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Scorpions of the Brandberg Massif, Namibia: Species richness inversely correlated with altitude

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ABSTRACT

A previous list of scorpions from the Brandberg Massif and vicinity, north-western Namibia (Omaruru District, Erongo Region), is updated, based on a survey of the Massif and surrounding areas (the region delimited by 21°00'S–21°30'S and 14°00'E–15°00'E) conducted during three separate expeditions, and augmented by an examination of material in museum collections. More than 1000 specimens, representing more than 100 point-locality records, were examined for the study. Notes on the ecology and distribution of the scorpions on the Massif and surrounding areas are provided. Excluding one dubious record, 20 scorpion species in seven genera (*Brandbergia*, *Lisposoma*, *Hottentotta*, *Parabuthus*, *Uroplectes*, *Hadogenes*, and *Opistophthalmus*) of four families (Bothriuridae, Buthidae, Liochelidae, Scorpionidae) are recorded from the area, which presently has the richest scorpion fauna in Namibia, if not southern Africa, and ranks among those with the richest scorpion faunas in the world. The high diversity of scorpions on the Brandberg Massif and vicinity is attributed to the heterogeneity of landforms, substrata and habitats in the area. The scorpions of the Massif and surrounding areas may be classified into seven ecomorphotypes, using every available niche. The species richness of the scorpion fauna is inversely correlated with altitude. The greatest diversity of genera and species occurs at the base of the Massif and in the surrounding areas, and decreases towards the summit. Five species occur in the area surrounding the Massif but not at its base, five at its base (below 500 m) but not on its slopes, two on its lower slopes (500–1000 m), but not on its middle slope (1000–1500 m), upper slope (1500–2000 m) or summit (above 2000 m), and two on its summit, upper and middle slopes only. Only five species occur from the base to the summit of the Massif.

KEY WORDS: Southern Africa, Namibia, Brandberg, Scorpiones, biodiversity, ecomorphotypes.

INTRODUCTION

Namibia presently has the highest species richness and endemism of scorpions in southern Africa (Prendini 2000*a*, 2005*a*). All four families, eight (62 %) genera, and 63 (45 %) species of southern African scorpions occur in the country, of which two (15 %) genera and at least 31 (22 %) species are endemic (Lamoral 1979; Prendini 2000*a*, *b*, 2001*a*, 2003*a*, 2005*a*). It could be argued that this is nothing more than a reflection of the fact that the scorpion fauna of Namibia is better studied than that of other southern African countries, as a result of the extensive collections and publications on Namibian scorpions by various specialists (notably A. Harington, B.H. Lamoral, R.F. Lawrence, G. Newlands and the first author). Indeed, the species richness and endemism of scorpions in South Africa appears to be even greater than that of Namibia, based on work in preparation by the first author on several speciose genera, especially *Hadogenes* Kraepelin, 1894, *Opistophthalmus* C.L. Koch, 1837 and *Uroplectes* Peters, 1861. Nevertheless, despite decades of research on the scorpions of Namibia, new species and even genera continue to be discovered within its borders (Prendini 2000*a*, *b*, 2003*a*, *b*, 2005*a*; Harington 2002), partly due to the rugged and inhospitable desert terrain and partly due to the cryptic nature of most desert scorpion species that inhabit it. Many, for example, are fossorial and can only be collected by means of ultraviolet (UV) light detection (Honetschlager 1965; Stahnke 1972; Sissom *et al.* 1990), pitfall trapping or, in the case of *Opistophthalmus*, burrow excavation.

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Some of the most recently described Namibian scorpions are endemic to the Brandberg Massif and vicinity (Figs 1–8), in the Omaruru District (Erongo Region) of north-western Namibia (Prendini 2000*a*, 2003*a*). Prendini (2000*a*) recorded fourteen scorpion species, in five genera and three families, from the area. The subsequent description of *Brandbergia haringtoni* Prendini, 2003 and the discovery of new records of *Lisposoma elegans* Lawrence, 1928 from the Massif (Prendini 2003*c*) increased the total to sixteen species, in seven genera and four families. A further five species are recorded in the present study: *Hadogenes hahni* (Peters, 1862); *Opistophthalmus coetzeei* Lamoral, 1979; *Opistophthalmus gibbericauda* Lamoral, 1979; *Parabuthus kraepelini* Werner, 1902; *Uroplectes gracilior* Hewitt, 1913. However, the single record of *O. coetzeei* is questionable. The presence of *Parabuthus stridulus* Hewitt, 1913 was not confirmed within the study area, although it has been collected further west at the Ugab River mouth (Lamoral 1979). Excluding the dubious record of *O. coetzeei*, twenty scorpion species in seven genera and four families have been recorded, to date, from the Brandberg Massif and vicinity (Table 1).

STUDY AREA

The study area comprises the region delimited by 21°00'S–21°30'S and 14°00'E–15°00'E, an area representing two half-degree squares and approximately 2300 km^2, in the Omaruru District (Erongo Region) of north-western Namibia. The dominant landform within the study area is the prominent, circular Brandberg Massif, rising abruptly from the surrounding gravel plains of the central Namib Desert (Figs 1, 3), and covering an area of *ca* 650 km^2 (Marais & Kirk-Spriggs 2000). An extensive central plateau occurs at an altitude of about 2000 m (Fig. 8), from which many peaks arise, the highest of these being Königstein (2573 m), the highest point in Namibia. Deep alluvial valleys and ravines, leading down to the surrounding pediplain, radially dissect the steep slopes of the periphery (Figs 4, 7). At the higher altitudes (Figs 6–8), orographic amelioration of the prevailing hyperarid conditions around the base and lower slopes (Figs 1–5; Olszewski 2000) provide a refugium for relict fauna (Irish 1994; Craven & Craven 2000; Marais & Kirk-Spriggs 2000; Prendini 2003*a*). Besides the Brandberg Massif, other prominent landforms falling within the study area are the Goboboseberge, the Messum Crater, the Messum River, the Uis Mountains and numerous smaller inselbergs (Figs 2, 7).

Three separate expeditions to the area were conducted in January 1998, December 2003 and April 2006. The first expedition surveyed the base of the Brandberg Massif, including several major gorges intersecting its periphery, and surrounding areas (Figs 1–4). The two subsequent trips, each of which involved a hike from the base along the Goaseb (Ga-Asab or Ga-Aseb) Gorge, surveyed its slopes and summit (Figs 5–8). During these trips, collections were made at periodic intervals along a transect from the base to the summit during two different seasons (hot, dry and warm, wet).

MATERIAL AND METHODS

Specimens collected during the three expeditions were mostly found at night using UV light detection (Honetschlager 1965; Stahnke 1972; Sissom *et al.* 1990). A portable UV lamp, comprising two mercury-vapour tubes attached to a chromium parabolic

TABLE 1

Summary of the ecology and distribution of scorpion species recorded from the Brandberg Massif (Namibia) and surrounding areas (region delimited by 21°00'S–21°30'S and 14°00'E–15°00'E). Abbreviations: Ec, ecomorphotype; La, lapidicolous; sP, semi-psammophilous; Ps, psammophilous; sL, semi-lithophilous; Co, corticolous; Li, lithophilous; Pe, pelophilous; Bu, excavates burrows; Sc, excavates scrapes; Og, in open ground; Us, under stones on soil; Rc, in rock cracks, crevices, under exfoliations and stones on bedrock; Tb, under peeling tree bark or holes in tree trunks; Sa, area surrounding Massif; Ba, base of Massif (<500 m); Ls, lower slopes of Massif (500–1000 m), Mus, middle (1000–1500 m) and upper (1500–2000 m) slopes of Massif; Su, summit of Massif (>2000 m). Asterisked is a dubious record.

	Ec	Bu	Sc	Og	Us	Rc	Tb	Sa	Ba	Ls	Mus	Su
Family Bothriuridae *Brandbergia haringtoni* Prendini, 2003	La				X						X	
Lisposoma elegans Lawrence, 1928	La				X			X	X	X	X	X
Family Buthidae *Hottentotta conspersus* (Thorell, 1876)	La				X			X	X	X		
Parabuthus brevimanus (Thorell, 1876)	sP	X		X				X	X	X	X	X
Parabuthus gracilis Lamoral, 1979	Ps	X		X				X				
Parabuthus granulatus (Ehrenberg, 1831)	sP	X		X				X	X			
Parabuthus kraepelini Werner, 1902	sP	X		X				X				
Parabuthus namibensis Lamoral, 1979	sP	X		X				X				
Parabuthus villosus (Peters, 1862)	sL		X					X	X			
Uroplectes gracilior Hewitt, 1913	La				X			X				
Uroplectes otjimbinguensis (Karsch, 1879)	Co						X	X	X	X	X	X
Uroplectes planimanus (Karsch, 1879)	Li				X	X		X	X	X	X	X
Family Liochelidae *Hadogenes hahni* (Peters, 1862)	Li					X		X				
Hadogenes tityrus (Simon, 1888)	Li					X		X	X	X	X	X
Family Scorpionidae *Opistophthalmus carinatus* (Peters, 1861)	Pe	X		X	X			X			X	X
Opistophthalmus coetzeei Lamoral, 1979*	Pe	X		X	X			X				
Opistophthalmus gibbericauda Lamoral, 1979	sP	X		X				X				
Opistophthalmus jenseni (Lamoral, 1972)	Ps	X		X				X	X			
Opistophthalmus lamorali Prendini, 2000	sL		X		X			X	X			
Opistophthalmus ugabensis Hewitt, 1934	sL		X		X			X	X	X		
Opistophthalmus wahlbergii (Thorell, 1876)	Ps	X		X				X	X			

reflector and powered by a rechargeable 7 Amp/hr, 12 V battery, was used for this purpose. Additional specimens were collected during the day by turning stones and excavating burrows. A portable Garmin™ GPS V device was used for recording the geographical coordinates of collection localities in the field.

Fig. 1. Brandberg Massif (Namibia), gravel plains southwest, facing northeast to Massif in distance, dry year. Gravel plains, habitat of *Parabuthus brevimanus* (Thorell, 1876), *Parabuthus namibensis* Lamoral, 1979 and *Uroplectes gracilior* Hewitt, 1913.

Fig. 2. Brandberg Massif (Namibia), granitic inselberg south, surrounded by low sand dunes, leading down to sandy plain, facing west, wet year. Dominant vegetation, *Euphorbia damarana* L.C. Leach and *Stipagrostis* sp. Dunes, habitat of *Parabuthus gracilis* Lamoral, 1979 and *Opistophthalmus jenseni* (Lamoral, 1972). Sandy plain, habitat of *Parabuthus brevimanus* (Thorell, 1876), *Parabuthus granulatus* (Ehrenberg, 1831) and *Opistophthalmus wahlbergii* (Thorell, 1876).

Fig. 3. Brandberg Massif (Namibia), gravel plains and foothills southeast, facing northwest to Massif, wet year. Dominant vegetation, *Euphorbia damarana* L.C. Leach and *Stipagrostis* sp. Gravel plain, habitat of *Parabuthus brevimanus* (Thorell, 1876), *Parabuthus granulatus* (Ehrenberg, 1831). Rocky foothills, habitat of *Parabuthus villosus* (Peters, 1862) and *Opistophthalmus lamorali* Prendini, 2000.

Fig. 4. Brandberg Massif (Namibia), base of Massif at entrance to Goaseb (Ga-Asab) Gorge, facing north to Orabeskopf at summit, wet year. Dominant vegetation, *Boscia foetida* Schinz and *Commiphora* sp. Rocky flats, habitat of *Hottentotta conspersus* (Thorell, 1876), *Parabuthus brevimanus* (Thorell, 1876), *Parabuthus villosus* (Peters, 1862), and *Opistophthalmus lamorali* Prendini, 2000.

Fig. 5. Brandberg Massif (Namibia), lower slopes of Massif in Goaseb (Ga-Asab) Gorge, facing southwest, wet year. Dominant vegetation, *Acacia montis-usti* Merxm. & A. Schreib., *Commiphora* sp., *Euphorbia* sp. and *Moringa ovalifolia* Dinter & A. Berger. Rocky flats and slopes, habitat of *Hottentotta conspersus* (Thorell, 1876), *Hadogenes tityrus* (Simon, 1888) and *Opistophthalmus ugabensis* Hewitt, 1934.

Fig. 6. Brandberg Massif (Namibia), upper slopes of Massif in Goaseb (Ga-Asab) Gorge, facing northeast, wet year. Dominant vegetation, *Cyphostemma currorii* (Hook.f.) Desc. and *Ozoroa crassinervia* (Engl.) R. Fern & A. Fern. Rocky slopes, habitat of *Brandbergia haringtoni* Prendini, 2003, *Lisposoma elegans* Lawrence, 1928, *Hadogenes tityrus* (Simon, 1888), and *Uroplectes planimanus* (Karsch, 1879). Woody vegetation, habitat of *Uroplectes otjimbinguensis* (Karsch, 1879).

Fig. 7. Brandberg Massif (Namibia), just below summit of Massif in Goaseb (Ga-Asab) Gorge, facing south to gravel plains, dry year. Rocky slopes, habitat of *Brandbergia haringtoni* Prendini, 2003, *Hadogenes tityrus* (Simon, 1888) and *Uroplectes planimanus* (Karsch, 1879).

