozambique (Broadley and Broadley, 1997). Further collecting may well indicate that this taxon occurs widely across the Mozambican plain.

SAURIA
SCINCIDAE
Scincinae

Scelotes* sp. *cf. arenicola

Three specimens (TM 86140, TM 86142–43) were collected in a Lebombo Ironwood *Androstachys johnstonii* forest 50 km north of Manjacaze (24°20′34″S, 33°56′31″E, 83 m a.s.l.) on 14 June 2011. A further two individuals were released. Three specimens (TM 86141, TM 86144–45) were collected in evergreen thickets between Sitila and Bobiane (23°04′24″S, 35°03′58″E). These specimens have 18 scale rows at midbody and all lack limbs, although a slight indentation is present above the vent. All specimens have three supraoculars, five supraciliaries, six supralabials (4th beneath the eye) and five infralabials, with the exception of TM 86143 which has five supraciliaries (left) and four supraciliaries (right). TM 86144 has the parietals separated by a nuchal scale behind the interparietal. TM 86141 has the right parietal fused with the interparietal. The 1st supralabial is narrowly separated from the rostral by a small (TM 86140, TM 86141, TM 86143 and TM 86144) to vestigial (TM 86142 and TM 86145) nasal scale. Meristic data for these specimens are summarized in Table 1.

The specimens have a pale median dorsal band five scales wide, within which are four rows of spots that form dark ‘lines’ (each scale row dark-edged). The head and sides of the body (and tail) are dark. The ventral scales are infuscate, at least ventro-laterally, but may become white ventro-medially. The subcaudal scales are lightly infuscate (entirely white in some specimens), becoming white ventro-medially and posteriorly. The chin was pale

Table 1
Comparative meristic data for the eight newly collected *Scelotes* sp. specimens, compared with literature values (Broadley, 1990*a*, 1994; Jacobsen *et al.,* 2010) for *S. arenicola* and *S. insularis*. Measurements are in millimetres.

TMSA Number	SVL	Tail	Ventrals	Subcaudals	Notes
TM 86055	80	58	93	73	
TM 86056	85	37	94	49	Tail tip regenerating
TM 86140	60	44	90	61	Tail tip regenerating
TM 86141	70	50	95	63	Tail tip regenerating
TM 86142	67	55	92	79	
TM 86143	60	50	92	73	
TM 86144	44	36	92	85	
TM 86145	56	40	91	69	Tail tip regenerating
Scelotes arenicola	68–88		95–117	82–93	
Scelotes insularis	57–64		84–89	76	

red, fading after preservation; the tail tips were bright metallic blue, this coloration having faded in alcohol but leaving faint remnants in some specimens. Regenerated tail portions are dark grey.

The Manjacaze specimens are 71 km WNW of the nearest *S. arenicola* population at Coguno (Broadley, 1994) and 290 km SW of the nearest known *S. insularis* population on the San Sebastian Peninsula (Jacobsen *et al.*, 2010). The Sitila/Bobiane records are 96 km NNW of the nearest *S. arenicola* population at Inhambane (Broadley, 1994) and 115 km SSW of the nearest known *S. insularis* population on the San Sebastian Peninsula (Jacobsen *et al.*, 2010).

***Scelotes* sp.**

Two specimens (TM 86055–56) were collected on the Panda floodplain 35 km southwest of Panda town, Inhambane Province, southern Mozambique (24°15′05.3″S, 34°26′57.0″E, 63 m a.s.l.) on 21 June 2011. Both have 20 scale rows at midbody and the third supraciliary fused with the anterior supraocular on both sides. The nasal shield is minute and crescent-shaped and coloration resembles *S. arenicola*. Both specimens have ventral counts intermediate between *S. arenicola* and *S. insularis,* and TM 86055 (with an intact tail) has a low subcaudal count (Table 1). These records are 50 km east of the Manjacaze site.

Lygosominae

Trachylepis boulengeri (Sternfeld, 1911)

Specimens have been collected on the 'North bank, opposite Zuenya Confluence', *c.* 16°23′05″S, 33°47′33″E (TM 83300) and at Cabora Bassa Dam (TM 83314). These records are about 170 km north and 350 km NW, respectively, of the nearest part of the known range of this species as depicted in Branch (1998), although it occurs as far north as Tanzania (Branch, 1998; Spawls *et al.*, 2002).

