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A new species of spectacularly coloured flat lizard *Platysaurus* (Squamata: Cordylidae: Platysaurinae) from southern Africa

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Abstract

We describe a new species of flat lizard (*Platysaurus attenboroughi* sp. nov.) from the Richtersveld of the Northern Cape Province of South Africa and the Fish River Canyon region of southern Namibia. This species was formerly confused with *P. capensis* from the Kamiesberg region of Namaqualand, South Africa. Genetic analysis based on one mtDNA and two nDNA loci found *Platysaurus attenboroughi* sp. nov. to be genetically divergent from *P. capensis* and these species can also be differentiated by a number of scalation characters, coloration and their allopatric distributions. To stabilize the taxonomy the type locality of *Platysaurus capensis* A. Smith 1844 is restricted to the Kamiesberg region, Namaqualand, Northern Cape Province, South Africa.

Key words: southern Africa, lizard, new species, reptile, *Platysaurus attenboroughi* sp. nov., *Platysaurus capensis*

Introduction

Flat lizards (*Platysaurus*) belong to the Cordylidae, the only lizard family endemic to Africa (Stanley *et al.*, 2011), and currently comprise 26 taxa, including 15 subspecies (Mouton *et al.*, 2014). The last major taxonomic revision of the genus was by Broadley (1978; see also FitzSimons, 1943; Loveridge, 1944), although several new taxa have since been described (e.g. Jacobsen & Newbery, 1989; Jacobsen, 1994; Branch & Whiting, 1997) followed by a molecular phylogeny and biogeographic analysis of 14 taxa (Scott *et al.*, 2004). More recently, the generic relationships of the Cordyliformes were reassessed by Stanley *et al.* (2011) and *Platysaurus* was placed in its own subfamily (Platysaurinae). Resolving species boundaries has been constrained by the conservative nature of *Platysaurus* morphology (Broadley, 1978; Jacobsen, 1994), and this is currently being addressed in a comprehensive molecular systematics study of the genus (Keogh *et al.* in prep).

Flat lizards are found on rocky outcrops of granite, gneiss and sandstone (Broadley, 1978). The majority of species are found in rocky habitats in mesic savannah extending from southern Tanzania in the north to eastern South Africa and Swaziland in the south (Broadley, 1978; Spawls *et al.*, 2002). The *P. broadleyi-capensis* clade, however, is found in Succulent and Nama Karoo habitats in the Northern Cape Province of South Africa and southern Namibia, separated to the east by > 500 km from its nearest congener (*Platysaurus minor* in the Waterberg, Limpopo Province, South Africa) (Broadley, 1978; Branch & Whiting, 1997; Whiting, 2014). They are among the most dorso-ventrally flattened lizards, enabling them to squeeze into tight crevices where they seek refuge. Interestingly, the majority of species are allopatric (Broadley, 1978). In the few instances of sympatry, species pairs are either large- and small-bodied, and/or use different microhabitat (Broadley, 1978). *Platysaurus* are also strikingly sexually dimorphic: males are brightly coloured while females are drab and typically are smaller in both head and body size (Broadley, 1978; Jacobsen, 1989; Branch & Whiting, 1997). Juveniles and females of all

species except *P. ocellatus* are striped, and males of at least one species (*P. broadleyi*) are able to delay the development of male coloration (Whiting *et al.*, 2009). The most likely explanation for male ornamentation is sexual selection. In the Augrabies Flat Lizard (*P. broadleyi*), males (not females) have a UV-reflective throat that is used as an honest signal of fighting ability (Stapley & Whiting, 2006; Whiting *et al.*, 2006) and all species for which there are data or field observations engage in intense male contest competition over space and females (Whiting, 1999; Korner, 2000; Whiting *et al.*, 2003; Whiting *et al.*, 2006). *Platysaurus* are primarily insectivorous, although they will eat fruit such as figs when they are available (Broadley, 1978; Whiting & Greeff, 1997; Greeff & Whiting, 2000; Whiting, 2007). Foraging mode and behaviour have been studied in great detail in one species: *P. broadleyi* (reviewed in Whiting, 2007). This species has a somewhat plastic foraging mode consisting of a sit-and-wait strategy when feeding on insects (but with high frequency of short movements) and an active foraging mode when searching for figs (Whiting & Greeff, 1997; Whiting, 2007).

While the majority of species occur in mesic savanna in the south-eastern region of Africa, two species (*P. capensis* and *P. broadleyi*) occur in Succulent and Nama Karoo habitats in the semi-arid regions of the Northern Cape Province of South Africa and southern Namibia (Branch & Whiting, 1997; Whiting, 2014). *Platysaurus capensis* was the first flat lizard to be described (Smith, 1844), although the type locality “Great Namaqualand” was vague (see below). Subsequently, Broadley (1978) noted subtle morphological differences between the Augrabies Falls National Park population and other populations to the west, but was unaware whether intermediate populations occurred along the Orange River between the known populations. He therefore deferred taxonomic assessment of the Augrabies population. Subsequent surveys in this region have not revealed intermediate populations (see updated map in Whiting 2014), and following the examination of additional material and male coloration in live animals, Branch and Whiting (1997) described the eastern population from the Gordonia-Kenhardt district of the Northern Cape Province of South Africa as a new species, *Platysaurus broadleyi* (Augrabies Flat Lizard). The specific status of *P. broadleyi* was based on allopatry (ca. 100 km separating it from the western populations), two autapomorphies (a feature of scalation and distinct male coloration) and significant differences in eight other scalation features (Branch & Whiting, 1997; Mouton *et al.*, 2014; Whiting, 2014).

In their analysis, Branch and Whiting (1997) identified three operational taxonomic units (OTUs) within *P. capensis sensu stricto*, among which they analysed meristic and morphological data. The OTUs comprised a northern population from the Fish River canyon region of southern Namibia; an adjacent population from the Richtersveld in the far north of the Northern Cape Province; and a southern population from the Kamiesberg region of central Namaqualand. For ease these OTUs are referred to as the Namibia, Richtersveld and Namaqualand populations. Although Branch and Whiting (1997) only detected relatively minor differences in scalation between these populations, biogeographic breaks and differences in male coloration suggested a need to evaluate further levels of divergence among these populations using molecular data. We now present new material from the Fish River Canyon population (Namibia) that allows us to examine levels of divergence between these three populations, and to reassess their taxonomic status.

Methods

We reassessed our morphological and meristic data after including additional matching data for new specimens deposited in the Ditsong Museum (Table 1), as detailed in Branch and Whiting (1997). We incorporate the new morphological findings into our diagnoses below and summarize them in Table 2 and 3. Tissues for genetic analysis were obtained from 17 *P. capensis* from the Fish River Canyon (Namibia), the Richtersveld National Park, South Africa (Richtersveld), and from the Kamiesberg near Kamieskroon, South Africa (Namaqualand). In addition, six samples of *P. broadleyi* were obtained from Augrabies Falls National Park and Onseepkans, South Africa. *Platysaurus orientalis* and *Cordylus peersi* were used as outgroups. Tissue samples consisted of either liver or tail stored in 99% ethanol. We extracted genomic DNA from approximately 1 mm³ of tissue using EDNA HiSpEx tissue kit (Chaga) following the manufacturer’s protocols. For all individuals we sequenced data from the mitochondrial NADH dehydrogenase subunit 2 (ND2) gene using the primers L4437 and H5540 (Macey *et al.*, 1997) as well as a modified L4437 primer from this study (5' AAGCTCTTGGGCCCATACC 3'). For a subset of these individuals we also sequenced two nuclear loci, neurotrophin 3 (*nt3*) (Townsend *et al.*, 2008) and kinesin family member 24 (*kif24*) (Portik *et al.*, 2012) (see Table 1 for details on the individuals sequenced for each locus). PCR and sequencing follows the same protocol as in Pepper *et al.* (2014).