Fig. 8. Brandberg Massif (Namibia), Wasserfallfläche, plateau on summit of Massif, facing southwest, wet year. Dominant vegetation, *Boscia albitrunca* (Burch.) Gilg & Gilg-Ben., *Cyphostemma currorii* (Hook.f.) Desc. and *Euphorbia* sp. Rocky flats and slopes, habitat of *Lisposoma elegans* Lawrence, 1928, *Hadogenes tityrus* (Simon, 1888) and *Uroplectes planimanus* (Karsch, 1879). Sandy flats, habitat of *Parabuthus brevimanus* (Thorell, 1876) and *Opistophthalmus carinatus* (Peters, 1861). Woody vegetation, habitat of *Uroplectes otjimbinguensis* (Karsch, 1879).

In addition to the material that was newly collected for the survey, an attempt was made to examine all available specimens in museum collections, originating from localities within the study area. Abbreviations for collections in which material is deposited, are as follows: Albany Museum, Grahamstown, South Africa (AMGS); American Museum of Natural History, New York (AMNH), some bearing accession numbers from the Alexis Harington Collection (AH); Ambrose Monell Collection for Molecular and Microbial Research (AMCC) at the AMNH; California Academy of Sciences, San Francisco (CASC); Natal Museum, Pietermaritzburg, South Africa (NMSA); ARC–Plant Protection Research Institute, National Collection of Arachnida, Pretoria, South Africa (NCA); National Museum of Namibia, Windhoek (SMN); South African Museum, Cape Town (SAMC); Swedish Museum of Natural History, Stockholm (NHRM), some bearing accession numbers from the Julio Ferrer Collection (JF); Transvaal Museum, Pretoria, South Africa (TMSA); University of Stellenbosch, Department of Pharmacology, South Africa (USDP).

More than 1000 specimens, representing more than 100 point-locality records, were examined for the study. Only a small proportion of the locality records from museum collections were accompanied by geographical coordinates or quarter-degree squares, usually entered by the collector or subsequently added by the curator or collections manager. These were checked for accuracy and an attempt was made to georeference as many of the other locality records as possible, by reference to gazetteers and the official 1:50 000 topo-cadastral maps of Namibia published by the Government Printer. Retrospectively georeferenced locality records and other supplementary locality data are provided in square brackets in the Material Examined.

The classification followed in this contribution is that of Prendini and Wheeler (2005).

TAXONOMY

Family Bothriuridae Simon, 1880

Brandbergia haringtoni Prendini, 2003

Brandbergia haringtoni: Prendini 2003*a*: 159–165, figs 1, 5–8, table 3.

Material examined: 1♀ holotype, 1♀ paratype (AMNH [AH 1029]), Goaseb, Brandberg [21°14'S:14°35'E], 1.iii.1978, H. Pager, 1650 m, syntopic with *U. planimanus*.

Ecology and distribution: This endemic Namibian species is known only from two female specimens taken at a single, indefinite locality in the upper slopes (1650 m) of the Goaseb (Ga-Asab or Ga-Aseb) Gorge, just below the summit on the southern side of the Massif (Figs 6, 7). Two attempts to collect additional specimens at similar altitude in the upper reaches of the Goaseb Gorge (December 2003 and April 2006) were unsuccessful. It is likely that this species is restricted to the summit, upper and middle slopes of the Massif, where the rainfall is greater than at lower altitude. Based on its morphology, *B. haringtoni* is probably lapidicolous, sheltering under stones (Prendini 2001*b*, 2003*a*).

Lisposoma elegans Lawrence, 1928

Lisposoma elegans: Lawrence 1928: 281–286, pl. XXIII, figs 52–57, pl. XXIV, fig. 58.

Material examined: 1♂ (AMCC 172342 [LP 5693]), Brandberg, Ga-Asab (Goaseb) Gorge, 21°12'35.3"S: 14°34'32.2"E, 1300 m, 1–2.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on cool, dark,

still night becoming windy later, on mid-slopes of Brandberg in arid savannah with *Cyphostemma currorii* (Hook.f.) Desc. and *Aloe dichotoma* Masson on larger granite outcrops and sandy loam soils, specimen taken on rock surface; 2♂ (AMNH; AMCC 138987 [LP 2526]), Brandberg, summit, below Longipoele, 21°11'34.9"S:14°33'23.9"E, 1794 m, 23.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, sheltered, flat sandy valley with granite domes and boulders intersected by dry watercourses, granitic loam soil with *Stipagrostis–Aristida* grassland, *Boscia* Lam., *Cyphostemma* (Planch.) Alston, *Euphorbia* L. and *Ozoroa* Delile in rocky areas, specimens collected with UV detection on warm, dark, still night, sitting on ground surface; 1♂ (AMNH), Brandberg, summit, between Longipoele and Helmpoele, 21°11'33.2"S:14°33'31.4"E, 1830 m, 23.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, sheltered, flat sandy valley with granite domes and boulders intersected by dry watercourses, granitic loam soil with *Stipagrostis–Aristida* grassland, *Boscia*, *Cyphostemma*, *Euphorbia* and *Ozoroa* in rocky areas, specimen collected with UV detection on warm, dark, still night, sitting on ground surface; 1♂ (AMNH), Brandberg, summit, valley E Helmpoele, 21°11'31.9"S:14°34'00.5"E, 1930 m, 3.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on cool, still night (moonset 10 pm), on summit of Brandberg in sandy valley surrounded by granitic outcrops, arid savannah with *C. currorii* and *A. dichotoma* on larger granite outcrops and sandy-loam soils, specimen collected on stony ground; 1♂ 1♀ (SMN 1860), Brandberg, N end Tsisab, 21°05'S:14°40'E, 21.i–27.ii.1995, E. Marais, preservative pitfall traps; 1 juv.♀ (SMN 1861), Tsisab ravine foot [Brandberg], 21°05'S:14°40'E, 27.ii–20.vi.1995, E. Marais, preservative pitfall trap; 1♂ (AMNH [AH 2133]), 20 km S of Omatjette–Khorixas junction [21°03'S:14°53'E], 6.ii.1981, A. Harington, near rocky hill, ground was sandy, area basically flat.

Ecology and distribution: This lapidicolous species shelters under stones (Lamoral 1979; Prendini 2001*b*, 2003*c*). Although it may also occur in Angola, this species has been recorded only from Namibia (Lamoral 1979; Prendini 2001*b*, 2003*c*, 2005*a*). It has been collected from the base (Fig. 4) to the summit (Fig. 8) of the Brandberg and in rocky areas surrounding the Massif. Fet *et al.* (2004) and Soleglad *et al.* (2005) reported one specimen from Königstein (2573 m), the highest peak on the Massif.

Family Buthidae C.L. Koch, 1837

Hottentotta conspersus (Thorell, 1876)

Buthus conspersus: Thorell 1876*a*: 115–118.
Buthus conspersus aeratus Lawrence, 1927: 69–70 (synonymised by Lamoral 1979: 549).
Buthus angolensis Monard, 1930: 38–40, fig. 2 (synonymised by Vachon & Stockmann 1968: 94–96).

Material examined: 1♀ [homotype] (NMSA 9045), Brandberg Mtns, 21°05'S:14°40'E, vi.1963, F. Gaerdes; 1 juv.♀ (NMSA 10016), Brandberg Mtns, northern valleys [21°01'S:14°33'E], 20.ii.1969, B. Lamoral & R. Day; 2♀ (SMN 3095), 1♀ (SMN 3254), Brandberg, 21°11'54.9"S:14°28'56.0"E, 726 m, 3–4.ii.2007, T.L. Bird, P. Michalik, A. Klann & G. Talarico, on stones; 5♀ (AMNH) Brandberg, Amis Gorge [21°11'S:14°28'E], 30.i.1981 (3♀ [AH 2037–2039]), 31.i.1981 (2♀ [AH 3372, 3373]), A. Harington, UV detection, found nr sheer cliffs and sloping hills at the base of the mountain and gorge sides, syntopic with *P. brevimanus* and *U. planimanus*; 1♂ (AMNH [AH 1861]), Brandberg, Amis Gorge base camp [21°11'S:14°28'E], 600 m, 18.x.1979, H. Pager; 4♂ 3♀ 1 subad.♀ (SMN 3082 [TB 07/04(b)]), Brandberg, Amis Gorge (lower foothills), 21°19'43.08"S:14°47'41.04"E, 740 m, 5.ii.2007, T.L. Bird, P. Michalik, A. Klann & G. Talarico, UV detection; 1♂ (AMNH [AH 1439]), Brandberg, Basswald Rinne [21°10'S:14°38'E], 18.iv.1980, A. Harington, syntopic with *U. planimanus*; 1♂ (AMNH [AH 1133]), Brandberg, Goaseb Gorge [21°14'S:14°35'E], 6.iv.1978, H. Pager; 1♂ 2♀ 1 subad.♀ (AMNH), 2 juv.♂ 2 juv.♀ (AMCC 172340 [LP 2620]), Brandberg, base of Ga-Aseb Gorge, 21°13'41.6"S:14°34'44.1"E, 781 m, 21.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, dry riverbed surrounded by steep rocky slopes comprising igneous rocks with *Sterculia* L., *Acacia montis-usti* Merxm. & A. Schreib. and *Commiphora* Jacq., UV detection on warm, dark, still night, specimen collected in open midslope; 1♂ 1 subad.♀ (SMN 2114), Brandberg, Messum Valley, 21°13.29'S:14°30.98'E, 16.iv.1999, S. van Noort, under rock, bushy Karoo-Namib shrubland; 1♀ 1 juv.♀ (SMN 96), 1♀ (NMSA 10411), Brandberg, Numas Gorge base camp [21°07'S:14°25'E], 16.viii.1969, P.J. Buys; 1♂ (AMNH [AH 2198]), Brandberg, Numas Gorge [21°07'S:14°25'E], 30.i.1981, A. Harington, syntopic with *P. brevimanus*; 1♀ (SMN 99), Brandberg, Numas Valley [21°06'S:14°23'E], 2.viii.1970, C.G. Coetzee; 1♂ (AMNH), Numaskloof, Brandberg, 21°07.48'S:14°25.54'E, 17.i.1998, 470 m, L. Prendini & E. Scott, steep rocky slopes, coarse granitic sandy loam, UV detection, syntopic with *P. villosus*, *H. tityrus*, *O. ugabensis* and *O. wahlbergii*; 1♂ 1♀ (AMNH [AH 1858]), Brandberg, Orabes Gorge [21°13'S:14°37'E], 16.iv.1980, A. Harington, syntopic with *U. planimanus* and *O. ugabensis*; 1♀ (SMN 1859), N end Tsisab, Brandberg, 21°05'S:14°40'E, 21.i–27.ii.1995, E. Marais, preservative pitfall traps; 3♀ (AMNH [AH 3295, 4138, 4139]), Brandberg, hill 282,

Figs 9, 10. Adult females, habitus in life: (9) *Hottentotta conspersus* (Thorell, 1876); (10) *Parabuthus brevimanus* (Thorell, 1876).

opposite Orabes Wall [21°15'S:14°38'E], 1.i.1981, A. Harington, syntopic with *P. brevimanus*, *U. planimanus* and *O. lamorali*; 2♂ 3♀ 2 subad.♀ (AMNH [AH 2222–2227]), Brandberg West, 7 km from turnoff towards Uis [21°06'S:14°17'E], 28.i.1981, A. Harington, sympatric with *P. brevimanus* and *H. tityrus*; 2♂ 1♀ (SMN 727), Brandberg West Mine Rd, 21°08'S:14°08'E, 9.iv.1979, S. Louw; 4♂ (AMNH [AH 4492–4495]), 2♀ (AMNH [AH 4496]), 7 km SE of Brandberg West–Cape Cross–Uis T-junction [21°06'S:14°17'E], 28.i.1981, A. Harington; 3♂ (AMNH [AH 3156]), 3♀ (AMNH [AH 3153–3155]), Zebedeus, S of Uis [21°19'S:14°48'E], 21.viii.1982, S. Braine.

Ecology and distribution: This lapidicolous species (Fig. 9) shelters under stones (Lamoral 1979; Prendini 2001*b*). It is endemic to Angola and Namibia (Lamoral 1979; Prendini 2005*a*) and has been collected at the base and on the lower slopes (Figs 4, 5) of the Brandberg (the highest altitude at which it has been collected on the Massif is 781 m), and in rocky areas surrounding the Massif.

Parabuthus brevimanus (Thorell, 1876)

Buthus brevimanus: Thorell 1876*a*: 110–113.
Parabuthus cristatus Pocock, 1901: 284, 285 (synonymised by Kraepelin 1908: 250; Lamoral 1979: 561).