Trachylepis margaritifera (Peters, 1854)

Wulf D. Haacke collected a series (TM 29185–90) at Massangena on the Save River [*c.* 21°32′33″S, 32°57′03″E, 121 m a.s.l.]. These records are approximately 80 km east of the nearest known population in eastern Zimbabwe (Branch, 1998).

Trachylepis varia (Peters, 1867)

A specimen was collected on Inhaca Island by Breyer and Adendorf in 1919 (TM 3995), but was not subsequently reported from the island by Broadley (1990*a*).

LACERTIDAE

Ichnotropis capensis (A. Smith, 1838)

A specimen was collected at Vilanculos (TM 30108), which is 20 km NE (across the bay) of the population on the San Sebastian Peninsula (Jacobsen *et al*., 2010). An individual was seen and photographed in *Brachystegia* woodland near Panda (24°09′01″S, 34°28′21″E, 80 m a.s.l.) on 23 December 2012 (SARCA no. 8507), approximately 50 km inland of the population known to occur in a narrow strip along the coast as far north as Inhambane (Branch, 1998).

Meroles squamulosus (Peters, 1854)

Wulf D. Haacke collected a series of specimens (TM 29220–44) from Massangena on the Save River [ca. 21°32′33″S, 32°57′03″E, 121 m a.s.l.]. These records are about 85 km east of the population occurring on the eastern border of Zimbabwe (Branch, 1998). Another specimen was collected at Vilanculos (TM 30109), 20 km NW (across the bay) from the population reported from the San Sebastian Peninsula (Jacobsen *et al.*, 2010).

AGAMIDAE

Agama armata Peters, 1854

Specimens have been collected 8 km (*c.*

23°07′38″S, 35°24′39″E, 84 m a.s.l.; TM 36461) and 20 km (*c.* 23°03′42″S, 35°28′54″E, 108 m a.s.l.; TM 36473) north of Rio das Pedras as well as at Mambone (20°59′S, 33°39′E, 156 m a.s.l.; TM 30100), Barra Falsa (*c.* 22°55′39″S, 25°25′58″E, 23 m a.s.l.; TM 36474), 8 km east of Jangamo (*c.* 24°06′28″S, 35°23′48″E, 47 m a.s.l.; TM 36476–78), Praia do Morrungulo (*c.* 23°13′56″S, 35°29′29″E, 4 m a.s.l.; TM 83445) and Mahangati (22°37′49″S, 35°29′54″E, 27 m a.s.l.; TM 85584). These additional records provide further evidence of this species occurring near the coast, at least as far north as the San Sebastian Peninsula (Jacobsen *et al.*, 2010).

GEKKONIDAE

Homopholis walbergii (A. Smith, 1849)

A specimen was collected at Inhassoro, Inhambane Province (TM 31245) by P. de Moor in 1965. This record is 315 km east of the nearest population in eastern Zimbabwe and 315 km north of the nearest population at Inhambane (Branch, 1998), although only 30 km west of the insular population on Bazaruto Island (Broadley, 1990*a*, 1992).

Lygodactylus chobiensis FitzSimons, 1932

An adult male specimen (TM 86061) was collected in the branches of a *Combretum* cf. *collinum* tree on Catapu Concession (18°02′32″S, 35°11′55″E, 91 m a.s.l.). This specimen has a well-developed dorsal pattern, superficially resembling a *Hemidactylus* in size and dorsal coloration, although displaying a bright yellow belly and well-developed scansors on the tail tip. The throat is black with two white chevrons parallel to the jaw-line. There are nine pre-anal pores. It measured 40 mm SVL+ 43 mm tail length. Two further individuals were seen on the concession at 18°04′08″S, 35°12′17″E, 92 m a.s.l., while yet another individual was observed at 18°04′51″S, 35°10′22″E, 85 m a.s.l. All were relatively high up (= 3 m) on tree trunks or branches in *Combretum* cf. *collinum* woodland and dense savanna. They occurred sympatrically with *Lygodactylus c. capensis* at most localities, although the latter species tended to occur lower down in the vegetation (typically <2 m above the ground). These records are 265 km SE of the nearest recorded locality of Tete (Branch, 1998).

AMPHIBIA
ANURA
HYPEROLIIDAE

Hyperolius acuticeps Ahl, 1931

H. G. Breyer and G. van Dam each collected a specimen (TM 6932 and TM 6937, respectively) at Guija (2432DB) in September 1915. These specimens were originally accessioned as *Hyperolius marmoratus*. Although both specimens now appear pure white after lengthy preservation, the elongated body form and acutely pointed snout suggest that both specimens are in fact referable to *H. acuticeps*. This locality is situated 200 km north of the population at Maputo (Poynton and Broadley, 1987).