TABLE 1. Locality information and GenBank numbers for all individuals used in the molecular phylogeny and all individuals examined for meristics and morphology. Lab numbers are used in Figure 2. More detailed locality information in Branch and Whiting (1997). RSA = South Africa. SAM 17377 (4 specimens), SAM 18368 (16 specimens), SAM 18068 (5 specimens)

Species	Lab #	Voucher #	Locality	ND2	NTF3	Kif
<i>Cordylus peersi</i> (outgroup)	PLOG08			KR606528	KR606552	KR606521
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 200066	1.1 km N Kook Riv Rd to Koubank Riv, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 193576	16.2 km W of SE Gate, border Richtersveld NP, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 193577	16.2 km W of SE Gate, border Richtersveld NP, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 193385	22.8 km E Sendelingsdrift, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 193386	22.8 km E Sendelingsdrift, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 193388	22.8 km E Sendelingsdrift, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 193390	22.8 km E Sendelingsdrift, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 193456	8.7 km E Hellskloof Pass gate, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 193459	8.7 km E Hellskloof Pass gate, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 193462	8.7 km E Hellskloof Pass gate, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 193465	8.7 km E Hellskloof Pass gate, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		PEM 7777	Akkedis drive, Richtersveld National Park, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 21478	Between Geligwerkberg & Doornkloof, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 24176	Between Geligwerkberg & Doornkloof, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		PEM 12417	Central flats: Nichodemus, Richtersveld National Park, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35446	Confluence Fish/Orange Rivers, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35447	Confluence Fish/Orange Rivers, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35461	Confluence Fish/Orange Rivers, Lüderitz District, Namibia			

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TABLE 1. (Continued)

Species	Lab #	Voucher #	Locality	ND2	NTF3	Kif
<i>Platysaurus attenboroughi</i> sp.nov.		SAM 43609	Farm Namuskluft, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35335	Farm Namuskluft, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35336	Farm Namuskluft, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35340	Farm Namuskluft, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35341	Farm Namuskluft, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35342	Farm Namuskluft, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 47646	Farm Namuskluft, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35380	Farm Spitzkop, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35381	Farm Spitzkop, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35382	Farm Spitzkop, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 201884	Farm Witzputz Sud, Lüderitz, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 201885	Farm Witzputz Sud, Lüderitz, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 28272	Fish River Canyon, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 28273	Fish River Canyon, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 36830	Fish River Canyon, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.	PL087		Fish River Canyon, Namibia	KR606551	KR606554	KR606526
<i>Platysaurus attenboroughi</i> sp.nov.	PL088		Fish River Canyon, Namibia	KR606549	KR606555	
<i>Platysaurus attenboroughi</i> sp.nov.	PL089		Fish River Canyon, Namibia	KR606550	KR606556	
<i>Platysaurus attenboroughi</i> sp.nov.	PL090		Fish River Canyon, Namibia	KR606546		
<i>Platysaurus attenboroughi</i> sp.nov.	PL091		Fish River Canyon, Namibia	KR606544		
<i>Platysaurus attenboroughi</i> sp.nov.	PL092		Fish River Canyon, Namibia	KR606548		
<i>Platysaurus attenboroughi</i> sp.nov.	PL093		Fish River Canyon, Namibia	KR606545		
<i>Platysaurus attenboroughi</i> sp.nov.	PL094		Fish River Canyon, Namibia	KR606547		
<i>Platysaurus attenboroughi</i> sp.nov.		TM 28270	Fish River Canyon, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 17879	Goodhouse, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 17867	Goodhouse, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 17868	Goodhouse, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 17869	Goodhouse, Northern Cape Province, RSA			

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TABLE 1. (Continued)

Species	Lab #	Voucher #	Locality	ND2	NTF3	Kif
<i>Platysaurus attenboroughi</i> sp.nov.		TM 17870	Goodhouse, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 17871	Goodhouse, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 17872	Goodhouse, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 17874	Goodhouse, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 17875	Goodhouse, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 17876	Goodhouse, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		SAM 45027	Granite Boss, Kuboos/khubus, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		SAM 45028	Granite Boss, Kuboos/khubus, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 27857	Groenkloofrivier, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 27858	Groenkloofrivier, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 27859	Groenkloofrivier, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 27860	Groenkloofrivier, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		SAM 45583	Hell's Kloof, Vioolsdrift, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 56157	Henkries Pump St., Orange River, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 56450	Henkries Pump St., Orange River, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.	PL005		Kamiesberg region, near Kamieskroon, Northern Cape Province, RSA	KR606530	KR606559	KR606524
<i>Platysaurus attenboroughi</i> sp.nov.	PL006		Kamiesberg region, near Kamieskroon, Northern Cape Province, RSA	KR606543	KR606563	
<i>Platysaurus attenboroughi</i> sp.nov.	PL007		Kamiesberg region, near Kamieskroon, Northern Cape Province, RSA	KR606542	KR606560	
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35438	Kuamsib Mountain, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		PEM 524	Kuboos, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 15854	Kuboos-Lekkersing, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		SAM 11348	Kuboos/khubus, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		SAM 18681	Kuboos/khubus, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		SAM 18682	Kuboos/khubus, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		SAM 18684	Kuboos/khubus, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 15879	Kuboos/khubus, Richtersveld, Northern Cape Province, RSA			

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TABLE 1. (Continued)

Species	Lab #	Voucher #	Locality	ND2	NTF3	Kif
<i>Platysaurus attenboroughi</i> sp.nov.		TM 15880	Kuboes/khubus, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 15883	Kuboes/khubus, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 15937	Kuboes/khubus, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 27849	Kuboes/khubus, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35414	McMillan's Pass, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35281	Numes Mine, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 12090	Numes, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		PEM 7602	On path: Hellskloof-Nicodaemus, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 52584	Ploegberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 53855	Ploegberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 53856	Ploegberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 53857	Ploegberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 53858	Ploegberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 53859	Ploegberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 53860	Ploegberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 53861	Ploegberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 53862	Ploegberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 53863	Ploegberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 53864	Ploegberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		SAM 18824	Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		PEM 12460	Road to Nicodaemus, Richtersveld National Park, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 35330	Rosh Pinah, Lüderitz District, Namibia			
<i>Platysaurus attenboroughi</i> sp.nov.		TM 52761	Tatasberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		CAS 200057	Tierhoek, Ploesberg, Richtersveld, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		PEM 11882	Tierhoek, South of Ploegberg, Northern Cape Province, RSA			
<i>Platysaurus attenboroughi</i> sp.nov.		SAM 18527	Vioolsdrift, Orange Riv., Northern Cape Province, RSA			

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TABLE 1. (Continued)

Species	Lab #	Voucher #	Locality	ND2	NTF3	Kif
<i>Platysaurus broadleyi</i>	PL003		Augrabies Falls National Park, Northern Cape Province, RSA	KR606529	KR606561	KR606523
<i>Platysaurus broadleyi</i>	PL330		Augrabies Falls National Park, Northern Cape Province, RSA	KR606535	KR606566	
<i>Platysaurus broadleyi</i>	PL331		Augrabies Falls National Park, Northern Cape Province, RSA	KR606536	KR606568	
<i>Platysaurus broadleyi</i>	PL332		Augrabies Falls National Park, Northern Cape Province, RSA	KR606534	KR606569	
<i>Platysaurus broadleyi</i>		CAS 126053	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		CAS 126054	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		CAS 126056	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		PEM 12466	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		PEM 12467	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		PEM 12578	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		SAM 18368	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79828	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79830	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79831	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79832	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79833	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79834	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79835	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79837	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79841	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79843	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79848	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 79849	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 80482	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 80483	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 80484	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 80501	Augrabies Falls National Park, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		TM 80509	Augrabies Falls National Park, Northern Cape Province, RSA			

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TABLE 1. (Continued)