Material examined: 1 subad.♀ (SMN 3260), Brandberg, 21°11'54.9"S:14°28'33.9"E, 726 m, 3–4.ii.2007, T.L. Bird, A. Klann, P. Michalik & G. Talarico, on stones; 1♂ (AMNH [AH 2160]), 1♀ (AMNH [AH 2161]), 1 juv.♂ (AMNH [AH 2041]), Brandberg, Amis Gorge [21°11'S:14°28'E], 30.i.1981, A. Harington, syntopic with *U. planimanus* (adults), UV detection, found near sheer cliffs and sloping hills at the base of the mountain and gorge sides, syntopic with *H. conspersus* and *U. planimanus* (juv.); 1♂ 3♀ 1 juv. (SMN 1856), Amis Valley [Brandberg], 21°11'22"S:14°27'59"E, 21–22.iv.1996, E. Griffin, preservative pitfall traps; 1♂ 3♀ 1 subad.♀ (SMN 1856), Brandberg, Amis valley, 21°11'22"S:14°27'59"E, 21–22.iv.1996, E. Griffin, preservative pittraps; 1♀ (AMNH [AH 1341]), 1♂ (AMNH [AH 1516]), Brandberg, Basswald Rinne [21°10'S:14°38'E], 8.iv.1980 (♀), under stone on sandy ground on top of mountain, 16.iv.1980 (♂), on foothills, under stone, A. Harington; 1♀ (AMNH), Brandberg, base of Ga-Aseb Gorge, 21°13'41.6"S:14°34'44.1"E, 781 m, 21.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, dry riverbed surrounded by steep rocky slopes comprising igneous rocks with *Sterculia*, *Acacia montis-usti* and *Commiphora*, UV detection on warm, dark, still night, specimen collected in open midslope; 1 subad.♀ (AMNH [AH 3866]), Brandberg, Goaseb Gorge [21°14'S:14°35'E], 31.i.1981, A. Harington, syntopic with *U. planimanus*; 1♂ (SMN 2116), 1♀ (SMN 2115), Brandberg, Messum Valley, 21°13.29'S:14°30.98'E, 700 m, 4.iv.1999 (♂), bushy Karoo-Namib shrubland, S. van Noort, 5–17.iv.1999 (♀), pan trap, bushy Karoo-Namib shrubland, S. van Noort & S.G. Compton; 1♀ (SMN 2090), Brandberg, Messum Valley mouth 690, 21°13.72'S:14°30.73'E, 17.iv.1999, S. van Noort, under rock, gravel plain with Welwitschias; 1♀ (AMNH [AH 2197]), Brandberg, Numas Gorge [21°07'S:14°25'E], 30.i.1981, A. Harington, syntopic with *H. conspersus*; 2♂ (AMNH), Brandberg, summit, below Longipoele, 21°11'34.9"S:14°33'23.9"E, 1794 m, 23.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, sheltered, flat sandy valley with granite domes and boulders intersected by dry watercourses, granitic loam soil with *Stipagrostis–Aristida* grassland, *Boscia*, *Cyphostemma*, *Euphorbia* and *Ozoroa* in rocky areas, specimens collected with UV detection on warm, dark, still night, sitting on ground surface; 1♂ 2♀ (AMNH), 1 juv.♂ 2 juv.♀ (AMCC 172341 [LP 2640]), 1♀ (SMN 3377), Brandberg, summit, between Longipoele and Helmpoele, 21°11'33.2"S:14°33'31.4"E, 1830 m, 23.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, sheltered, flat sandy valley with granite domes and boulders intersected by dry watercourses, granitic loam soil with *Stipagrostis–Aristida* grassland, *Boscia*, *Cyphostemma*, *Euphorbia* and *Ozoroa* in rocky areas, specimens collected with UV detection on warm, dark, still night, sitting on ground surface; 1♀ (AMNH), same locality, 21°11'33.4"S:14°33'39.8"E, 1841 m, 3.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on cool, still night (moonset 10 pm), on summit of Brandberg in sandy valley surrounded by granitic outcrops, arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops and sandy-loam soils, specimen taken on ground surface; 1♂ (SMN 1858), N end Tsisab, Brandberg, 21°05'S:14°40'E, 21.i–27.ii.1995, E. Marais, preservative pitfall traps; 2♂ (AMNH [AH 2254, 4140]), 1♀ (AMNH [AH 2064]), 1 subad.♀ (AMNH [AH 2065]), 1 juv.♀ (AMNH [AH 2066]), Brandberg, base of hill 282, opposite Orabeskopf [21°15'S:14°38'E], 1.ii.1981, A. Harington, night collecting (cloudy sky, warm, windless), on harder flats at base of hill, syntopic with *P. gracilis*, *P. granulatus*, *P. kraepelini*, *U. planimanus* and *O. jenseni*; 2♂ (USDP), Brandberg, plains S, opposite Orabeskopf, 21°15.48'S:14°36.54'E, 790 m, 16.i.1998, L. Prendini & E. Scott, flats at the base of gritty white dune sand dune against hill, UV detection, syntopic with *P. gracilis*, *P. granulatus*, *O. jenseni* and *O. wahlbergii*; 1♀ (SMN 1855), W of Brandberg [21°04'S:14°20'E], 10–12.viii.1985, E. Griffin, preservative pitfall traps; 1♀ (AMNH [AH 2220]), Brandberg West, 7 km from turnoff towards Uis [21°06'S:14°17'E], 28.i.1981, A. Harington, syntopic with *H. conspersus* and *H. tityrus*; 1 juv.♀ (SMN 1911), 'G of E', 21°11'47"S:14°33'43"E, 1.xii.1999, pitfall row 1, Phase 99 P(3); 1♂ 1♀ (NMSA 10847), Messum Crater area, 21°16'S:14°13'E, 26.iii.1976, B. Lamoral, on surface of sandy to

gritty soil at night; 1♀ (AMNH [AH 2163]), Messum Crater area [21°25'S 14°13'E], 21.i.1981, A. Harington, syntopic with *P. gracilis* and *U. gracilior*; 1♀ (SMN 1917), Messum Crater, 21°26.430'S:14°13.215'E, 8.iv.2000, E. Griffin, on rocky hillside at night; 1♀ (AMNH [AH 1916]), Nai-Gap riverbed at N tip Uis Mtns [21°07'S:14°52'E], 6.ii.1981, A. Harington, syntopic with *P. gracilis*; 1♀ (AMNH [AH 1797]), Omatjette–Khorixas junction, 25 km towards Uis [21°03'S:14°53'E], 6.ii.1981, A. Harington, syntopic with *P. kraepelini* and *O. jenseni*; 1♂ 1♀ 2 subad.♂ 2 subad.♀ 2 juv.♂ 1 juv.♀ (SMN 2610), Uisberg, 21°07'S:14°31'E, 17.i–22.ii.1996, E. Marais, preservative pitfall traps; 6♂ 7♀ Uis R., nr Kai-Nuses, nr Uis [21°11'S:14°52'E], 2.i.1981, sympatric with *U. otjimbinguensis* (3♂ (AMNH [AH 4347–4349]), 2♀ (AMNH [AH 4350, 4351])), 2.ii.1981, syntopic with *P. kraepelini*, *P. namibensis*, *U. otjimbinguensis* and *U. planimanus* (3♂ (AMNH [AH 2146]), 5♀ (AMNH [AH 2147, 2148])), A. Harington; 3♂ (AMNH [AH 2166]), Uis, nr town [21°15'S:14°50'E], 2.ii.1981, A. Harington; 1♂ 3♀ (AMNH), Uis, 3 km W on road to Hentiesbaai, 21°13'57.5"S:14°51'08.7"E, 814 m, 31.iii.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on warm, still, dark night, becoming windy later, followed by rain, low rocky hills with *Euphorbia damarana* L.C.Leach, small Acacias and sparse grass, specimens collected in open rocky ground; 1♀ (SMN 1907), 'X-ray', 21°13'34"S:14°31'05"E, 2.xi.1999, pitfall row 1, Phase 99P(2); 1♂ 3♀ 'Yankee', 21°11'32"S:14°31'45"E, 3.xi.1999, pitfall row 2, Phase 99P(2) (1♂ 1♀ SMN 1906), pitfall row 3, Phase 99P(2) (2♀ SMN 1904, 1905).

Ecology and distribution: This semi-psammophilous species (Fig. 10) excavates burrows in open ground and at the base of shrubs and grass tufts in semi-consolidated to consolidated sandy and gritty substrata (Lamoral 1979; Prendini 2001*b*, 2004). It is endemic to Angola, Namibia and South Africa (Lamoral 1979; Prendini 2004, 2005*a*) and has been collected from the base (Fig. 4) to the summit (Fig. 8; 1841 m) of the Brandberg and in sandy and rocky areas surrounding the Massif (Figs 2, 3).

Parabuthus gracilis Lamoral, 1979

Parabuthus gracilis: Lamoral 1979: 566–571, figs 96, 103, 104, 107–116.

Material examined: 5♂ (AMNH [AH 2055–2057, 2067, 2068]), 4♀ (AMNH [AH 2058–2060, 2069]), 1 subad.♂ (AMNH [AH 2061]), 1 subad.♀ (AMNH [AH 2062]), 1 juv.♀ (AMNH [AH 2063]), Brandberg, base of hill 282, opposite Orabeskopf [21°15'S:14°38'E], 1.ii.1981, A. Harington, night collecting (cloudy sky, warm, windless) on sand dune (soft, white but sometimes gritty soil) near hill, most specimens where sand was soft, a few with burrows in dune, syntopic with *P. gracilis*, *P. granulatus*, *P. kraepelini*, *U. planimanus* and *O. jenseni*; 3♂ (AMCC 119231), Brandberg, plains S, opposite Orabeskopf, 21°15.48'S:14°36.54'E, 790 m, 16.i.1998, L. Prendini & E. Scott, gritty white dune sand dune against hill and adjacent gravel flats, UV detection, syntopic with *O. jenseni* and *O. wahlbergii*; 1♀ holotype (NMSA 10925), 8♂ 2♀ 4 juv. paratypes (NMSA 10848), 1♂ paratype (NMSA 10906), 1♂ paratype (SMN 766), Messum Crater area, 21°16'S:14°13'E, 26.iii.1976, B. Lamoral & L. Ferguson, on surface of sandy to gritty soil at night; 1♂ (AMNH [AH 2164]), Messum Crater area [21°25'S:14°13'E], 21.i.1981, A. Harington, syntopic with *P. brevimanus* and *U. gracilior*; 1 subad.♂ (AMNH [AH 3386]), 2 subad.♀ (AMNH [AH 3387, 3388]), Daweb (N Uis), 4 km S [21°03'S:14°54'E], 6.ii.1981, A. Harington, on sandy and rocky areas, sympatric with *L. elegans*, *P. granulatus*, *P. kraepelini*, *O. jenseni* and *O. wahlbergii*; 2 subad.♂ (AMNH [AH 1917, 1918]), Nai-Gap riverbed at N tip Uis Mtns [21°07'S:14°52'E], 6.ii.1981, A. Harington, syntopic with *P. brevimanus*; 1 subad.♂ (AMNH [AH 2167]), Uis townlands [21°15'S:14°50'E], 2.ii.1981, A. Harington; 1♂ (AMNH [AH 2089]), 2 subad.♂ 3 subad.♀ (AMNH [AH 2090]), Uis, 20 km from turnoff to Khorixas [21°02'S:14°54'E], 6.ii.1981, A. Harington, drizzling, specimens abundant on sand and near rocky surfaces, syntopic with *P. granulatus*, *P. kraepelini*, *O. jenseni* and *O. wahlbergii*.

Ecology and distribution: This psammophilous species (Fig. 11) excavates burrows in unconsolidated white sand dunes (Lamoral 1979; Prendini 2001*b*, 2004) situated in dry riverbeds and against small hills (Fig. 2) surrounding the Brandberg and adjacent landforms (e.g. the Messum Crater). It is endemic to Namibia (Lamoral 1979; Prendini 2004, 2005*a*).

Parabuthus granulatus (Ehrenberg, 1831)

Androctonus (*Prionurus*) *granulatus*: Ehrenberg in Hemprich & Ehrenberg 1831 [unpaginated].
Buthus brevimanus var. β *segnis* Thorell, 1876*a*: 110, 112 (synonymised by Prendini 2004: 144).
Buthus fulvipes Simon, 1888: 378, 379 (synonymised by Purcell 1899: 434; Lamoral 1979: 571).

Figs 11, 12. *Parabuthus* adults, habitus in life: (11) *P. gracilis* Lamoral, 1979, female; (12) *P. granulatus* (Ehrenberg, 1831), male.

Parabuthus granulatus fuscus Pocock, 1901: 285 (synonymised by Kraepelin 1908: 251, 252; Lamoral 1979: 571).
Parabuthus granulatus bergeri Werner, 1916: 83–84 (synonymised by Lamoral 1979: 571).
Parabuthus granulatus strenuus Hewitt, 1918: 176 (synonymised by Prendini 2004: 145).

Material examined: 1♂ (SMN 121), Brandberg base camp [21°07'S:14°25'E], 15.viii.1968, P.J. Buys; 1♂ (USDP), Brandberg, plains S, opposite Orabeskopf, 21°15.48'S:14°36.54'E, 790 m, 16.i.1998, L. Prendini & E. Scott, flats at the base of gritty white dune sand dune against hill, UV detection, syntopic with *P. brevimanus*, *P. gracilis*, *O. jenseni* and *O. wahlbergii*; 1♂ (USDP), Numaskloof, Brandberg, 21°07.48'S:14°25.54'E, 470 m, 17.i.1998, L. Prendini & E. Scott, coarse granitic sandy loam flats, UV detection, syntopic with *H. conspersus*, *O. lamorali*, *O. ugabensis* and *O. wahlbergii*; 1♂ (SMN 2174), Brandberg, Numas R., 21°06.815'S:14°24.340'E, 23.iv.2000, T.O. Osborne; 1♂ (SMN 2588), Brandberg, White lady campsite, 21°00'57.72"S:14°41'04.08"E, 4.iii.2005, 461 m, D. Kunz & M. Jouve; 1♂ (USDP), Uis, 21°13.10'S:14°52.04'E, 15.i.1998, 660 m, L. Prendini & E. Scott, coarse sandy loam flats, collected at night with UV light, syntopic with *O. wahlbergii*; 1♂ 1♀ (AMNH [AH 3382, 3383]), Daweb (N Uis), 4 km S [21°03'S:14°54'E], 6.ii.1981, A. Harington, on sandy flats away from hills, one had a burrow, often near *Euphorbia* bushes, sympatric with *L. elegans*, *P. brevimanus*, *P. kraepelini*, *O. jenseni* and *O. wahlbergii*; 2♂ 1♀ 1 juv.♂ 1 juv.♀ Uis [21°15'S:14°50'E], 29.xii.1989, H.C. Strauss (1♂ SMN 1336, 1 juv.♂ 1 juv.♀ SMN 1337), 1968, J.J. Nel (1♂ TMSA 10111), xii.1968, J.J. Nel (1♀ TMSA 10117); 2♂ 2♀ Uis tin mine, Uis [21°13'S:14°51'E], 24.ix.1968, J.J. Nel (1♂ TMSA 15796), xii.1968, J.J. Nel (1♂ TMSA 9397), xi.1969, J.J. Nel (1♀ TMSA 15785), 1979, H. Henke, syntopic with *P. kraepelini* (1♀ AMNH [AH 1192]).