Hyperolius argus Peters, 1854

A single individual was found sheltering in leaf litter in a bush clump on a hill crest on Inhaca Island (26°00′28″S, 32°55′39″E, 40 m a.s.l.) by the author and John Davies on 4 July 2008 (SAFAP no. 1101). Although this species occurs widely across southern Mozambique (Poynton and Broadley, 1987; du Preez and Carruthers, 2009), Broadley (1990*a*, 1992) did not record this species from Inhaca Island.

***Hyperolius* sp.**

Hyperolius individuals photographed in a pan at Rio Savane, north of Beira (SAFAP no. 1100; 19°38′39″S, 35°07′30″E, 5 m a.s.l.), could not be positively assigned to any currently recognized taxon. The photographed individuals resemble *H. tuberilinguis* in size and proportions. The ground colour is dirty mustard yellow, with dark speckling on the dorsum. There is a moderately broad, pale dorsolateral stripe and the lateral surfaces below this stripe are unmarked pale yellow. The terminal discs of the fingers and toes are bright yellow and the concealed surfaces pale white. The venter is smooth and white and the vocal sac is pale cream-yellow, but not bright yellow as in *H. tuberilinguis*. The call of this species was noticeably different from sympatric *H. tuberilinguis*, as was the microhabitat preference.

Sympatric *H. tuberilinguis* were observed and heard calling from emergent grass at the margin of the pan, whereas *Hyperolius* sp. was observed and heard calling from dense sedges in water 1.5–1.8 m deep in the centre of the pan. Surveys combined with molecular and sonogram analyses are required to verify the identity of these populations.

All the photographs of reptiles taken in Parque Nacional de Banhine and reported in Pietersen *et al.* (2013) have been submitted to the Animal Demography Unit virtual museums (FrogMAP and ReptileMAP) as stable URLs. The species and corresponding Virtual Museum accession numbers are listed in Appendix 2.

DISCUSSION

Broadley (1990*a*) described *Scelotes arenicola insularis* from the Bazaruto Archipelago, distinguishing it from typical *S. a. arenicola* on the basis of its smaller size, lower ventral counts and darker coloration. In his revision of eastern *Scelotes*,

Broadley (1994) elevated *S. a. insularis* to species status. All eight *Scelotes* specimens reported on here have ventral and subcaudal counts that are intermediate between *S. arenicola* and *S. insularis*. With the exception of the Panda specimens, the colour appears intermediate between the two species as well, being darker than *S. arenicola* specimens in the TMSA collection, but lighter than the two *S. insularis* specimens collected on the San Sebastian peninsula (Jacobsen *et al.*, 2010). The series of *Scelotes* collected at Manjacaze and between Sitila and Bobiane suggests that there is overlap in both the morphological characters and coloration previously used to distinguish these two taxa. The two Panda specimens also have scale counts that are intermediate between *S. arenicola* and *S. insularis*, although coloration resembles *S. arenicola*. These specimens are interesting as both have 20 midbody scale rows and the third supraciliary fused with the anterior supraocular. Although Broadley (1994) mentions that *S. arenicola* rarely does have 20 midbody scale rows, this feature in conjunction with the supraciliary–supraocular fusion is curious. Further collecting at this and nearby sites is required to determine whether these are two aberrant specimens or whether these traits are more widespread. I have not been able to examine the *S. arenicola* and *S. insularis* specimens in NMZB, thus interpretation of the above observations is limited, but it does suggest that further research into these taxa is warranted.

In addition to the two *Hyperolius acuticeps* specimens collected at Guija, the *H. marmoratus taeniatus* material collected at this site by Breyer and van Dam at the same time is interesting as all the material approaches *H. melanoleucus* in dorsal coloration. Further collecting at this site should be undertaken to confirm the continued presence of *H. acuticeps* and to provide fresh *H. m. taeniatus* material for examination.

The northern populations of *Hyperolius* also deserve further research, as there may be undescribed taxa in this region. The taxonomy of *Hyperolius* is complicated by the reliance on dorsal colour patterns, a trait that varies geographically and even within the same locality, and it is only with molecular analyses and advertisement call analyses that taxa can reliably be delineated (see for example Wieczorek *et al.*, 2000). The advertisement call of *Hyperolius* sp. from Rio Savane was noticeably different to sympatric *H. tuberilinguis* and this population warrants further investigation, ideally using both call and molecular analyses.