Species	Lab #	Voucher #	Locality	ND2	NTF3	Kif
<i>Platysaurus broadleyi</i>		SAM 17377	Baks Putz, Bakriver, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>		PEM 12257	Klein Pella, Northern Cape Province, RSA			
<i>Platysaurus broadleyi</i>	PL333		Onseepkans, Northern Cape Province, RSA	KR606533	KR606570	
<i>Platysaurus broadleyi</i>	PL172		Onseepkans, Northern Cape Province, RSA	KR606532	KR606562	
<i>Platysaurus broadleyi</i>		TM 55344	Steyer's Kraal, Northern Cape Province, RSA			
<i>Platysaurus capensis</i>		TM 34050	5 km E Kamieskroon, Northern Cape Province, RSA			
<i>Platysaurus capensis</i>		TM 34068	5 km E Kamieskroon, Northern Cape Province, RSA			
<i>Platysaurus capensis</i>		TM 66318	Carolusberg, Springbok, Northern Cape Province, RSA			
<i>Platysaurus capensis</i>		SAM 18024	Kamies, Northern Cape Province, RSA			
<i>Platysaurus capensis</i>	PL002		Kamiesberg region, near Kamieskroon, Northern Cape Province, RSA	KR606540	KR606572	
<i>Platysaurus capensis</i>	PL004		Kamiesberg region, near Kamieskroon, Northern Cape Province, RSA	KR606531	KR606557	KR606525
<i>Platysaurus capensis</i>	PL171		Kamiesberg region, near Kamieskroon, Northern Cape Province, RSA	KR606537	KR606558	
<i>Platysaurus capensis</i>	PL327		Kamiesberg region, near Kamieskroon, Northern Cape Province, RSA	KR606541	KR606567	
<i>Platysaurus capensis</i>	PL328		Kamiesberg region, near Kamieskroon, Northern Cape Province, RSA	KR606539	KR606565	
<i>Platysaurus capensis</i>	PL329		Kamiesberg region, near Kamieskroon, Northern Cape Province, RSA	KR606538	KR606564	
<i>Platysaurus capensis</i>		TM 13712	Kamieskroon, Northern Cape Province, RSA			
<i>Platysaurus capensis</i>		SAM 44320	Kamieskroon, Northern Cape Province, RSA			
<i>Platysaurus capensis</i>		SAM 18068	Kamieskroon, Northern Cape Province, RSA			
<i>Platysaurus capensis</i>		SAM 18024	Kamieskroon, Northern Cape Province, RSA			
<i>Platysaurus capensis</i>		TM 13711	Kamieskroon, Northern Cape Province, RSA			
<i>Platysaurus orientalis</i> (outgroup)	PL079		Mpumalanga, RSA	KR606527		KR606522

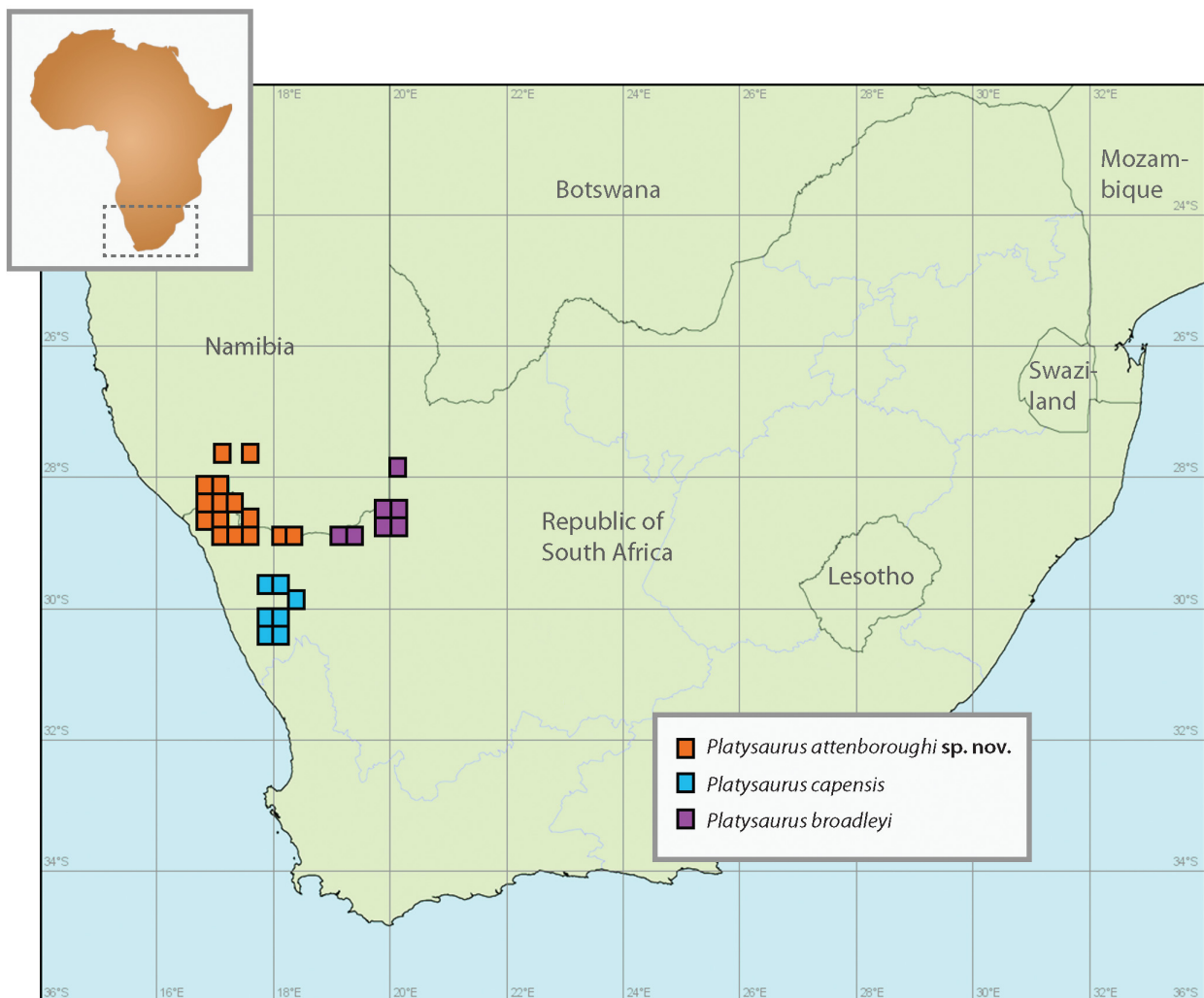


FIGURE 1. Map depicting the distribution of *Platysaurus broadleyi*, *P. capensis*, and the newly described *Platysaurus attenboroughi* sp. nov. Data from *Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland*. South African National Biodiversity Institute, Pretoria.

We used maximum likelihood (ML) and unweighted parsimony approaches to analyse the data. ML analyses were conducted using RAxML-VI-HPC v7.0.4 (Stamatakis, 2006). We concatenated the data from the three loci and partitioned the combined dataset by gene. We implemented the general time-reversible substitution model with gamma-distributed rates among sites (GTR + G), with the best ML tree determined using 20 distinct randomized Maximum Parsimony (MP) starting trees. Bootstrap support was determined using 1000 replicates. Heuristic parsimony analyses were implemented with the computer program PAUP*4.0b10 and we used TBR branch swapping and ran the parsimony analysis five times from random starting points to make sure overall tree space was well searched.