Ecology and distribution: This semi-psammophilous species (Fig. 12) excavates burrows in open ground, at the base of shrubs and grass tufts, and under stones, in semi-consolidated to consolidated sandy and gritty substrata (Lamoral 1979; Prendini 2001*b*, 2004). It occurs in Angola, Botswana, Namibia, South Africa and Zimbabwe (Lamoral 1979; FitzPatrick 1994; Prendini 2004, 2005*a*) and has been collected in gorges intersecting the Brandberg, e.g. Numaskloof (470 m), and in sandy areas surrounding the Massif (Figs 2, 3), but not on the slopes or the summit.

Parabuthus kraepelini Werner, 1902

Parabuthus kraepelini: Werner 1902: 599.

Material examined: 5♂ (AMNH [AH 1653, 1656, 1848, 3290, 3291]), 5♀ (AMNH [AH 1652, 1654, 1655, 1657, 3292]), Brandberg, base of hill 282, opposite Orabeskopf [21°15'S:14°38'E], 1.ii.1981, A. Harington, night collecting (cloudy sky, warm, windless), on harder flats at base of hill, sympatric with *H. conspersus*, *P. brevimanus*, *P. gracilis*, *P. granulatus*, *U. gracilior*, *U. planimanus*, *O. jenseni*, *O. lamorali* and *O. wahlbergii*; 1♂ (AMNH [AH 3384]), 1♀ (AMNH [AH 3385]), Daweb (N Uis), 4 km S [21°03'S:14°54'E], 6.ii.1981, A. Harington, on sand flats away from hills, one had a burrow, often nr *Euphorbia* bushes, sympatric with *L. elegans*, *P. brevimanus*, *P. granulatus*, *O. jenseni* and *O. wahlbergii*; 1 subad.♂ (AMNH [AH 3601]), 2♂ (AMNH [AH 1795, 1796]), Omatjette–Khorixas junction, 25 km towards Uis [21°03'S:14°53'E], 6.ii.1981, A. Harington (1 subad.♂), syntopic with *P. brevimanus* and *O. jenseni* (2♂); 1♂ (AMNH [AH 2144]), Uis R., nr Kai-Nuses, nr Uis [21°11'S:14°52'E], 2.ii.1981, A. Harington, syntopic with *P. brevimanus*, *P. namibensis*, *U. otjimbinguensis* and *U. planimanus*; 1♂ (AMNH [AH 1193]), Uis [21°15'S:14°50'E], 1979, H. Henke, syntopic with *P. granulatus*; 1♂ (TMSA 18158), Uis tin mine, Uis [21°13'S:14°51'E], 7.ii.1969, J.J. Nel; 1♀ (SMN 1621 [SAIMR 860]), Uis mine, 30.iii.1969, J.J. Nel; 2♂ (AMNH [AH 2085, 2087]), 2♀ (AMNH [AH 2086, 2088]), Uis, 20 km from turnoff to Khorixas [21°02'S:14°54'E], 6.ii.1981, A. Harington, drizzling, specimens on sand flats away from hill, often near Euphorbias, one in burrow, syntopic with *P. gracilis*, *P. granulatus*, *O. jenseni* and *O. wahlbergii*.

Ecology and distribution: This semi-psammophilous species (Fig. 13) excavates burrows in open ground and at the base of shrubs and grass tufts in consolidated sandy and gritty substrata (Lamoral 1979; Prendini 2001*b*, 2004). Although it may also occur in Angola, this species has been recorded only from Namibia (Lamoral 1979; Prendini 2004, 2005*a*). It has been collected in the areas surrounding the Brandberg, but not on the Massif itself.

Figs 13, 14. *Parabuthus* adults, habitus in life: (13) *P. kraepelini* Werner, 1902, female; (14) *P. villosus* (Peters, 1862), male.

Parabuthus namibensis Lamoral, 1979

Parabuthus namibensis: Lamoral 1979: 591–594, figs 155–163.

Material examined: 2♂ 2♀ Messum Crater area [21°25'S:14°13'E], 21.i.1981, at base of very large, barren dune hill, no vegetation, syntopic with *O. jenseni* (2♂ AMNH [AH 1949, 1996]; 1♀ AMNH [AH 1948]), 22.ii.1982, at base of very large, barren dune hill, no vegetation, syntopic with *O. jenseni* (1♀ AMNH [AH 4412]), A. Harington; 2♂ 1 subad.♀ Messum Crater, 21°26.430'S:14°13.215'E, 4–10.iv.2000, E. Griffin, preservative pitfall traps, rocky, sandy hill side (1♂ 1 subad.♀ SMN 2424), 7.iv.2000, M. Griffin, on sand covered rocky hillside at night (1♂ SMN 1915); 1♂ (AMNH [AH 3153]), Uis tin mine, Uis [21°13'S:14°51'E], 19.vii.1981, J. Botha, syntopic with *O. lamorali*; 1 juv.♂ (AMNH [AH 2145]), Uis R., nr Kai-Nuses, nr Uis [21°11'S:14°52'E], 2.ii.1981, A. Harington, syntopic with *P. brevimanus*, *P. kraepelini*, *U. otjimbinguensis* and *U. planimanus*.

Ecology and distribution: This semi-psammophilous species inhabits semi-consolidated to consolidated sandy and gritty substrata, where it probably excavates burrows in open ground and at the base of shrubs and grass tufts. All specimens collected to date were either captured in pitfall traps or at night by means of UV light detection (Lamoral 1979; Prendini 2001*b*, 2004). It is endemic to Namibia (Lamoral 1979; Prendini 2004, 2005*a*) and has been collected in the areas surrounding the Brandberg (Fig. 1) and adjacent landforms (e.g. the Messum Crater), but not on the Massif itself.

Parabuthus villosus (Peters, 1862)

Prionurus (*Androctonus*) *villosus*: Peters 1862: 26–27.
Buthus villosus var. β *dilutus* Thorell, 1876*a*: 103–107 (synonymised by Kraepelin 1899: 31).
Parabuthus brachystylus Lawrence, 1928: 270 (synonymised by Prendini 2004: 177).

Material examined: 1 juv.♀ (SMN 2091), Brandberg, Messum Valley mouth, 21°13.72'S:14°30.73'E, 690 m, 17.iv.1999, S. van Noort, under rock, gravel plain; 2♂ (USDP), Numaskloof, Brandberg, 21°07.48'S: 14°25.54'E, 470 m, 17.i.1998, L. Prendini & E. Scott, steep rocky slopes, coarse granitic sandy loam, UV detection, syntopic with *H. conspersus*, *H. tityrus* and *O. ugabensis*; 1 subad.♀ (SMN 2592 [TB 05/76]), Brandberg, White lady campsite, 21°00'57.72"S:14°41'04.08"E, 461 m, 3.iii.2005, J. & M. Jouve; 1♀ (NMSA 10823), Messum Crater area, 21°16'S:14°13'E, 26.iii.1976, B. Lamoral & L. Ferguson, on surface of sandy to gritty soil at night; 1♀ (SMN 1916), Messum Crater, 21°26.430'S:14°13.215'E, 6.iv.2000, M. Griffin, in pit trap along rocky hillside; 2♂ 1♀ 1 subad.♀ Uis [21°15'S:14°50'E], xii.1968 (1 subad.♀ TMSA 10046), 31.iii.1970 (1♂ TMSA 9830), J.J. Nel, 31.iii.1969 (1♀ TMSA 10110), v.1969 (1♂ TMSA 18160), J. Bezuidenhout; 3♂ 2 subad.♂ 1 subad.♀ Uis tin mine, Uis [21°13'S:14°51'E], 3.ix.1963, Mr Hass (1♂ 1 subad.♂ SMN 82), 1967 (1♂ TMSA 17697, 1 subad.♂ TMSA 17694), 19.ix.1967 (1♂ TMSA 17696, 1 subad.♀ TMSA 17695), 13.xii.1968 (1♂ TMSA 17402), J.J. Nel; 1♀ (AMNH [AH 1187]), Manager's Office, Uis tin mine, Uis [21°13'S:14°51'E], 28.iv.1980, J. Lavranos; 1♂ (USDP), Uis, 2 km from town, 21°13.48'S:14°51.84'E, 780 m, 15.i.1998, L. Prendini & E. Scott, rocky flats and hillside on outskirts of town, night collecting with UV detection, syntopic with *U. planimanus* and *O. lamorali*; 2♀ (AMNH), 1 subad.♀ (SMN 2922), Uis, 3 km W on road to Hentiesbaai, 21°13'57.5"S:14°51'08.7"E, 814 m, 31.iii.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on warm, still, dark night, becoming windy later, followed by rain, low rocky hills with *Euphorbia damarana*, small Acacias and sparse grass, specimens collected in open rocky ground; 1♀ (SMN 127), Ugab drift, 40 km from Uis [21°00'S:14°49'E], 6.iii.1966, P.S. Swart; 1 subad.♀ (SMN 1903), 'X-ray', 21°13'34"S:14°31'05"E, 2.xi.1999, pitfall row 3, Phase 99P(2).

Ecology and distribution: This semi-lithophilous species (Fig. 14) excavates shallow burrows or scrapes under stones in consolidated sandy, gritty or clayey substrata (Lamoral 1979; Prendini 2001*b*, 2004). Although it may also occur in Angola, this species has been recorded only from Namibia and South Africa (Lamoral 1979; Prendini 2004, 2005*a*). It has been collected in rocky areas surrounding the Brandberg and in gorges intersecting the Massif (Fig. 4), e.g. Numaskloof (470 m), but not on the slopes or the summit.

Uroplectes gracilior Hewitt, 1913

Uroplectes carinatus gracilior: Hewitt 1913: 147–148 (part).

Material examined: 1♀ (AMNH [AH 3293]), Brandberg, hill 282, opposite Orabes Wall [21°15'S:14°38'E], 1.ii.1981, A. Harington, sympatric with *H. conspersus*, *P. kraepelini*, *O. jenseni*, *O. lamorali* and *O. wahlbergii*;

3♂ Messum Crater area [21°25'S:14°13'E], 21.i.1981, syntopic with *P. brevimanus* and *P. gracilis* (2♂ AMNH [AH 2165]), 23.xii.1988 (1♂ AMNH [AH 4117]), A. Harington.

Ecology and distribution: This lapidicolous species (Fig. 15) shelters under stones and in grass tussocks (Lamoral 1979; Prendini 2001*b*) on rocky outcrops and gravel plains in areas surrounding the Brandberg (Fig. 1) and adjacent landforms (e.g. the Messum Crater). Although it may also occur in Angola, this species has been recorded only from Namibia and South Africa (Lamoral 1979; Prendini 2005*a*).

Uroplectes otjimbinguensis (Karsch, 1879)

Lepreus otjimbinguensis: Karsch 1879: 125.

Material examined: 1♀ (SMN 3372 [TB 03/47(a)]), Brandberg, 1–14.v.2003, EduVentures 1; 1♂ 1 juv. (AMCC 172345 [LP 5708]), Brandberg, Ga-Asab (Goaseb) Gorge, 21°12'35.3"S:14°34'32.2"E, 1300 m, 1–2.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on cool, dark, still night becoming windy later, on mid-slopes of Brandberg in arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops and sandy-loam soils, specimens taken on trees; 4♀ (AMNH), Brandberg, two-thirds up Ga-Aseb Gorge, below Orabeskopf, 21°12'18.0"S:14°34'17.6"E, 1529 m, 25.xii.2003, T.L. Bird, N.C. Krone & L. Prendini; 6♂ 5♀ (AMNH), 1♀ (AMCC 172334 [LP 2590]), 4♀ (SMN 3381), Brandberg, top of Ga-Aseb Gorge, *ca* 500 m W of Orabeskopf, 21°12'09.3"S:14°34'05.6"E, 1631 m, 22.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, flat, sandy valley below summit, surrounded by granite boulder-strewn slopes, *Aloe dichotoma*, *Cyphostemma*, *Euphorbia* and *Boscia*, with sparse grass on granitic sandy loam, specimens collected on trees with UV detection on warm, dark, still night; 1 juv.♂ (SMN 94), Brandberg, Numas Valley [21°06'S:14°23'E], 3.viii.1970, C.G. Coetzee; 3♂ 2♀ (AMNH), 3♂ (SMN 3380), Brandberg, summit, below Longipoele, 21°11'34.9"S:14°33'23.9"E, 1794 m, 23.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, sheltered, flat sandy valley with granite domes and boulders intersected by dry watercourses, granitic loam soil with *Stipagrostis–Aristida* grassland, *Boscia*, *Cyphostemma*, *Euphorbia* and *Ozoroa* in rocky areas, specimens collected with UV detection on warm, dark, still night, sitting on trees; 6♂ 3♀ (AMNH), 1♀ (AMCC 172337 [LP 2611]), 2♂ 2♀ (SMN 3379), Brandberg, summit, between Longipoele and Helmpoele, 21°11'33.2"S:14°33'31.4"E, 1830 m, 23.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, sheltered, flat sandy valley with granite domes and boulders intersected by dry watercourses, granitic loam soil with *Stipagrostis–Aristida* grassland, *Boscia*, *Cyphostemma*, *Euphorbia* and *Ozoroa* in rocky areas, specimens collected with UV detection on warm, dark, still night, sitting on trees; 1♂ 8♀ (AMNH), Brandberg, summit, valley E Helmpoele, 21°11'31.9"S:14°34'00.5"E, 1930 m, 3.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on cool, still night (moonset 10 pm), on summit of Brandberg in sandy valley surrounded by granitic outcrops, arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops and sandy-loam soils, specimens taken from trees, often several metres above ground; 6♂ 6♀ (AMNH), 2♂ 2♀ (SMN 3378), Brandberg, Wasserfallfläche, on summit, 21°10'47.0"S:14°33'16.6"E, 1977 m, 24.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, flat, sandy valley with granite domes and boulders, fairly dry and exposed, *Aloe dichotoma*, *Cyphostemma*, *Euphorbia* and *Boscia*, with sparse grass on granitic sandy loam, specimens collected with UV detection in open sand flats, on cool, dark, still night; 2♀ (SMN 93), Uis [21°15'S:14°50'E], 4.viii.1969, P.J. Buys; 1♂ 2♀ Uis R., nr Kai-Nuses, nr Uis [21°11'S:14°52'E], 2.i.1981, sympatric with *P. brevimanus* (1♀ AMNH [AH 4346]), 2.ii.1981, sympatric with *P. brevimanus*, *P. kraepelini*, *P. namibensis*, and *U. planimanus* (1♂ AMNH [AH 2151], 1♀ AMNH [AH 2152]), A. Harington.