Based on the results of this investigation, a number of taxa are now known to have wider distributions in southern Mozambique than was previously recorded. Morphological traits also suggest that some taxa would benefit from additional collecting and research, especially the *Scelotes arenicola-insularis* group and *Hyperolius* spp. Additional fieldwork will undoubtedly result in more range extensions, which will ultimately assist researchers in gaining a better understanding of the biogeography of this interesting region.

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Appendix 1

Additional material collected in Parque Nacional de Banhine by Joao Tello at Matchova and Acampamento Ruiz (2233CA) in 1972, housed in the National Museum of Zimbabwe (NMZB).

Taxon	Museum accession number
Monopeltis decosteri Boulenger, 1910	NMZB-UM 28797–837
Trachylepis depressa (Peters, 1854)	NMZB-UM 28882, 2890
Trachylepis punctulata (Bocage, 1872)	NMZB-UM 28848, 28884–887
Trachylepis striata (Peters, 1844)	NMZB-UM 28894
Nucras caesicaudata Broadley, 1972	NMZB-UM 28880
Cordylus jonesii (Boulenger, 1891)	NMZB-UM 28875–878, 28901
Agama armata Peters, 1854	NMZB-UM 28847
Chondrodactylus turneri (Gray, 1864)	NMZB-UM 28896
Hemidactylus mabouia Morreau de Jonnes, 1818	NMZB-UM 28895
Lygodactylus c. capensis (A. Smith, 1849)	NMZB-UM 28871
Poyntonophrynus fenoulheti (Hewitt & Methuen, 1913)	NMZB-UM 28850–862, 28888–893
Ptychadena mossambica Peters, 1854	NMZB-UM 28899
Tomopterna krugerensis Passmore & Carruthers, 1975	NMZB-UM 28897–898

Appendix 2

Animal Demography Unit Virtual Museum accession numbers for herpetofauna photographed in Parque Nacional de Banhine and reported in Pietersen *et al.* (2013).

Taxon	VM record number
Stigmochelys pardalis (Bell, 1828)	SARCA 8479
Kinixys zombensis (Gray, 1831)	SARCA 8480
Pelomedusa subrufa (Lacépède, 1788)	SARCA 8481
Rhinotyphlops lalandei (Schlegel, 1844)	SARCA 8482
Amblyodipsas m. microphthalma (Bianconi, 1850)	SARCA 8483
Xenocalamus bicolor lineatus Roux, 1907	SARCA 8484
Boaedon capensis (Duméril & Bibron, 1854)	SARCA 8485
Rhamphiophis rostratus Peters, 1854	SARCA 8486
Psammophis subtaeniatus (Peters, 1854)	SARCA 8487
Aspidelaps scutatus fulafula (Bianconi, 1849)	SARCA 8488–89
Elapsoidea sundevallii longicauda Broadley, 1971	SARCA 8490–91
Naja annulifera Peters, 1854	SARCA 8492
Bitis a. arietans (Merrem, 1820)	SARCA 8493
Monopeltis sphenorhynchus Peters, 1879	SARCA 8494

Continued on p. 180

Taxon	VM record number
Trachylepis punctulata (Bocage, 1872)	SARCA 8495
Trachylepis striata (Peters, 1844)	SARCA 8496
Trachylepis varia (Peters, 1867)	SARCA 8497
Afroablepharus wahlbergii (A. Smith, 1849)	SARCA 8498
Meroles squamulosus (Peters, 1854)	SARCA 8499
Cordylus jonesii (Boulenger, 1891)	SARCA 8500
Agama armata Peters, 1854	SARCA 8501–02
Chamaeleo d. dilepis Leach, 1819	SARCA 8503
Chondrodactylus turneri (Gray, 1864)	SARCA 8504
Lygodactylus c. capensis (A. Smith, 1849)	SARCA 8505
Pachydactylus punctatus Peters, 1854	SARCA 8506
Amietophrynus garmani Meek, 1897	SAFAP 1091
Pyxicephalus edulis Peters, 1854	SAFAP 1092
Tomopterna krugerensis Passmore & Carruthers, 1975	SAFAP 1093
Tomopterna sp. Beira Dawood *et al.*, in prep.	SAFAP 1094 & cf. 1095
Tomopterna sp. Form A	SAFAP 1096
Tomopterna sp. Form B	SAFAP 1097
Tomopterna sp. Form C	SAFAP 1098
Chiromantis xerampelina Peters, 1854	SAFAP 1099