Results and discussion

Following the removal of ambiguously aligned nucleotide sites, the final *nd2* dataset comprised 1005 base-pairs (bp), *nt3* comprised 599 bp, and *kif24* comprised 546 bp, totaling 2150 bps for the concatenated dataset. Figure 2 shows the maximum likelihood phylogeny based on the combined data. *P. broadleyi* is recovered as a strongly supported group whereas the '*P. capensis*' species group is comprised of three strongly supported clades

(corresponding to the populations Namibia, Richtersveld and Namaqualand). The Richtersveld and Namibia clades together form a subclade supported by moderate bootstrap levels (72/76) and they also are geographically proximate and morphologically similar relative to the Namaqualand clade (see diagnoses below). Uncorrected genetic distances based on the nd2 data set range from 0.067–0.73 (between *P. broadleyi* and *P. capensis* from Namaqualand), 0.065–0.081 (between *P. broadleyi* and the Richtersveld-Namibia clades) and 0.036–0.046 (between *P. capensis* from Namaqualand and the Richtersveld-Namibia clades). We consider the cryptic diversity identified within *Platysaurus capensis* populations is best reflected by treating the combined Namibia-Richtersveld populations as specifically distinct from that in Namaqualand. The Namibia-Richtersveld populations are similar in coloration, linked via historical drainage systems in this xeric habitat, and are geographically widely separated from the Namaqualand *P. capensis* clade in the succulent Nama-Karoo.

This raises the issues of the allocation of Andrew Smith's name and to which population the name *P. capensis* should be applied? When describing *P. broadleyi*, Branch and Whiting (1997) argued that the type specimen of *P. capensis* likely came from a western population (then comprising the combined Namibia, Richtersveld and Namaqualand populations). Smith's (1844) type locality for *Platysaurus capensis* was simply "Great Namaqualand". This term is no longer used and has been replaced by Namaland for the area north of the Orange River in southern Namibia. However, in the early part of the 19th century it could have encompassed the whole of the current Namaqualand region and also adjacent southern Namibia, and therefore included all three populations currently assigned to *P. capensis*. FitzSimons (1943), commenting on the vagueness of Smith's type locality, noted (p 471) "Probably from Little Namaqualand" (=Namaqualand), Broadley (1978: p157) concluded "presumably in error for Little Namaqualand", and Haacke (1965; p29) considered that "A. Smith's record from Great Namaqualand is doubtful, as he never visited this area" (i.e. southern Namibia, which in the late 20th century was often termed Great Namaqualand).

There is evidence of intraspecific morphological variation between populations currently assigned to *P. capensis* (Branch & Whiting 1997), and the presence of a small "internasal" between the rostral and frontonasal in the type specimen (BM 1946.8.29.26) is a common condition in the Namaqualand population. However, this condition also occur as a rare variant elsewhere in the Namibia-Richtersveld populations, and for this reason Branch & Whiting (1997) did not feel justified in restricting the type locality "Great Namaqualand" to a more specific region. Our current findings now make this restriction imperative. The female holotype of *P. capensis*, although faded, still displays three prominent pale dorsal stripes, a feature that is more characteristic of females from Namaqualand, in which the dorsal stripes are more conspicuous than those from the northern populations (compare Fig. 4b and 4h). As both these features (coloration and internasal condition) suggest that Smith's type originated from the Namaqualand population, and as Smith's type locality ("Great Namaqualand") historically included the range of the Namaqualand population, we therefore apply the name *Platysaurus capensis* Smith 1844 to the Namaqualand population. However, flat lizards do not occur throughout Namaqualand, and all recent records of *P. capensis* south of the Richtersveld fall in the general Kamiesberg region (see map, Whiting 2014). During his travels Smith visited numerous places in the Namaqualand region, including Kamieskroon adjacent to the Kamiesberg (Kirby, 1965). To stabilize the situation we therefore restrict the type locality of *Platysaurus capensis* Smith 1844 to the Kamiesberg region, Namaqualand, Northern Cape Province, South Africa.

There are no junior synonyms for *P. capensis* and we have restricted the name *Platysaurus capensis* Smith 1844 to the Namaqualand population. There is thus no name available for the northern populations that we have shown to be specifically distinct from *P. capensis*. Although we have demonstrated genetic divergence between the Richtersveld and Namibian populations, we are more influenced by the similarity of their colour pattern, scalation and habitat, as well as their close proximity. The lower Orange River was previously known to occasionally run dry, and is not considered to be a meaningful barrier to gene flow between other reptiles with trans-Orange River distributions, e.g. *Goggia gemmula*, *Pachydactylus haackei*, *P. monicae* and *Bitis schneideri* (Bauer *et al.*, 1996; Branch *et al.*, 1996; Bauer & Branch, 2001; Bauer *et al.*, 2006). We therefore consider the populations of flat lizards from the Richtersveld and adjacent southern Namibia to be conspecific, and take this opportunity to describe them as a new species.

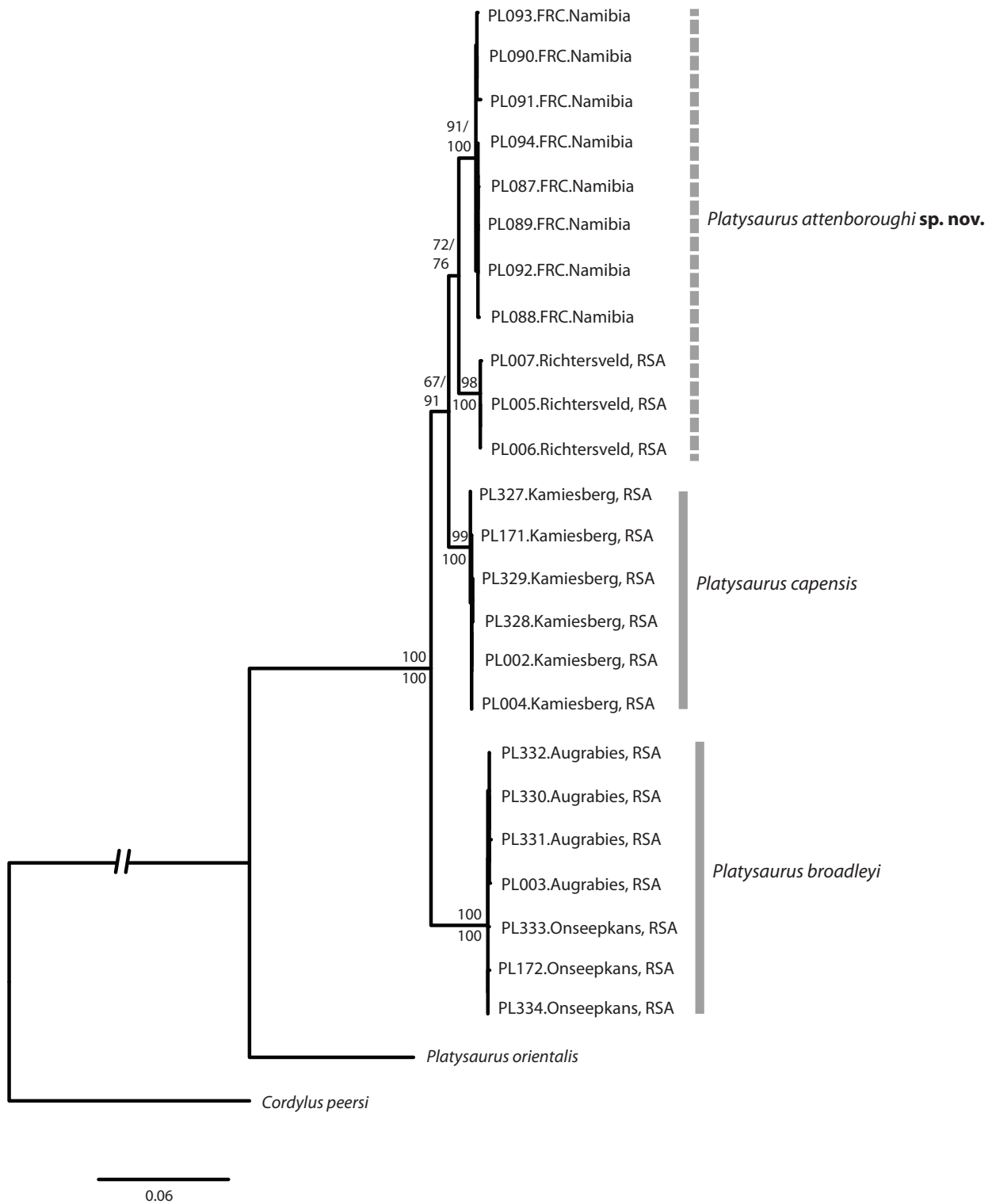


FIGURE 2. Maximum likelihood phylogram of *Platysaurus* species based on 2150 base pairs of the mtDNA locus *nd2* and the nDNA loci *nt3* and *kif24*. Numbers above nodes indicate likelihood bootstrap support while those below nodes indicate parsimony bootstrap support. The scale bar refers to the number of substitutions per site.