Ecology and distribution: This corticolous species shelters under the peeling bark of trees or in holes in tree trunks (Lamoral 1979; Prendini 2001*b*). It is endemic to Angola and Namibia (Lamoral 1979; Prendini 2005*a*) and has been collected from the base (Fig. 4) to the summit (Fig. 8) of the Brandberg and also in the areas surrounding the Massif.

Uroplectes planimanus (Karsch, 1879)

Lepreus planimanus: Karsch 1879: 125–126.
Lepreus lunulifer Simon, 1888: 375–377 (synonymised by Kraepelin 1895: 88).

Material examined: 1♂ 2 juv.♀ (SMN 1002), 1♀ (SMN 2036), 1♀ 5 juv. (SMN 2231 [TB 03/34(b)]), 1 juv.♂ 2 juv.♀ (SMN 2286), 1 juv.♂ (SMN 2312), 1♂ (SMN 2680 [TB 03/34c]), 1 juv.♂ (SMN 2684 [TB 03/40]), 1 juv.♀ (SMN 2940), 2♀ (SMN 3373 [TB 03/36(g)]), Brandberg [21°14'S:14°30'E], 1–14.v.2003, EduVentures 1, syntopic with *O. carinatus*; 1♂ (AMNH [AH 2040]), 1♀ (AMNH [AH 2162]), Brandberg, Amis Gorge [21°11'S:14°28'E], 30.i.1981, A. Harington, UV detection, found near sheer cliffs and sloping

hills at the base of the mountain and gorge sides, syntopic with *H. conspersus*, *P. brevimanus*, and *U. planimanus*; 3♂ (SMN 3078 [TB 07/04(b)]), Brandberg, Amis Gorge (lower foothills), 21°19'43.08"S:14°47'41.04"E, 740 m, 5.ii.2007, T.L. Bird, P. Michalik, A. Klann & G. Talarico, UV detection; 1♀ (SMN 3105) Brandberg, Amis Gorge (base), 21°19'43.08"S:14°47'41.04"E, 740 m, 5.ii.2007, T.L. Bird, P. Michalik, A. Klann & G. Talarico, UV detection in river bed; 1♂ (AMNH [AH 1440]), 1♀ (AMNH [AH 1441]), Brandberg, Basswald Rinne [21°10'S:14°38'E], 18.iv.1980, A. Harington, on foothills, more common under black rocks, syntopic with *H. conspersus*; 1 subad.♀ (AMNH) Brandberg, campsite at end of road to Ga-Aseb Gorge, 21°14.234'S: 14°34.847'E, 750 m, 24.xii.2003, E. Scott & C. Bird; 1♀ (AMNH), 1 juv.♂ (AMCC 172335 [LP 2592]), Brandberg, base of Ga-Aseb Gorge, 21°13'41.6"S:14°34'44.1"E, 781 m, 21.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, dry riverbed surrounded by steep rocky slopes comprising igneous rocks with *Sterculia*, *Acacia montis-usti* and *Commiphora*, UV detection on warm, dark, still night, specimen collected in open midslope; 4♀ 1 juv. Brandberg, Ga-Asab (Goaseb) Gorge, 21°12'35.3"S:14°34'32.2"E, 1300 m, 1–2.iv.2006, UV detection on cool, dark, still night becoming windy later, on mid-slopes of Brandberg in arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops and sandy-loam soils, specimen taken on rock surface (2♀ AMNH, 1 juv. AMCC 172346 [LP 5710]), 21°12'03"S:14°33'57.9"E, 1868 m, 2–3.iv.2006, UV detection on cool, dark, still night, on upper slopes of Brandberg in small sandy valley, arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops and sandy-loam soils, specimens taken on rock surface (2♀ AMNH), L. Prendini, T.L. Bird & S.K. Uunona; 1♂ (AMNH [AH 3865]), Brandberg, Goaseb Gorge [21°14'S:14°35'E], 31.i.1981, A. Harington, syntopic with *P. brevimanus*; 1 subad.♂ (AMNH [AH 837]), Goaseb nr Brandberg [21°14'S:14°35'E], 6.iv.1978, H. Pager, syntopic with *B. haringtoni*; 1♀ (SMN 2221), Brandberg, Mason Shelter, 21°04'39"S:14°05'43"E, 15.iii.2002, A.H. Kirk-Spriggs & D.J. Mann, black light; 1 subad.♂ 1♀ Brandberg, Numas Valley [21°06'S:14°23'E], 3.viii.1969, P.J. Buys (1♀ SMN 92), 14.viii.1995, M. & E. Griffin, rocky hillside, under stones in crevices (1 subad.♂ SMN 2226); 2♀ (SMN 98), Brandberg, Numas Gorge [21°07'S:14°25'E], 457 m, 11.viii.1969, P.G. Olivier; 2♀ (SMN 98), Brandberg, Numasplato, 2286 m, 11.viii.1969, P.G. Olivier; 1 subad.♀ (AMNH [AH 1857]), Brandberg, Orabes Gorge [21°13'S:14°37'E], 16.iv.1980, A. Harington, syntopic with *H. conspersus* and *O. ugabensis*; 1♀ (AMNH), 1 subad.♀ 1 juv.♂ (SMN 2930), Brandberg, summit, Longipoele, 21°11'35.8"S:14°33'29.5"E, 1832 m, 3.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on cool, still night (moonset 10 pm), on summit of Brandberg in sandy valley surrounded by granitic outcrops, arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops and sandy-loam soils, specimens collected on exfoliating rock outcrop; 1♂ 2♀ (AMNH), 2 juv.♂ 1 juv.♀ (AMCC 172336 [LP 2598]), 2♀ (SMN 3384), Brandberg, summit, below Longipoele, 21°11'34.9"S:14°33'23.9"E, 1794 m, 23.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, sheltered, flat sandy valley with granite domes and boulders intersected by dry watercourses, granitic loam soil with *Stipagrostis–Aristida* grassland, *Boscia*, *Cyphostemma*, *Euphorbia* and *Ozoroa* in rocky areas, specimens collected with UV detection on warm, dark, still night, sitting on rock faces; 14 specimens, Brandberg, summit, between Longipoele and Helmpoele, 21°11'33.2"S:14°33'31.4"E, 1830 m, 23.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, sheltered, flat sandy valley with granite domes and boulders intersected by dry watercourses, granitic loam soil with *Stipagrostis–Aristida* grassland, *Boscia*, *Cyphostemma*, *Euphorbia* and *Ozoroa* in rocky areas, specimens collected with UV detection on warm, dark, still night, sitting on rock faces (5♂ 1♀ AMNH, 1 subad.♀ 1 juv.♂ 1 juv.♀ AMCC 172338 [LP 2612], 1♂ 1♀ SMN 3383), 21°11'33.4"S: 14°33'39.8"E, 1841 m, 3.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on cool, still night (moonset 10 pm), on summit of Brandberg in sandy valley surrounded by granitic outcrops, arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops and sandy-loam soils, specimens taken on rock surface (1 juv. AMCC 172344 [LP 5707], 2 juv.♀ SMN 2929); 2♂ 2♀ (AMNH), Brandberg, summit, valley E Helmpoele, 21°11'31.9"S:14°34'00.5"E, 1930 m, 3.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on cool, still night (moonset 10 pm), on summit of Brandberg in sandy valley surrounded by granitic outcrops, arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops and sandy-loam soils, specimens collected on rock faces and stones; 2 juv.♂ Brandberg, Wasserfallfläche, 21°10.76'S:14°33.16'E, 7.iv.1999, S. van Noort, under rock, bushy Karoo-Namib shrubland (SMN 2117), 2000 m, 14.iv.1999, S.G. Compton, bushy Karoo-Namib shrubland (SMN 2113); 11♂ 3♀ (AMNH), 2 juv.♂ 4 juv.♀ (AMCC 172339 [LP 2613]), 1♂ 3 subad.♂ 4 subad.♀ (SMN 3382), Brandberg, Wasserfallfläche, on summit, 21°10'47.0"S:14°33'16.6"E, 1977 m, 24.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, flat, sandy valley with granite domes and boulders, fairly dry and exposed, *Aloe dichotoma*, *Cyphostemma*, *Euphorbia* and *Boscia*, with sparse grass on granitic sandy loam, specimens collected with UV detection in open sand flats, on cool, dark, still night; 1♀ (SMN 1862), top of Brandberg [21°14'S:14°30'E], vii.1993, Raleigh International; 1♀ (AMNH [AH 2042]), Brandberg, at hill 282, opposite Orabeskopf [21°15'S:14°38'E], 1.ii.1981, A. Harington, night collecting (cloudy sky, warm, windless), near rock border of hill, syntopic with *P. brevimanus*, *P. gracilis*, *P. granulatus*, *P. kraepelini* and *O. jenseni*; 1 subad.♂ (SMN 1577), W of Brandberg, 21°07'S:14°23'E, 10.viii.1985, E. Griffin, at night; 1 juv.♂ (NMSA 10879) Messum Crater area, 21°16'S:14°13'E, 26.iii.1976, B. Lamoral & L. Ferguson, on rocky ground at night; 1 subad.♂ (AMNH [AH 1915]), N end of Uis Mtns, nr Uis [21°07'S:14°52'E], 6.ii.1981, A. Harington; 1♂ 1♀ (AMNH [AH 2149]), Uis R., nr Kai-Nuses, nr Uis [21°11'S:

Figs 15, 16. *Uroplectes* adults, habitus in life: (15) *U. gracilior* Hewitt, 1913, male; (16) *U. planimanus* (Karsch, 1879), female with brood.

14°52'E], 2.ii.1981, A. Harington, syntopic with *P. brevimanus*, *P. kraepelini*, *P. namibensis*, and *U. otjimbinguensis*; 1♂ (TMSA 17292), Uis [21°15'S:14°50'E], 8.ii.1969, J.J. Nel; 1♀ (TMSA 17929), Uis tin mine, Uis [21°13'S:14°51'E], 1967, J.J. Nel; 3♂ 3♀ (AMNH), Uis, 2 km from town on Henties Bay road, 21°13.48'S:14°51.84'E, 780 m, 15.i.1998, L. Prendini & E. Scott, rocky flats and hillside on outskirts of town, night collecting with UV detection, syntopic with *P. villosus* and *O. lamorali*; 3♂ (AMNH), 2 subad.♀ (SMN 2933), Uis, 3 km W on road to Hentiesbaai, 21°13'57.5"S:14°51'08.7"E, 814 m, 31.iii.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on warm, still, dark night, becoming windy later, followed by rain, low rocky hills with *Euphorbia damarana*, small Acacias and sparse grass, specimens collected on rock faces; 1 subad.♀ (AMNH [AH 1417]), Uis, 5 km W [21°15'S:14°50'E], 15.iv.1980, A. Harington, in rock cracks, syntopic with *H. hahni*.

Ecology and distribution: This lithophilous species (Fig. 16) shelters in the cracks and crevices, and under the exfoliating flakes, of weathered rock outcrops and under stones resting on bedrock (Lamoral 1979; Prendini 2001*b*). It occurs in Angola, Botswana, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe (Lamoral 1979; Newlands & Martindale 1980; FitzPatrick 1996; Prendini 2005*a*; L. Prendini, unpubl. data) and has been collected from the base (Fig. 4) to the summit (Fig. 8) of the Brandberg and also in the areas surrounding the Massif.

Family Liochelidae Fet & Bechly, 2001

Hadogenes hahni (Peters, 1862)

Ischnurus hahni: Peters 1862: 27.
Ischnurus taeniurus Thorell, 1876*a*: 254–258.
Hadogenes angolensis Lourenço, 1999: 932–936, figs 1–17, 19, 20, 23, 25, table I (synonymised by Prendini 2005*b*: 376, 384–386).

