

Revision of the genus *Lisposoma* Lawrence, 1928 (Scorpiones: Bothriuridae)

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The endemic Namibian genus *Lisposoma* Lawrence, 1928, comprising two described species, represents one of two basal African genera in the Gondwanan family Bothriuridae Simon, 1880. All other, more derived genera of Bothriuridae occur in South America, India and Australia. Although the phylogenetic position of *Lisposoma* has become an increasingly contentious subject, three cladistic analyses based on morphological data have confirmed that it is a basal bothriurid. In view of those findings, the present contribution serves to revise the generic diagnosis of *Lisposoma*, last revised by Lamoral (1979), who placed the genus in the Scorpionidae Latreille, 1802 and constructed his diagnosis accordingly. A considerable number of new specimens, many representing new records for the two species of *Lisposoma*, have also accumulated since Lamoral's (1979) revision. These new data justify the provision of revised diagnoses and descriptions for the two species, together with a key to their identification, brief summaries of their ecology and conservation status, and a distribution map plotting all known locality records.

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Introduction

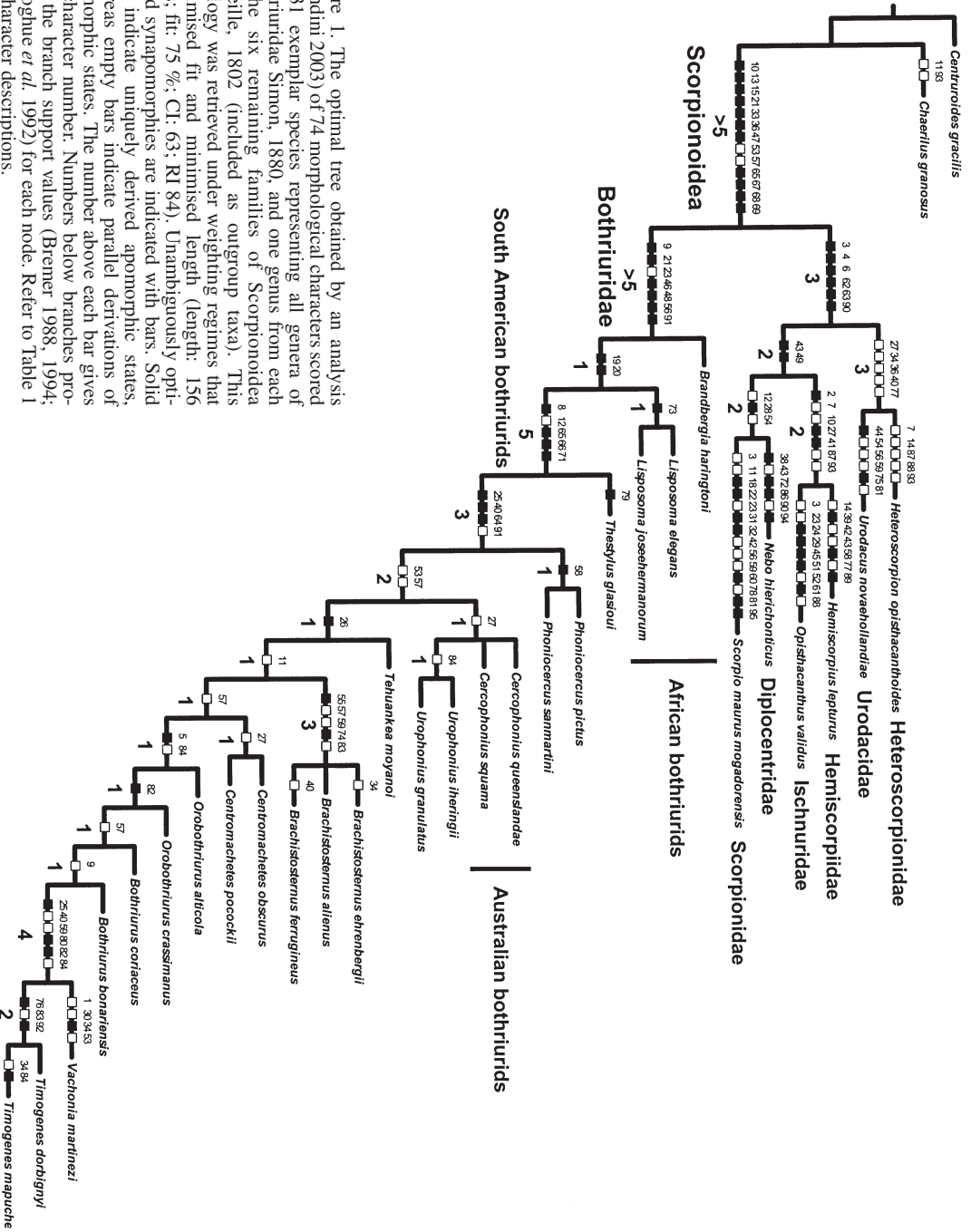
The endemic Namibian genus *Lisposoma* Lawrence, 1928, comprising two described species, represents one of two basal African genera in the Gondwanan family Bothriuridae Simon, 1880. All other, more derived genera of Bothriuridae occur in South America, India and Australia, confirming a well-known biogeographical pattern attributed to the earlier separation of Africa from the post-Gondwana landmass that included South America, India and Australia (Brundin 1965).