FIGURE 3. Sir David Attenborough inspects a rock crevice in prime flat lizard (*Platysaurus broadleyi*) habitat at Augrabies Falls National Park, South Africa, during the filming of *Life in Cold Blood* for the BBC, where he worked with two of the authors (MJW, JSK) in 2006.

Systematics of the *Platysaurus capensis* complex

Platysaurus capensis A. Smith 1844, Ill. Zool. S. Afr. Rept.: pl. XL.

English: Cape Flat Lizard

Afrikaans: Kaapse Platakkedis

Types. Holotype (lectotype) BM 65.5.4.110 (re-registered 1946.8.29.26); syntype (paralectotype) MHNP 2807 (2500).

Type locality. “Great Namaqualand”, retracted (above) to Kamiesberg region, Namaqualand, Northern Cape Province, South Africa.

Distribution. Restricted to the greater Kamiesberg region, from Carolusberg near Springbok south of Garies, Northern Cape Province. It is thus endemic to South Africa.

Remarks. The existence of the Paris specimen, listed as a syntype (Brygoo 1985), was not noted by Branch & Whiting (1997). If the Paris specimen is indeed part of Smith’s original material, Broadley’s recognition of the BMNH specimen as the holotype effectively becomes the designation of a lectotype, making the Paris specimen a paralectotype.

***Platysaurus attenboroughi* sp. nov.**

English: Attenborough's Flat Lizard

Afrikaans: Attenborough se Platakkedis

Synonymy. *Platysaurus capensis* (part). FitzSimons, 1935: 535; 1943: 473; Loveridge, 1944: 97; Rose, 1950: 155; 1962: 156; Broadley, 1978: 157; Branch, 1998: 165; Van Wyk & Mouton, 1996: 117; Whiting, 2014: 214.

Type material. *Holotype.* TM 85806 (MJW 936), adult male collected by Bryan Maritz, Nick Tye and Chris Barichiev, May 2008 (Table 2, Figure 4–5). *Type locality:* Fish River Canyon, Karasburg District, southern Namibia (27°52'21.7S, 17°31'15.7E; quarter-degree unit, 2717Dc). *Allotype.* TM 85807 (MJW 937), adult female collected by Bryan Maritz, Nick Tye and Chris Barichiev, May 2008; same locality data as holotype. *Paratypes* (2 specimens): TM 85805 (MJW 935), adult male, TM 85804 (MJW 934), adult female, both collected by Bryan Maritz, Nick Tye and Chris Barichiev, May 2008, Fish River Canyon, Karasburg District, southern Namibia (27°50'03.7S, 17°32'47.5E; quarter-degree unit, 2717Dc) (Table 2).



FIGURE 4. a.) *Platysaurus attenboroughi* sp. nov., male (paratype, TM 85805), Fish River Canyon; b.) *P. attenboroughi* sp. nov., female (allotype, TM 85807), Fish River Canyon; c.) *P. attenboroughi* sp. nov., male (holotype, TM 85806), venter, Fish River Canyon; d–e.) *P. attenboroughi* sp. nov., male (holotype, TM 85806), Fish River Canyon; f.) *P. attenboroughi* sp. nov., male, Richtersveld; g.) *Platysaurus capensis*, male, Kamiesberg near Kamieskroon; h.) *P. capensis*, female, Kamiesberg near Kamieskroon; and i.) *P. attenboroughi* sp. nov., habitat, Fish River Canyon (Photograph by N. Tye). All other photos by M.J. Whiting.

Diagnosis. A medium-sized *Platysaurus* (Table 3, Figure 4) distinguished from all congeners, except *P. capensis* and *P. broadleyi*, in that the scales on the side of the neck are indistinguishable from those on the dorsum. It can be distinguished from *P. broadleyi* as follows: the breeding male has blue forelimbs (anterior surface) while that of *P. broadleyi* may be orange, yellow, or a combination; the male has a light blue throat (Fig. 4, 5) compared to the dark blue of *P. broadleyi* (although this may be highly variable and could be related to male fighting ability (Whiting *et al.*, 2006); and the male also has an extensive blue belly with a small orange lower abdominal patch and sometimes with an irregular black abdominal patch (centre), while *P. broadleyi* has a darker (deep blue-black) abdomen with the lower abdomen usually orange (but may also be yellow or a mix). It also differs from *P.*

broadleyi in some features of scalation, particularly the number of collar scales (mean *P. attenboroughi* **sp. nov.** 7.93 ± 1.06 , *P. broadleyi* 9.22 ± 1.04), transverse dorsal scale rows (mean *P. attenboroughi* **sp. nov.** 85.23 ± 4.32 , *P. broadleyi* 104.96 ± 5.38) and the smaller upper forelimb scales (mean *P. attenboroughi* **sp. nov.** 17.17 ± 2.09 , *P. broadleyi* 25.82 ± 2.31 ; Table 3). Adult male coloration in *P. attenboroughi* **sp. nov.** is further distinguished from *P. capensis* by having the dorsum more extensively covered with white spots (Figure 4), and with a reduced fine vertebral stripe that only partially extends on to the hindbody, and with reduced (or absent) broad, dark paravertebral stripes; adult female coloration is more vaguely patterned than in either *P. capensis* or *P. broadleyi*, lacking the bold dark and pale paravertebral stripes and with scattered pale spots. It also differs from *P. capensis* in features of scalation (summarized in Table 3), particularly the greater number of upper forelimb scale rows (mean *P. attenboroughi* **sp. nov.** 17.17 ± 2.09 , *P. capensis* 14.62 ± 1.04) and number of subdigital lamellae beneath the 4th toe (mean *P. attenboroughi* **sp. nov.** 19.10 ± 1.11 , *P. capensis* 17.92 ± 0.64).