Material examined: 1 subad.♂ (SMN 167), Uis mine, Uis R. [21°11'S:14°52'E], 12.ix.1962, B. Grobbelaar; 1♂ (TMSA 9416), Uis tin mine, Uis [21°13'S:14°51'E], 30.iii.1969, J.J. Nel; 1 juv.♂ (AMNH [AH 1416]), Uis, 5 km W [21°15'S:14°50'E], 15.iv.1980, A. Harington, in rock cracks, syntopic with *U. planimanus*.

Ecology and distribution: This lithophilous species shelters in the cracks and crevices, and under the exfoliating flakes, of weathered rock outcrops and under stones resting on bedrock (Lamoral 1979; Prendini 2001*b*). It is endemic to Angola and Namibia (Lamoral 1979; Prendini 2005*a*, *b*) and has been collected in areas to the southeast of the Brandberg, but not on the Massif itself.

Hadogenes tityrus (Simon, 1888)

Ischnurus tityrus: Simon 1888: 383–384.

Material examined: 1♀ (TMSA 18350), Brandberg [21°14'S:14°30'E], B.H. Lamoral, 1977; 2♀ 2 subad.♀ (AMNH [AH 1369–1371]), Brandberg, Basswald Rinne [21°10'S:14°38'E], 17–18.iv.1980, A. Harington, in cracks in red rocks; 1♂ 1♀ (AMNH), Brandberg, base of Ga-Aseb Gorge, 21°13'41.6"S: 14°34'44.1"E, 781 m, 21.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, dry riverbed surrounded by steep rocky slopes comprising granitic and igneous rocks with *Sterculia*, *Acacia montis-usti* and *Commiphora*, UV detection on warm, dark, still night, specimen collected in open midslope; 1 juv. (AMCC 172343 [LP 5702]), Brandberg, Ga-Asab (Goaseb) Gorge, 21°13'10.9"S:14°34'36.7"E, 1002 m, 1.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, lower slopes of Brandberg, arid savannah with *Acacia montis-usti* on sandy-loam soils with granite outcrops, specimen taken in rock crevice; 1♀ (AMNH [AH 4001]), Brandberg, Goaseb Gorge [21°14'S:14°35'E], 20.xii.1988, A. Harington, on foothills, under granite rocks, syntopic with *O. ugabensis*; 1♂ 1♀ 1 juv.♀ Brandberg, Numas Valley [21°06'S:14°23'E], 13.viii.1995, between slabs of stone (1♂ SMN 1863), under stones between slabs (1♀ SMN 2222), 14.viii.1995, rocky hillside, under stones in crevices (1 juv.♀ SMN 2225), M. & E. Griffin; 1♂ (AMNH), Brandberg, Numaskloof, 21°07.48'S:14°25.54'E, 470 m, 17.i.1998, L. Prendini & E. Scott, rocky granite slopes at base of mountain, UV detection, syntopic with *H. conspersus*, *P. villosus*, *O. ugabensis* and *O. wahlbergii*; 1♀ 7 juv.♀ (SMN 2101), Brandberg, Numas, 1–14.v.2003, EduVentures 1 expedition; 2♂ (AMNH), Brandberg, summit, below Longipoele, 21°11'34.9"S: 14°33'23.9"E, 1794 m, 23.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, sheltered, flat sandy valley with granite domes and boulders intersected by dry watercourses, granitic loam soil with *Stipagrostis–Aristida* grassland, *Boscia*, *Cyphostemma*, *Euphorbia* and *Ozoroa* in rocky areas, specimens collected with UV

detection on warm, dark, still night, sitting on rock faces; 1 juv.♀ (SMN 3011), Brandberg, nr Umuab vlakte, 21°04'46.5"S:14°34'07.9"E, 1803 m, 9–12.v.2004, EduVentures 4 expedition; 1♀ 1 subad.♂ (SMN 90), Brandberg West mine [21°00'S:14°09'E], 27.iii.1964, F. Motonane; 1♀ 1 juv.♂ (AMNH [AH 2221]), Brandberg West, 7 km from turnoff towards Uis [21°06'S:14°17'E], 28.i.1981, A. Harington, sympatric with *H. conspersus* and *P. brevimanus*; 1♀ (AMNH [AH 3757]), 5 km SE of Brandberg West–Cape Cross–Uis T-junction [21°05'S:14°16'E], 22.xii.1988, A. Harington, granite exfoliations of low boulders, no hill *per se*.

Ecology and distribution: This lithophilous species (Fig. 17) shelters in the cracks and crevices, and under the exfoliating flakes, of weathered rock outcrops and under stones resting on bedrock (Lamoral 1979; Prendini 2001*b*). Although it may also occur in Angola, this species has been recorded only from Namibia and South Africa (Lamoral 1979; Prendini 2005*a*). It has been collected from the base (Fig. 4) to the summit (Fig. 8) of the Brandberg and also in the areas surrounding the Massif.

Family Scorpionidae Latreille, 1802
Opistophthalmus carinatus (Peters, 1861)

Heterometrus carinatus: Peters 1861: 515.
Opisthophthalmus anderssonii Thorell, 1876*a*: 239–242 (synonymised by Kraepelin 1894: 85).
Opisthophthalmus histrio Thorell, 1876*a*: 242–243 (synonymised by Kraepelin 1894: 85).
Petrovicus furcatus Simon, 1888: 380–381 (synonymised by Kraepelin 1894: 85).

Material examined: 1♂ 1♀ 1 subad.♀ 2 juv.♀ Brandberg [21°14'S:14°30'E], 1240 m, H. Pager (1♂ TMSA 18179), v.1979 (1♀ TMSA 17774), 1–14.v.2003, Edu-Ventures 1, syntopic with *U. planimanus* (1 subad.♀ 1 juv.♀ SMN 2400, 1 juv.♀ SMN 2682); 2♂ Brandberg, Amis Gorge [21°11'S:14°28'E], 1700 m, 20.x.1979 (1♂ AMNH [AH 1489]), 23.x.1979 (1♂ AMNH [AH 1881]), H. Pager; 1♀ (AMNH [AH 1354]), 1 subad.♀ (AMNH [AH 1355]), Brandberg, Basswald Rinne [21°10'S:14°38'E], 17–18.iv.1980, A. Harington; 1♀ (AMNH), Brandberg, top of Ga-Aseb Gorge, *ca* 500 m W of Orabeskopf, 21°12'09.3"S:14°34'05.6"E, 1631 m, 22.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, flat, sandy valley below summit, surrounded by granite boulder-strewn slopes, *Aloe dichotoma*, *Cyphostemma*, *Euphorbia* and *Boscia*, with sparse grass on granitic sandy loam, specimens collected with UV detection on warm, dark, still night, captured in the open or doorkeeping at burrow entrances at base of stones; 5♀ 2 subad.♀ 2 juv.♂ Brandberg, Ga-Asab (Goaseb) Gorge, 21°12'35.3"S:14°34'32.2"E, 1300 m, 1–2.iv.2006, mid-slopes of Brandberg in arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops and sandy-loam soils, one specimen collected on surface by UV detection on cool, dark, still night, rest excavated from burrows under stones (1♀ AMNH, 2 subad.♀ SMN 2956), 21°12'02.6"S:14°34'08.6"E, 1825 m, 2.iv.2006, excavated from burrow under stone in granitic sandy-loam soil on upper slopes of Brandberg, arid savannah vegetation (1♀ AMNH), 21°12'03"S:14°33'57.9"E, 1868 m, 3.iv.2006, upper slopes of Brandberg in small sandy valley, arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops and sandy-loam soils, specimens observed at night, 'doorkeeping' at burrow entrances, mostly at base of stones but sometimes in open ground, and excavated during the day, 3♀ (AMNH), 2 juv.♂ (SMN 2957), L. Prendini, T.L. Bird & S.K. Uunona; 10 specimens, Brandberg, Goaseb Gorge [21°14'S:14°35'E], 1670 m, 7.ii.1978 (1 juv.♀ TMSA 18145), 8.ii.1978 (1 juv.♂ TMSA 18143), 25.ii.1978 (1♀ TMSA 18144), 17–18.iv.1982 (2 juv.♀ AMNH [AH 3141, 3142]), v.1978 (1♂ TMSA 17773), H. Pager, 4–5.ii.1981 (2♀ AMNH [AH 1737, 2070], 2 subad.♂ AMNH [AH 3435, 3436]), A. Harington; 1♂ (AMNH [AH 2245]), Brandberg, Hungarob-Mulde [21°10'S:14°32'E], 23.v.1980, H. Pager; 1 juv.♂ (SMN 2229), Brandberg, Mason Shelter, 21°04'39"S:14°05'43"E, 15.iii.2002, A.H. Kirk-Spriggs & D.J. Mann, black light; 1♀ 2 subad.♀ 1 juv.♂ 2 juv.♀ (SMN 2747 [TB 04/128]), Brandberg, Mason Shelter, 1.25 km ENE, 21°04'41.0"S:14°36'08.8"E, 9.v.2004, EduVentures 4, dug from burrow 25–30 cm deep; 1♀ (AMNH), Brandberg summit, Longipoele, 21°11'40.9"S:14°33'31.8"E, 1840 m, 3.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, excavated from burrow under stone in granitic sandy-loam soil on summit of Brandberg, arid savannah vegetation; 34 specimens, Brandberg summit, between Longipoele and Helmpoele, 21°11'33.2"S:14°33'31.4"E, 1830 m, 23.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, sheltered, flat sandy valley with granite domes and boulders intersected by dry watercourses, granitic loam soil with *Stipagrostis–Aristida* grassland, *Boscia*, *Cyphostemma*, *Euphorbia* and *Ozoroa* in rocky areas, specimens excavated from burrows in open ground or at the base of stones or collected with UV detection on warm, dark, still night, sitting on ground surface (7♂ 2♀ AMNH, 2 juv.♂ 12 juv.♀ AMCC 144125 [LP 2582], 1 subad.♂ 4 subad.♀ 3 juv.♀ SMN 2808), 21°11'33.4"S:14°33'39.8"E, 1841 m, 3.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, excavated from burrows in open granitic sandy-loam soil, on summit of Brandberg in sandy valley surrounded by granitic outcrops, arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops, other specimens observed

'doorkeeping' at burrow entrances at night (1♀ AMNH, 1 subad.♀ 1 juv.♂ SMN 2954); 4♂ 3♀ (AMNH), 1 subad.♀ 1 juv.♀ (SMN 2955), Brandberg summit, valley E Helmpoele, 21°11'31.9"S:14°34'00.5"E, 1930 m, 3.iv.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on cool, still night (moonset 10 pm), on summit of Brandberg in sandy valley surrounded by granitic outcrops, arid savannah with *Cyphostemma currorii* and *Aloe dichotoma* on larger granite outcrops and sandy-loam soils, specimens taken on ground surface; 1 juv.♂ (SMN 2678 [LP 04/135c]), Brandberg, Umuab Vlakte, 21°04'55.3"S:14°34'03.4"E, 1803 m, 9–12.v.2004, EduVentures 4, dug from burrow 30 cm deep; 1 subad.♀ (SMN 2033), Brandberg, Wasserfallfläche, 21°10.76'S:14°33.16'E, 2000 m, 7.iv.1999, S. van Noort & R. Powell, under rock on rocky hillside, bushy Karroo-Namib shrubland; 47 specimens, Brandberg, Wasserfallfläche, on summit, 21°10'47.0"S:14°33'16.6"E, 1977 m, 24.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, flat, sandy valley with granite domes and boulders, fairly dry and exposed, *Aloe dichotoma*, *Cyphostemma*, *Euphorbia* and *Boscia*, with sparse grass on granitic sandy loam, specimens collected with UV detection in open sand flats, on cool, dark, still night (30♂ 3♀ AMNH, 3 juv.♀ AMCC 144127 [LP 2584], 2♂ 2 subad.♂ 2 subad.♀ 1 juv.♂ 3 juv.♀ SMN 2806, 1♂ SMN 2807); 1 juv.♂ (SMN 2100), 1 juv.♂ (SMN 2121), Gravel Plain, 21°10'28"S:14°34'07"E, 28.xi.1999, pitfall trap; 1♂ (AMNH [AH 1794]), Omatjette–Khorixas junction, 25 km towards Uis [21°03'S:14°53'E], 6.ii.1981, A. Harington; 1♂ 1♀ (AMNH [AH 1338 & AH 1337]) Uis [21°15'S:14°50'E], late 1979–early 1980, H. Henke.

Ecology and distribution: This pelophilous species (Fig. 18) excavates shallow to moderate, gently curving burrows under stones or in open ground in consolidated loamy substrata (Lamoral 1979; Prendini 2001*b*). This species occurs in Angola, Botswana, Mozambique, Namibia, South Africa, Zambia and Zimbabwe (Lamoral 1979; Prendini 2005*a*). Although widespread further east in Namibia, the species is restricted to the summit, upper and middle slopes of the Brandberg (Figs 6–8). The lowest altitude at which it has been collected on the Massif is 1240 m. It is replaced by *Opistophthalmus ugabensis* at lower altitudes on the Massif (Fig. 5).

Opistophthalmus coetzeei Lamoral, 1979

Opisthophthalmus coetzeei: Lamoral 1979: 694–698, figs 348, 410–417, 427.

Material examined: 1♂ (AMNH [AH 4087]), Brandberg (probably Numas/Amis/Goaseb area) [21°14'S:14°35'E], 1670 m, 6.ii.1978, H. Pager.