Description. *Holotype*. TM 85806, an adult male with original tail (lacking 2–3 mm from tip, removed for DNA analysis). Head strongly depressed, much longer than broad (head length: tip of snout to anterior border of ear-opening, HL): 16.6 mm; head width (HW): 12.9 mm; HL/HW: 1.27). Large supranasals in broad contact behind rostral; nostril directed slightly backwards and piercing a very small nasal that contacts the rostral, first supralabial, a small postnasal and the large supranasal. Frontonasal hexagonal, as broad as long and in good contact on sides with loreal. Prefrontals in median contact. Frontal longer (3.32 mm) than broad (max. width: 2.2 mm), much wider in front than behind. A pair of frontoparietals, each in contact laterally with middle pair of supraoculars. Interparietal small, diamond-shaped, set in the middle of the two pairs of parietals, the anterior pair the smallest, and with a conspicuous pineal pore. Occipital absent, two slightly enlarged triangular granules in its position. Four supraoculars, the first large and triangular and contacting the pentagonal preocular, the last the smallest. Four supraciliaries, anterior elongate, middle pair largest. Lower eyelid with a semi-transparent disc faintly divided into a number of vertical septa. Three elongate upper temporals bordering parietals on each side, middle one largest and longitudinally elongate, twice the length of posterior one. Two additional rows of enlarged scales present in dorsal temporal region, upper row (five right, four left) vertically elongate and more than twice the size of lower row. Ventral temporal region covered with five rows of irregular granules, slightly larger than those along backbone. A small postnasal; an elongate loreal and a preocular, the former much smaller than the latter. Four suboculars, the second elongate and extensively bordering the lip below. Rostral pentagonal, broader than deep. Six supralabials, five anterior to subocular. Mental subpentagonal. Seven infralabials, 5–7 very small and elongate and sandwiched between lip and very large fourth sublabial; five, all slightly larger than infralabials, the fourth by far the largest, the fifth the smallest. A longitudinal median series of four enlarged quadrangular or polygonal gular scales, bordered by scales that become smaller (subgranular and rounded) particularly laterally on the neck, and increase in size towards the collar, which consists of eight enlarged scales; in 25 rows between the angle of the jaws. Dorsal scales smooth, small, flat and rounded, without minute granules at junctions, and largest along backbone and on flanks, smallest dorso-laterally and minute on sides, in 89–91 transverse rows across midbody. Ventrals square or a little broader than long medially, arranged in 39 mainly regular transverse and 20 longitudinal series. Eight preanal plates, median pair largest and much larger than ventrals, reducing laterally towards the groin. Limbs long and slender, length of tibia subequal to head length. Upper forelimb and thighs with subequal granules above. Forearm and tibia with enlarged keeled scales; a row of nine large transverse plates on underside of tibia, largest at midcalf. Toes long, clawed and with smooth subdigital lamellae (17 on 4th toe on both sides). A series of 16 femoral pores on lower surface of right thigh, 13 on left, with 2–3 rows of modified generation gland scales (32 right thigh, 30 left) anterior to these pores. Tail depressed, tapering, with regular whorls of elongate, quadrangular scales, strongly keeled above laterally, smooth below. Measurements for the holotype and other type material are given in Table 2.

Description. *Allotype*. TM 85807, an adult female with original tail (lacking 2–3 mm from tip, removed for DNA analysis). Scalation as for holotype except for: head length 16.4 mm, head width 11.4 mm; HL/HW: 1.44); large supranasals in only narrow contact behind rostral; a small triangular occipital present at middle border of posterior parietals. Middle row of temporals comprised of six vertically elongate scales on each side of head; gulars in 26 rows between the angle of the jaws, and seven scales in collar; dorsal scales in 90 transverse rows across midbody; ventrals arranged in 38 mainly regular transverse and 18 longitudinal series; femoral pores minute, 17 on each thigh; thighs without modified scales with generation glands; subdigital lamellae under 4th toe 18/19.

Coloration. Holotype: In life: Above dull grey-brown dorsally, with a single narrow pale stripe along the

backbone, running from the base of tail to crown of head, where it shallowly divides; scattered pale spots, 3–5 granules across, speckled body and flanks, with largest aligned in a longitudinal row on the upper flank which is confluent with a pair of pale lateral stripes on head that arise above each eye and travel backwards across upper temporal region; forebody flanks and front of forelimbs bright blue, which extends through neck and onto upper lip; upper surface of tail and flanks anterior to groin orange-brown; proximal tail and upper surface of hindlimbs light brown at tail tip; upper hindbody and upper surface of tail grey-tan, darker along midline, with vague, paler spots laterally. Ventral surface of neck and first three-quarters of belly brilliant blue, paler under head, and with black ‘badge’ with irregular outline in centre of belly; lower surface of forelimbs ivory-pink; rear of belly, underside of tail and lower surface of hindlimbs light orange. In preservative (70% ethanol): faded, most orange and blue coloration lost; conspicuous central black belly ‘badge’ inconspicuous; thin dorsal stripe and pale spots only vaguely visible; upper and lower surface of head back to forelimb insertion dark grey, lighter towards hindlimbs; tail and lower surface of hindlimbs pinkish-ivory, darker on upper surface of limbs.

TABLE 2. Measurements (mm) for the type series of *Platysaurus attenboroughi* sp. nov.

	Museum Number			
	Holotype TM 85806	Allotype TM 85807	Paratype TM 85805	Paratype TM 85804
Sex	M	F	M	F
Snout-vent length	86.6	78.5	77.5	74.0
Tail length	121 (t) *	124 (t) *	114 (r) **	107 (r) **
Total length	207.6 (t) *	202.5 (t) *	191.5 (t) **	181.0 (t) **
Head length	16.6	16.4	16.8	16.5
Head width	12.2	11.4	11.9	11.2
Head height	6.0	5.4	6.1	5.7
Snout length	6.7	6.3	6.4	6.6
Eye diameter	4.8	4.4	4.5	4.8
Inter-limb length	36.4	40.1	35.0	35.8
Elbow to wrist	12.9	11.3	12.5	10.2
Knee to heel	16.0	15.0	16.2	16.3
Gulars	25	26	27	26
Ventrals (long.)	39	38	39	37
Ventrals (trans.)	20	18	20	18
Femoral pores	16/13	17/17	17/18	16/16
Dorsals (trans.)	89-91	90	88-91	89=90
Collar scales	8	7	8	10
Subdigital lamellae (4 th toe)	17/17	18/19	18/16	19/18

* tail original, but 2–3mm removed for DNA analysis

** tail tip regenerated and 2-3mm removed for DNA analysis

Allotype: In life: above grey brown, with a thin vertebral stripe from top of head to tail base, bordered on each side from eye to groin by a pale dorso-lateral ‘stripe’ comprising a paler background underlying a longitudinal series of pale spots; back, flanks and upper surface of hindlimbs speckled with pale spots, 2–4 granules wide; top of head dark brown lighter with three pale stripes; upper lip and lower temporal region tan-cream; tail dirty gold, darker along midline, paler below; belly pale brown, lacking a central black ‘badge’. In preservative (70% ethanol): as above but much paler above and below; vertebral stripe almost inconspicuous and pale spots less visible.

Distribution. Along the lower Orange River from Goodhouse to the Richtersveld, extending north into Namibia and recorded from the Hunsberg, Huamsib and Ploegberg mountains and the Fish River Canyon (Figure 1).

Habitat and climate. *Platysaurus attenboroughi* sp. nov. occurs in the arid-subtropical region of the Northern

Cape Province of South Africa and southern Namibia and specifically within the Gariiep Desert Bioregion (Mucina & Rutherford, 2006). This is an arid area characterized by low and erratic summer rainfall. Summers are typically hot and dry. Like all flat lizards, they are dependent on rock (mostly granite in this area) and take refuge in narrow rock fissures where they can escape suboptimal temperatures and predators. These areas are largely devoid of significant vegetation bar the occasional fig tree (*Ficus*) or succulent. For more detailed descriptions of climate, vegetation and topography see Mucina & Rutherford (2006).

TABLE 3. Summary statistics (n = sample size, mean \pm 1 SD, range) for SVL (snout-vent-length) and meristic characters: gulars: scales transversely between posterior sublabials, UL: upper labials, Col: scales in collar, LRV: longitudinal rows of ventrals, TRV: transverse rows of ventrals, TD: transverse rows of dorsals, Forearm: upper forelimb scale rows, 4th toe: number of subdigital lamellae beneath 4th toe, and FP: number of femoral pores on left thigh.

Character	<i>P. attenboroughi</i> sp. nov.	<i>P. broadleyi</i>	<i>P. capensis</i>
N	87	45	13
SVL	71.75 \pm 6.92 36–86	70.18 \pm 7.21 40–80	68.92 \pm 11.00 37–82
Gulars	25.5 \pm 0.3 22–30	27.5 \pm 0.4 24–32	23.8 \pm 1.4 21–27
UL	4.95 \pm 0.24 4–5.5	4.9 \pm 0.27 4–5	5 \pm 0.20 4.5–5.5
Col	7.93 \pm 1.06 5–10	9.22 \pm 1.04 7–11	7.69 \pm 0.63 6–8
LRV	19.79 \pm 1.08 18–22	20.73 \pm 1.0 20–22	19.69 \pm 0.63 18–20
TRV	41.84 \pm 2.43 36–48	43.32 \pm 1.86 41–47	40.42 \pm 1.08 38–42
TD	85.23 \pm 4.32 78–94	104.96 \pm 5.38 92–117	83.67 \pm 3.45 77–86
Forearm	17.17 \pm 2.09 13–23	25.82 \pm 2.31 21–30	14.62 \pm 1.04 13–16
4 th toe	19.10 \pm 1.11 17–22	20.6 \pm 1.03 18–22	17.92 \pm 0.64 17–19
FP	16.73 \pm 1.33 14–19	16.68 \pm 0.83 15–18	16.73 \pm 1.33 14–18.5

Natural history and behaviour. In South Africa, it is mainly restricted to the Richtersveld region (Bauer & Branch, 2001; Whiting, 2014). There it is widespread and common in boulder-strewn areas and on broad rock faces, often far from river courses (e.g. Tierhoek). It does not form the high density populations recorded for *P. broadleyi* (MJW unpubl. data). All *Platysaurus* have a fixed clutch of two eggs (Broadley, 1978). The reproductive cycles of *P. capensis*, *P. broadleyi* and *P. attenboroughi* sp. nov. were collectively studied when these were considered a single species (Van Wyk & Mouton, 1996). The minimum size at sexual maturity is 64 mm (sex not specified); eggs are likely laid in summer (November–December) (Van Wyk & Mouton, 1996). While we know very little about the diet of *P. attenboroughi* sp. nov., the closely related *P. broadleyi* is an omnivore and lives in similar habitat. The marked sexual dichromatism suggests a classic sexual selection system in which males compete heavily for females, as is the case in *P. broadleyi* (Whiting *et al.*, 2003; Whiting *et al.*, 2006). Males do have UV-reflective throats, which suggests a role of this colour signal in either settling contests (as in *P. broadleyi*) or in mate choice, although this remains to be tested. In the two males we measured, their throats had violet and blue and less pure UV than we would typically see in adult male *P. broadleyi* (Figure 5)(Whiting *et al.*, 2006). Measurement of spectral reflectance in additional individuals is necessary for a proper comparison.

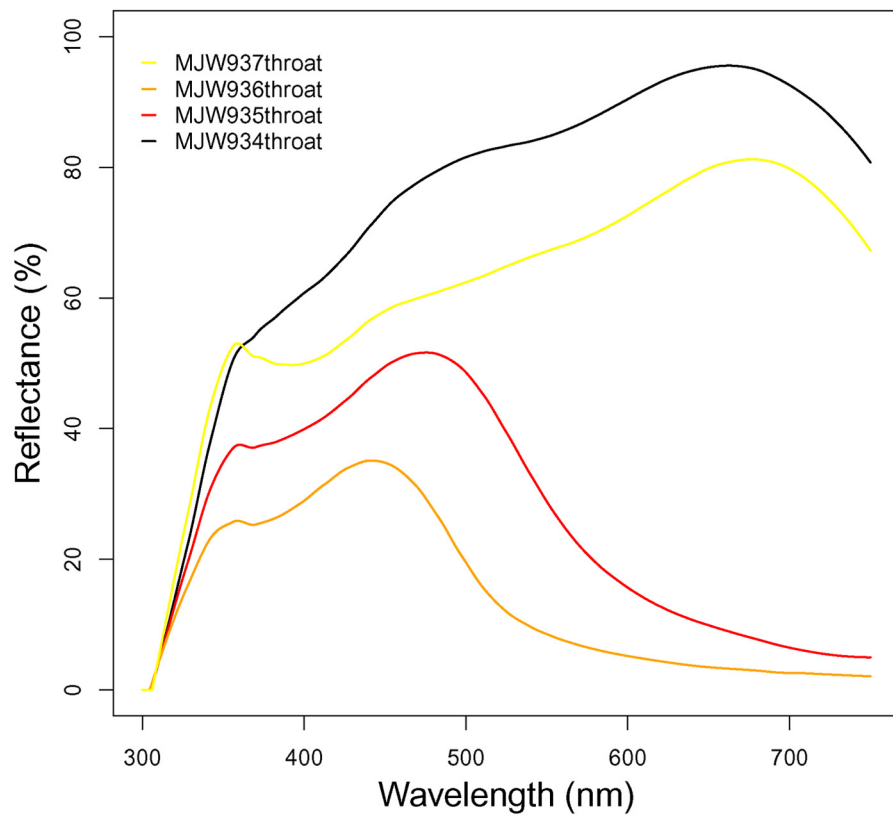
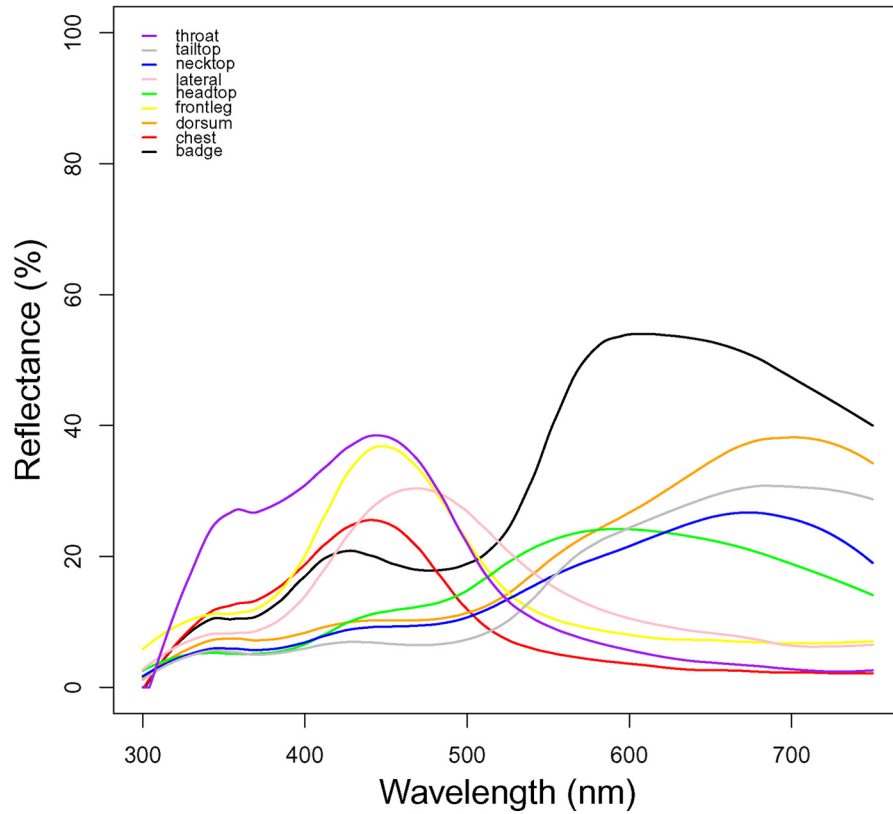


FIGURE 5. a.) Spectral reflectance curves objectively measuring colour by body region in the holotype (TM 85806) in life. b.) Spectral reflectance of throat region for two males: (MJW935/TM 85805, MJW936/TM 85806=holotype) and two females (MJW934/TM 85804, MJW937/TM 85807). Males have more distinct UV in their throats than females although it is still less conspicuous than what has been documented for the closely related *P. broadleyi* (Whiting *et al.*, 2006).

Etymology. We name this new species in honour of Sir David F. Attenborough (Fig. 3), in recognition of his immense contribution to the public understanding and appreciation of animals, plants, ecosystems and nature in general. David Attenborough made flat lizards, specifically the closely related *Platysaurus broadleyi*, famous in the BBC documentary series *Life in Cold Blood*.