Ecology and distribution: This pelophilous species excavates shallow to moderate, spiral burrows in open ground or at the base of small stones in consolidated gritty to loamy substrata (Lamoral 1979; Prendini 2001*b*). This species is endemic to Namibia (Lamoral 1979; Prendini 2005*a*). Its occurrence on the Brandberg is doubtful. It is possible, but unlikely, that the species occurs on the gravel plains surrounding the Brandberg. The next closest record for the species is on Farm Vrede 119 in the Karibib District, further southeast at 21°27.96'S:15°08.64'E (SMN 1938).

Opistophthalmus gibbericauda Lamoral, 1979

Opisthophthalmus gibbericauda: Lamoral 1979: 707–711, figs 356, 441–448.

Material examined: 1♂ (AMNH [AH 1339]), Uis [21°03'S:14°51'E], late 1979–early 1980, H. Henke.

Ecology and distribution: This semi-psammophilous species excavates moderate to deep, spiral burrows in open ground in consolidated sandy-loam substrata (Lamoral 1979; Prendini 2001*b*). It is endemic to Angola and Namibia (Lamoral 1979; Prendini 2005*a*) and has been collected in areas to the southeast of the Brandberg, but not on the Massif itself.

Opistophthalmus jenseni (Lamoral, 1972)

Protophthalmus jenseni: Lamoral 1972: 118–119, figs 3c–d, 4–6, tab. 1.

Material examined: 42 specimens, Brandberg, base of hill 282, opposite Orabeskopf [21°15'S:14°38'E], 1.ii.1981, A. Harington (34♂ AMNH [AH 1658–1689, 1849, 3286], 4♀ AMNH [AH 1691–1693, 3287], 1

Figs 17, 18. Adult males, habitus in life: (17) *Hadogenes tityrus* (Simon, 1888); (18) *Opistophthalmus carinatus* (Peters, 1861).

subad.♂ AMNH [AH 1690]), on white gritty soft sand dune against hill at night (2♂ 1♀ NMSA 13940); 46 specimens, Brandberg, plains S, opposite Orabeskopf, 21°15.48'S:14°36.54'E, 790 m, 16.i.1998, L. Prendini & E. Scott, gritty white sand dune against hill, UV detection, syntopic with *P. gracilis* and *O. wahlbergii* (42♂ 1♀ SMN 1973, 1♂ 1♀ AMNH, 1♂ AMCC 100851 [LP 1087]); 1♀ (SMN 3064), Brandberg, White Lady Campsite, 21°00'57.72"S:14°41'04.8"E, 461 m, 5.iii.2005, D. Kunz, at night; 1♂ (NMSA 10845 [SW 44]), Messum Crater area, 21°16'S:14°13'E, 26.iii.1976, B.H. Lamoral, on surface of sandy to gritty soil at night; 15♂ Messum Crater, SW Brandberg [21°25'S:14°13'E], 21.i.1981 (12♂ AMNH [AH 1950–1960, 2255]), 26.i.1981 (3♂ AMNH [AH 3105–3107]), A. Harington; 1♂ (AMNH [AH 1902]), 1♀ (AMNH [AH 1903]), Nai-Gap riverbed at N tip Uis Mtns [21°07'S:14°52'E], 6.ii.1981, A. Harington; 3 specimens, Omatjette–Khorixas junction, 20 km towards Uis [21°02'S:14°51'E], 6.ii.1981 (1♀ AMNH [AH 1904]), 25 km towards Uis [21°03'S:14°53'E], 6.ii.1981 (1♀ AMNH [AH 1798], 1 subad.♀ AMNH [AH 1759]), A. Harington; 5♂ (AMNH [AH 1961–1964, 2153]), 2♀ (AMNH [AH 1965, 1966]), Uis R., nr Kai-Nuses, nr Uis [21°11'S:14°52'E], 2.ii.1981, A. Harington.

Remarks: Specimen NMSA 10845 was misidentified as *Opistophthalmus holmi* (Lawrence, 1969) by Lamoral (1979: 719).

Ecology and distribution: This psammophilous species (Fig. 19) excavates shallow burrows in unconsolidated white sand dunes (Lamoral 1979; Prendini 2001*b*) situated in dry riverbeds at the base of the Brandberg, and against small hills (Fig. 2) surrounding the Brandberg and adjacent landforms (e.g. the Messum Crater). It is endemic to Namibia (Lamoral 1972, 1979; Prendini 2005*a*).

Opistophthalmus lamorali Prendini, 2000

Opistophthalmus lamorali: Prendini 2000*a*: 109–119.

Opisthophthalmus undulatus ugabensis Hewitt, 1934: 408–410 (AMGS 6574: ♂ only, not ♀ syntype), pl. I, figs 1, 4.

Material examined: 1♂ (NHRM [JF 173]), Brandberg [21°14'S:14°30'E], 8.iii.2004, C.R. Owen; 1♂ (SMN 3090 [TB 07/05]), 1♀ (SMN 3089 [TB 07/05]), Brandberg, SW, 21°14'49.86"S:14°25'54.36"E, 625 m, 5.ii.2007, T.L. Bird, A. Klann, P. Michalik & G. Talarico, scattered rubble, under stones; 1♂ (AMNH [AH 3202]), Brandberg, W foot [21°09'S:14°42'E], 3.xii.1982, S. Braine; 1 subad.♂ paratype (NMSA 10711 [SMN 89]), Brandberg West, 32 km from coast on road [21°15'S:14°10'E], 29.iv.1964, W. Steyn; 1 subad.♀ 2 juv.♂ 3 juv.♀ (NHRM [JF]), Brandberg West [21°00'S:14°09'E], 23.iii.2005, C.R. Owen; 1♂ paratype (SMN 1898), Brandberg West Mine, 21°00.51'S:14°09.03'E, 300 m, 17.i.1998, L. Prendini & E. Scott, stoney plain with small drainage, under stone; 12♂ 3♀ 1 subad.♂ Brandberg, Amis Gorge [21°11'S:14°28'E], 30.i.1981, A. Harington (5♂ AMNH [AH 1742–1744, 1748, 1764], 3♀ AMNH [AH 1745–1747]), H. Pager (1♂ AMNH [AH 3296]), 31.i.1981, A. Harington (6♂ AMNH [AH 1929, 3367, 3369–3371, 3453], 1 subad.♂ AMNH [AH 3368]); 4 subad.♂ 1 subad.♀ 2 juv.♂ 1 juv.♀ paratypes (SMN 1900), Brandberg, Messum valley mouth [21°14'S:14°31'E], 690 m, 17.iv.1999, S. van Noort, under rock, gravel plain with Welwitschias; 1 subad.♂ (AMNH [AH 1749]), Brandberg, Numas Gorge [21°07'S:14°25'E], 30.i.1981, A. Harington; 1 subad.♂ paratype (SMN 1899), Numaskloof, Brandberg, 21°07.48'S:14°25.54'E, 470 m, 17.i.1998, L. Prendini & E. Scott, under stone at base of rocky slope, syntopic with *P. granulatus*, *P. villosus*, *H. tityrus*, *O. ugabensis* and *O. wahlbergii*; 2♂ (AMNH [AH 3288, 3289]), Brandberg, opposite Orabes Wall [21°13'S:14°38'E], 1.ii.1981, A. Harington; 1♂ paratype (SMN 1901), Messum Crater [21°27'S:14°13'E], 9.iv.2000, M. Griffin, under stone, gravel plains; 1♀ 1 subad.♂ paratypes (SMN 1897), Messum R., hills near intersection with road to Brandberg-Wes, 21°15.58'S:14°26.72'E, 700 m, 17.i.1998, L. Prendini & E. Scott, low stony hills with Welwitschias, under dark metallic stones; 1♂ (NHRM [JF 109]), Tafelkop, 16.5 km W [21°03'S:14°10'E], 10.iv.2002, C.R. Owen; 1♂ (NHRM [JF 108]), Tafelkop, 20 km E [21°03'S:14°26'E], 16.iv.2002, C.R. Owen; 1 juv.♂ paratype (NMSA 17185 [AMGS 6458]), Brandberg area, Uis [21°09'S:14°47'E]; 10 paratypes, Uis [21°13'S:14°51'E], 2♂ 2♀ (AMGS), 1968, J.J. Nel (1♂ TMSA 18201), 13.ii.1968, J.J. Nel (1 subad.♂ TMSA 18199), x.1968, J.J. Nel (1♂ TMSA 18200), i.1969, J.J. Nel (1 subad.♀ TMSA 10028), 30.iii.1969, J.J. Nel (1♀ TMSA 18290), 21.i–27.ii.1995, E. Marais, preservative pitfall traps (1♂ SMN 1792); 3♂ (AMNH [AH 2034–2036]), Uis [21°15'S:14°50'E], iii–iv.1981, J. Botha; 3♀ (AMNH [AH 2141, 2142, 2233]), Uis tin mine, Uis [21°13'S:14°51'E], vii.1981, J. Botha; 9♂ 3♀ paratypes (SMN 1896), 1♂ 1♀ paratypes (AMNH), 1♂ 1♀ paratypes (CASC), 1 juv.♀ paratype (AMCC 100858 [LP 1161]), Uis, 2 km from town, 21°13.48'S:14°51.84'E, 780 m, 15.i.1998, L. Prendini & E. Scott, rocky flats on outskirts of town, night collecting with UV detection, syntopic with *P. villosus* and *U. planimanus*; 2♂ 2♀ (AMNH), 1 subad.♀ (SMN 2952), Uis, 3 km W on road to Hentiesbaai, 21°13'57.5"S:14°51'08.7"E, 814 m, 31.iii.2006, L. Prendini, T.L. Bird & S.K. Uunona, UV detection on warm, still, dark night, becoming windy later, followed by rain,

Figs 19, 20. *Opistophthalmus* adult males, habitus in life: (19) *O. lamorali* Prendini, 2000; (20) *O. jenseni* (Lamoral, 1972).

low rocky hills with *Euphorbia damarana*, small Acacias and sparse grass, specimens collected in open rocky ground; 1♂ paratype (SAMC C1367), Uis, Brandberg area [21°09'S:14°47'E]; 2♂ (AMNH [AH 2130, 2131]), Uis R., nr Kai-Nuses, nr Uis [21°11'S:14°52'E], 2.ii.1981, A. Harington.

Remarks: Specimen NMSA 10711 [SMN 89] was misidentified as *Opistophthalmus litoralis* Lawrence, 1955 by Lamoral (1979: 729).

Ecology and distribution: This semi-lithophilous species (Fig. 20) excavates shallow scrapes under stones in consolidated gritty or clayey substrata (Prendini 2000*a*, 2001*b*). It is endemic to Namibia (Prendini 2000, 2005*a*) and has been collected in rocky areas surrounding the Brandberg (Fig. 3) and in gorges intersecting the Massif (Fig. 4), e.g. Numaskloof (470 m), but not on the slopes or the summit.

Opistophthalmus ugabensis Hewitt, 1934

Opisthophthalmus undulatus ugabensis: Hewitt 1934: 408–410 (AMGS 6574: ♀ lectotype only, not ♂), pl. I, fig. 3.

Material examined: 2 specimens, Brandberg [21°14'S:14°30'E], 18.xi.1971, D.P. van Schoor (1 juv.♀ TMSA 10844), iv.1999 (1 subad.♀ SMN 2104); 2 juv.♂ 1 juv.♀ (SMN 101), Brandberg base camp [21°07'S:14°25'E], 16.viii.1969, P.J. Buys; 2 juv.♂ (NMSA 10038), Brandberg Mtns, northern valleys [21°01'S:14°33'E], 20.ii.1969, B.H. Lamoral & R. Day; 1♀ (SMN 91), Brandberg West mine [21°00'S:14°09'E], 20.iv.1966, Manager of mine; 6 specimens, Brandberg, Basswald Rinne [21°10'S:14°38'E], 16.iv.1980 (1 subad.♂ AMNH [AH 1350], 1 subad.♀ AMNH [AH 1351]), 17–18.iv.1980 (1 subad.♂ AMNH [AH 1353], 1 subad.♀ AMNH [AH 1352]), under stones (1 subad.♂ 1 subad.♀ AMNH), A. Harington; 1♂ 1 subad.♀ (AMNH), 1 juv.♀ (AMCC 144211 [LP 2581]), Brandberg, base of Ga-Aseb Gorge, 21°13'41.6"S:14°34'44.1"E, 781 m, 21.xii.2003, L. Prendini, T.L. Bird & N.C. Krone, dry riverbed surrounded by steep rocky slopes comprising igneous rocks with *Sterculia*, *Acacia montis-usti* and *Commiphora*, UV detection on warm, dark, still night, specimen collected in open midslope; 1 juv.♂ 2 juv.♀ (SMN 1633), Brandberg, Ga-Asab Gorge [21°14'S:14°35'E], 21.xii.1988, E. Griffin; 1♀ (AMNH [AH 4000]), Brandberg, Goaseb Gorge [21°14'S:14°35'E], 20.xii.1988, A. Harington; 2♀ (AMNH [AH 3448, 3538]), Brandberg, Naib base [21°03'S:14°25'E], 7.v.1982, H. Pager; 1♂ (AMNH [AH 4422]), Brandberg, Numas base [21°07'S:14°25'E], 25.viii.1981, H. Pager; 3 juv.♂ 1 juv.♀ (SMN 100), Brandberg, Numas Gorge [21°08'S:14°26'E], 5.viii.1969, P.J. Buys; 2 juv.♀ (SMN 95), Brandberg, Numas Plateau, Camp I [21°08'S:14°27'E], 9.viii.1969, P.J. Buys; 4 specimens, Brandberg, Numas Valley, 21°06'S:14°23'E, 13.viii.1995, under stones, between slabs (1♂ 1♀ SMN 1800), 14.viii.1995, rocky hillside under stones in crevices (1 juv.♂ 1 juv.♀ SMN 1801), M. & E. Griffin; 1♂ 1♀ (AMNH), 1♂ 1♀ (CASC), 1♂ 1♀ (SAMC C5183), 1♀ 1 subad.♂ 1 subad.♀ (SMN 2017), 1♀ (SMN 2016 [LP 1223]), 1 subad.♀ (AMCC 100933 [LP 1169]), 1 juv.♀ (AMCC 100934 [LP 1170]), Numaskloof, Brandberg, 21°07.48'S:14°25.54'E, 470 m, 17.i.1998, L. Prendini & E. Scott, steep rocky slopes, coarse granitic sandy loam, UV detection, syntopic with *H. conspersus*, *P. villosus*, *H. tityrus* and *O. wahlbergii*; 3 juv.♂ (AMNH [AH 1859]), Brandberg, Orabes Gorge [21°13'S:14°37'E], 16.iv.1980, A. Harington; 1 subad.♂ (CASC), Brandberg, Tsisab Canyon [21°06'S:14°40'E], 550 m, 11.v.1958, E.S. Ross & R.E. Leech; 2 subad.♀ Brandberg, White Lady [21°06'S:14°39'E], 25.iv.1999, under stone (SMN 1864), iv.1999, J.J. van der Walt, under stone (SMN 2015 [LP 1000]); 1 juv.♂ (SMN 1640), W of Brandberg [21°04'S:14°20'E], 10.viii.1985, E. & M. Griffin, under stone; 1♀ (NHRM [JF 107]), 1♀ 1 subad.♂ (NHRM [JF]), Tafelkop, 20 km E [21°03'S:14°26'E], 16.iv.2002, C.R. Owen.

Ecology and distribution: This semi-lithophilous species excavates shallow scrapes under stones in consolidated gritty or clayey substrata (Prendini 2000*a*, 2001*b*). It is endemic to Namibia (Lamoral 1979; Prendini 2005*a*) and has been collected in rocky areas on landforms surrounding the Brandberg, e.g. Tafelkop, in gorges intersecting the Massif, e.g. Numaskloof (470 m), and on its lower slopes (Fig. 5). The highest altitude at which it has been collected on the Massif is 781 m. It is replaced by *O. carinatus* at higher altitudes on the Massif (Figs 6–8).

Opistophthalmus wahlbergii (Thorell, 1876)

Miaephonus wahlbergii: Thorell 1876*b*: 13.
Opisthophthalmus wahlbergi gariepensis Purcell, 1901: 194–195 (synonymised by Lamoral 1979: 756).
Opisthophthalmus wahlbergi nigrovesicalis Purcell, 1901: 195 (synonymised by Lamoral 1979: 756).

Opisthophthalmus lundensis Monard, 1937: 267–268 (synonymised by Prendini 2001*a*: 41–42).
Opisthophthalmus wahlbergi robustus Newlands, 1969: 6–7, fig. 1c, tables 1–2 (synonymised by Prendini 2001*a*: 41–42).

Material examined: 2♂ Brandberg [21°14'S:14°30'E], 5.iv.1991, deep burrow in river bed (1♂ NCA 91/867), deep complicated burrow (1♂ NCA 91/872), J. Leroy; 1 subad.♀ (SMN 2630), Brandberg, way to, 21°04'54.9"S:14°41'28.8"E, 497 m, 5.iii.2005, D. Kunz; 6♂ Brandberg, Amis Gorge [21°11'S:14°28'E], 4.i.1981 (2♂ AMNH [AH 1840, 1841]), 30.i.1981 (1♂ AMNH [AH 1750]), 31.i.1981 (3♂ AMNH [AH 1930, 3365, 3366]), A. Harington; 1♂ (SMN 2032), Brandberg, Messum Valley, 21°13'S:14°31'E, 700 m, 5–17.iv.1999, S. van Noort, Malaise trap, bushy Karroo-Namib shrubland; 1♀ (SMN 97), Brandberg, Numas Gorge [21°08'S:14°26'E], 5.viii.1969, P.J. Buys; 1♀ (AMNH [AH 2126]), Numas riverbed, 2–3 km from Brandberg base [21°04'S:14°22'E], 30.i.1981, A. Harington; 13♂ 1 subad.♀ (SMN 2019), Numaskloof, Brandberg, 21°07.48'S:14°25.54'E, 470 m, 17.i.1998, L. Prendini & E. Scott, coarse granitic sandy loam flats, UV detection, syntopic with *H. conspersus*, *P. granulatus*, *P. villosus*, *H. tityrus* and *O. ugabensis*; 1♂ (AMNH), Uis, 21°13.10'S:14°52.04'E, 660 m, 15.i.1998, L. Prendini & E. Scott, coarse sandy loam flats, collected at night with UV light, syntopic with *P. granulatus*; 4♀ (TMSA 18090, 18092, 18148, 18149), 2 juv.♂ (TMSA 18091, 18147), 1 juv.♀ (TMSA 18150), Uis [21°15'S:14°50'E], 15.ii.1978, H. Pager; 1 juv.♂ (SMN 2679 [LP 04/144a]), Brandberg, below Nuwuarib Gorge, 21°00'02.6"S: 14°35'04.8"E, 428 m, 15.v.2004, Edu-Ventures 4, sandy plain, dug from burrow 50 cm deep; 2♂ (AMNH [AH 3284, 3285]), Brandberg, opposite Orabes Wall [21°13'S:14°38'E], 1.ii.1981, A. Harington; 2♂ (SMN 2020), Brandberg, plains S, opposite Orabeskopf, 21°15.48'S:14°36.54'E, 790 m, 16.i.1998, L. Prendini & E. Scott, flats at the base of gritty white dune sand dune against hill, UV detection, syntopic with *P. brevimanus*, *P. gracilis*, *P. granulatus* and *O. jenseni*; 1 juv.♀ (AMNH [AH 3381]), Daweb (N Uis), 4 km S [21°03'S:14°54'E], 6.ii.1981, A. Harington; 1♂ (AMNH [AH 2082]), Nai-Gap riverbed at N tip Uis Mtns [21°07'S:14°52'E], 6.ii.1981, A. Harington; 1♀ (AMNH [AH 2132]), Uis R., nr Kai-Nuses, nr Uis [21°11'S:14°52'E], 2.ii.1981, A. Harington; 6♂ 3♀ 1 subad.♀ 1 juv.♂ (NMSA 11459), Uis tin mine, Uis [21°13'S:14°51'E], v.1969, J. Bezuidenhout; 1 juv.♂ (NCA 2005/1972 [LR2094]), Uis rest camp, 21°13.10'S:14°52.04'E, 24.iv.1999, A. Leroy, burrow in deep hard sand, trapped at night; 3♀ 4 subad.♂ 4 subad.♀ (AMNH), 4 subad.♂ 2 subad.♀ (SMN 2960), Uis, Brandberg Rest Camp, open plot of land adjacent to campsite, 21°13'06.7"S:14°52'04.1"E, 814 m, 31.ii–1.iii.2006, L. Prendini, T.L. Bird & S.K. Uunona, collected in pitfall traps set at burrow entrances in open ground on sandy-loam flats with sparse grass and scattered Acacias; 1♀ (NHRM [JF 105]), Uis, 18.5 km E [21°14'S:15°04'E], 12.iv.2002, C.R. Owen; 1♂ (AMNH [AH 2091]), Uis, 20 km from turnoff to Khorixas [21°02'S:14°54'E], 6.ii.1981, A. Harington, night collecting on red sandy flats, drizzling, syntopic with *P. gracilis*, *P. granulatus*, *P. kraepelini* and *O. jenseni*.

Ecology and distribution: This psammophilous species excavates deep, spiral burrows in semi-consolidated sandy or gritty substrata (Lamoral 1979; Prendini 2001*b*) on sandy to gravel plains (Fig. 2) or dry riverbeds intersecting the Brandberg (e.g. Numaskloof), around the base of the Massif and in the surrounding areas. It occurs in Angola, Botswana, Namibia, South Africa, Zambia and Zimbabwe (Lamoral 1979; Prendini 2005*a*).

RESULTS AND DISCUSSION

Based on the current survey, twenty scorpion species in seven genera and four families are recorded from the Brandberg Massif and vicinity (Table 1), which presently has the richest scorpion fauna in Namibia, if not southern Africa. The only other regions of comparable scorpion diversity in southern Africa are the Soutpansberg and vicinity in the Limpopo Province (Soutpansberg District) of South Africa, with 19 species in eight genera and three families recorded, and the Koa River Valley and associated mountain ranges near Aggeneys in the Northern Cape Province (Namaqualand District) of South Africa, with 17 species in five genera and three families recorded (L. Prendini, unpubl. data). These areas rank among those with the richest scorpion faunas in the world, comparable to the most diverse areas in the Baja California Peninsula, Mexico (Williams 1980; Polis 1990).

The high diversity of scorpions on the Brandberg Massif and vicinity, like that of other areas with a high diversity of scorpions, is attributable to the heterogeneity of

landforms, substrata and habitats in the area (Prendini 2001*b*; Figs 1–8). The scorpions of the Brandberg Massif and surrounding areas may be classified into seven ecomorphotypes (Table 1), including five substratum generalists, four lapidicolous and one corticolous species, and 15 substratum-specialists, spanning the extent of the substratum-hardness continuum (Prendini 2001*b*): three psammophilous, five semi-psammophilous, one pelophilous, three semi-lithophilous, and three lithophilous species. The diversity of ecomorphotypes represented by the scorpion species of the Brandberg Massif and surrounding areas has enabled them to exploit every available niche.

The species richness of the scorpion fauna of the Brandberg Massif and surrounding areas is inversely correlated with altitude (Fig. 21). The greatest diversity of genera (6) and species (20) occurs at the base of the Massif (below 500 m) and in the surrounding areas (Table 1; Figs 1–4), where the heterogeneity of landforms, substrata and habitats is greatest, and decreases towards the summit (Fig. 8). Five species, including two psammophiles, occur in the area surrounding the Massif, but not at its base: *P. gracilis*, *P. kraepelini*, *P. namibensis*, *U. gracilior*, *H. hahni*, *O. gibbericauda*, *O. jenseni*. Five species that also occur in the area surrounding the Massif, including one psammophile, occur at its base but not on its slopes: *P. granulatus*, *P. villosus*, *O. lamorali*, *O. wahlbergii*. Unsurprisingly, no psammophilous species occur on the Massif itself; the fauna of the Massif is dominated by lithophilous, semi-lithophilous and lapidicolous species. Two species that also occur in the area surrounding the Massif and at its base, occur on its lower slopes (500–1000 m; Fig. 5), but not on its middle slope (1000–1500 m), upper

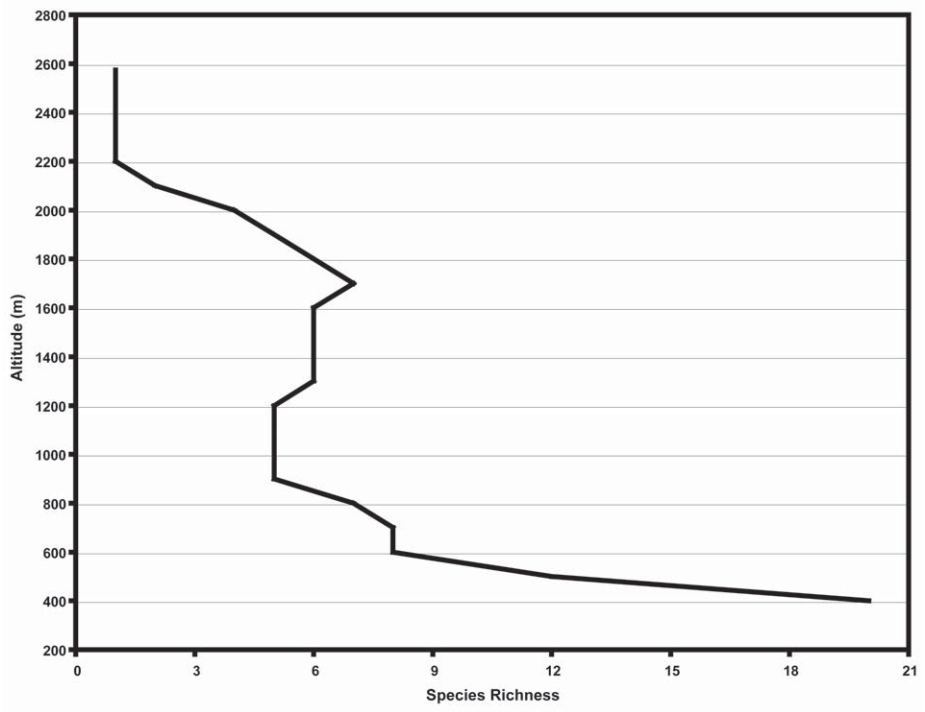

Fig. 21. Graph illustrating decreasing scorpion species richness with increasing altitude (100 m contour interval) on the Brandberg Massif (Namibia). Data from Material Examined (this study).

slope (1500–2000 m; Fig. 6) or summit (above 2000 m; Fig. 8): *H. conspersus*, *O. ugabensis*. Two species occur only on its summit, upper and middle slopes: *B. haringtoni*, *O. carinatus*. Only five species, all of which also occur in the area surrounding the Massif, occur from its base to its summit: *L. elegans*, *P. brevimanus*, *U. otjimbinguensis*, *U. planimanus*, *H. tityrus*.

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