Conservation status. The conservation status of the Cape Flat Lizard (*P. capensis* sensu lato) was assessed as of Least Concern (Whiting 2014). Our division of this taxon into two species therefore requires a re-assessment of their conservation status. Both have relatively restricted distributions, with that of *P. capensis* now restricted to only seven quarter-degree grid squares (Figure 1). Although the Kamiesberg region is not formally protected, it does form part of an envisaged expansion of the Namaqua National Park (San Parks 2013). The species has also been recorded from Carolusberg, Springbok, within or in close proximity to the Goegap Nature Reserve. *Platysaurus attenboroughi* is recorded from numerous localities within the Richtersveld National Park, and the Fish River Canyon forms part of the Ai-Ais Hot Springs Game Park in Namibia. Together these two conserved areas form the /Ai/Ais-Richtersveld Transfrontier Park, and thus protect a large proportion of the species' range. The extensive granite outcrops of both the Kamiesberg region and the /Ai/Ais-Richtersveld Transfrontier Park form the main habitat for both species, and are subject to little existing habitat threat. We conclude that currently both *P. capensis* and *P. attenboroughi* are not of conservation concern (Least Concern).

In summary, we describe a new species of flat lizard (*Platysaurus attenboroughi*) that was formerly confused with *P. capensis*. *Platysaurus attenboroughi* **sp. nov.** occurs on rock from the region of the Orange River west of Goodhouse, including the Richtersveld of the Northern Cape Province of South Africa and into Namibia as far as the Fish River Canyon. This poorly known species warrants detailed future study.

Acknowledgments

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APPENDIX 1. Material examined

Acronyms: BM = Natural History Museum, London; TM = Transvaal Museum (now Ditsong National Museum of Natural History, Pretoria, South Africa); PEM = Port Elizabeth Museum, South Africa; SAM = South African Museum (now Iziko South African Museum), Cape Town, South Africa; CAS = California Academy of Science, USA; RNP = Richtersveld National Park.

Platysaurus capensis

SOUTH AFRICA, NORTHERN CAPE PROVINCE: BM 1946.8.29.26, "Great Namaqualand" (holotype); TM 66318, Carolusberg, Springbok (29°38'S, 17°57'E; 2917DB); TM 13711-13, SAM 18068 (five specimens), 44320, Kamieskroon, Northern Cape Province (30°11'S, 17°59'E; 3017BB); TM 34050, 34068, 5 km E of Kamieskroon (3017BB); TM 35209, 7 km NW of Lilliefontein, Kamiesberg (30°15'S, 18°03'E; 3018AA); PEM R13052-53, Garies to Kamiesberg; SAM 18024 (two specimens), Kamies (?). OTHER: SAM 2106, Victoria West (in error).

Platysaurus attenboroughi

NAMIBIA: CAS 201884-5, Farm Witputz Sud, Lüderitz District (27°40'18"S, 16°43'10"E; quarter-degree unit 2716DA; elevation 1165 m a.s.l.); TM 27983-84, 28270-75, 27985, 36829-32, Fish River Canyon, 72 km W Klein Karas, Lüderitz District (27°35'S, 17°37'E; 2717DA); TM 35330, Rosh Pinah, Lüderitz District (27°58'S, 16°46'E; 2716DD); TM 35335-45, 39974, 47646, SAM 43609, Farm Namuskluft, Lüderitz District (27°56'S, 16°50'E; 2716DD); TM 35380-82, Farm Spitzkop, Lüderitz District (27°52'S, 16°44'E; 2716DC); TM 35437-38, Kuamsib Mountain, Lüderitz District (27°59'S, 17°05'E; 2717CC); TM 35414, McMillan's Pass, 18 km E Rosh Pinah, Lüderitz District (27°56'S, 16°54'E; 2716DD); TM 35446-47, 35461, confluence of Fish and Orange rivers, Lüderitz District (28°06'S, 17°10'E; 2817AA); TM 85806 (Holotype), Fish River Canyon, Karasburg District, southern Namibia (27°52'21.7S, 17°31'15.7E; 2717Dc); TM 85807 (Allotype), same locality as holotype; TM 85804-05 (Paratypes), Fish River Canyon, Karasburg District, southern Namibia (27°50'03.7S, 17°32'47.5E; 2717Dc). SOUTH AFRICA, NORTHERN CAPE PROVINCE: TM 17867-79, Goodhouse, S bank Orange River (28°54'S, 18°14'E; 2818CC); TM 56157, 56450, Henkries pump station, Orange River (28°53'S, 18°08'E; 2818CC); SAM 18527, Violdsdrift, Orange River (2817DC); SAM 45583, Hell's Kloof, Violdsdrift (2817CD); SAM 18824, Richtersveld; SAM 45027-28, Granite Boss (Kuboos = Khubus), SW corner Richtersveld (2817CA); TM 24176-80, between Geligwerkberg and Doornkloof, Richtersveld; TM 15879-85, 15937, 27848-50, SAM 11348, 18681-82, 18684, Kuboos (= Khubus), Richtersveld (28°26'S, 16°59'E; 2816BD); TM 27857-60, Groenkloofrivier, Richtersveld (28°31'S, 16°58'E; 2816CB); TM 34212-13, 5 km from De Hoop to Numes, Richtersveld (28°10'S, 17°07'E; 2817AA); TM 35281-82, Numes Mine, Richtersveld (28°17'S, 16°58'E; 2816BD); TM 52584, Ploegberg, Richtersveld (2817CA); TM 52761, Tatasberg, Richtersveld (2817DA); TM 53846, 53855-64, Ploegberg, Richtersveld (28°37'S, 17°00'E; 2817CA); A. Bauer collection (AMB) 5056 (to be accessioned into Louisiana State University Museum, LSU), 4.7 km towards Oenna, Richtersveld National Park (RNP) (28°05'11"S, 17°07'45"E; 2817AA; 400m a.s.l.); AMB 5084 (to LSU), 3.5 km S by road from the bottom of Hellskloof Pass, RNP (2816BD; 28°19'12"S, 16°58'30"E; 420 m a.s.l.); CAS 200057, Tierhoek, Ploesberg (28°37'59"S, 17°00'41"E; 2817CA; 425 m a.s.l.); PEM R7610, central grazed flats W of Nichodemus (=Nicodaemus), RNP (28°20'39"S, 16°59'04"E; 2816BD; 700 m a.s.l.); PEM R7602, 1.3 km along path running SE from top of Hellskloof to Nicodaemus (28°20'39"S, 16°59'01"E; 2816BD; 677 m a.s.l.); PEM R7616 17, De Tuin ("Devil's Playground"), Tatasberg, RNP (28°18'49"S, 17°16'52"E; 2817AB; 681 m a.s.l.); PEM R7650, Nicodaemus camping area, RNP (28°21'07"S, 16°59'43"E; 2816BD; 749 m a.s.l.); CAS-SU 12089-90, Numes, Richtersveld, RNP (2816BD); CAS 193359, main road at Potjiespram turn-off, RNP (2816BB); CAS 193385-90, 22.8 km E of Sendelingsdrift on main park road, RNP (2817AA); CAS 193446-68, 8.7 km E of Hellskloof Pass gate, RNP (2816BD); CAS193573-77, 16.2 km W of SE Gate, border of RNP (2817CA); CAS 193595, main road at Potjiespram junction (no. 1), RNP (2816BB); CAS 193628, 23.5 km E of Sendelingsdrift on main park road, RNP (2817AA); CAS 201932, Tierhoek, Plousberg, RNP (28°37'59"S, 17°00'41"E; 2817CA; 425 m a.s.l.); CAS 200066, 1.1 km N of Kook River Fountain road on track to Koubank River, Richtersveld (28°40'11"S, 17°10'14"E; 2817CA; 565 m a.s.l.).