The recent description of a second basal African bothriurid genus, *Brandbergia* Prendini, 2003, also endemic to Namibia and displaying clear affinities with the enigmatic *Lisposoma*, necessitated a reanalysis of bothriurid relationships (Prendini 2003). The reanalysis also returned attention to the phylogenetic position of *Lisposoma*, a subject that has become increasingly contentious.

When first described as a monotypic genus, *Lisposoma* was placed in a separate subfamily, Lisposominae Lawrence, 1928, of the Scorpion-

idae Latreille, 1802. There it remained unquestioned for more than 50 years. Vachon (1974) discussed trichobothrial similarities between *Lisposoma* and the Bothriuridae, but merely regarded these as evidence in support of Lawrence's (1928) placement of the genus in its unique subfamily. When Lamoral (1979) revised *Lisposoma* and described its second species, he also continued to regard the genus as a scorpionid. However, Francke (1982) realised that the trichobothrial similarities between *Lisposoma* and the Bothriuridae, and several other characters, were potentially synapomorphic. Francke (1982) suggested that *Lisposoma* should be transferred to the Bothriuridae, where it remained *incertae sedis* (Francke 1985; Sissom 1990; Lowe & Fet 2000) until two cladistic analyses (Stockwell 1989; Prendini 2000) confirmed that it is a basal bothriurid. No fewer than seven morphological synapomorphies supported the grouping of *Lisposoma* with the Bothriuridae in one of those analyses (Prendini 2000).

Figure 1. The optimal tree obtained by an analysis (Prendini 2003) of 74 morphological characters scored for 31 exemplar species representing all genera of Bothriuridae Simon, 1880, and one genus from each of the six remaining families of Scorpionioidea Latreille, 1802 (included as outgroup taxa). This topology was retrieved under weighting regimes that maximised fit and minimised length (length: 156 steps; fit: 75%; CI: 63; RI 84). Unambiguously optimised synapomorphies are indicated with bars. Solid bars indicate uniquely derived apomorphic states, whereas empty bars indicate parallel derivations of apomorphic states. The number above each bar gives the character number. Numbers below branches provide the branch support values (Bremer 1988, 1994; Donoghue *et al.* 1992) for each node. Refer to Table 1 for character descriptions.



Lourenço (1996) rejected the evidence that *Lisposoma* is a bothriurid on the grounds that this genus presents characteristics of both Scorpionidae and Bothriuridae. Lourenço (1996) failed to consider the possibility that the putatively scorpionid characteristics expressed by *Lisposoma* might be plesiomorphic in the Bothriuridae (Prendini 2003).

Lourenço (2000) went on to erect a new family, Lisposomidae Lawrence, 1928, to accommodate *Lisposoma*. Lourenço (2000) justified the new rank for *Lisposoma* solely on the opinions of Lawrence (1928) and Lamoral (1979), both of whom had maintained the genus in its unique subfamily of the Scorpionidae, without reference to its shared similarities with the Bothriuridae. The significance of trichobothria in scorpion taxonomy was largely unappreciated at the time of Lawrence's (1928) description (but see Kraepelin 1894) and, given that Lawrence had limited experience with the scorpion fauna beyond southern Africa, his placement of *Lisposoma* in the Scorpionidae must be viewed in that light. In contrast, Lamoral (1979, 1980) demonstrated a greater appreciation of the global scorpion fauna and was thoroughly acquainted with Vachon's (1974) landmark work on trichobothrial analysis. Indeed, Lamoral and Vachon were in regular contact (*vide* Vachon 1974: 881, 943; Lamoral 1979: 503, 588). Lamoral's (1979) decision to retain *Lisposoma* in the Scorpionidae may therefore have been based on an opinion shared with Vachon, although Vachon's (1974: 940) discussion on the matter was not actually cited by Lamoral (1979).

My reanalysis of bothriurid phylogeny (Prendini 2003), designed to test the phylogenetic positions of *Brandbergia* and *Lisposoma*, was based on 74 morphological characters, scored for 31 exemplar species representing all genera of Bothriuridae, and one genus from each of the six remaining families of Scorpionoidea Latreille, 1802 (included as outgroup taxa). Analysis of those data demonstrated, under a range of weighting regimes, that *Brandbergia* is the most basal bothriurid genus, followed by *Lisposoma* as the next most basal (Fig. 1). Continued recognition of the Lisposomidae would render the Bothriuridae paraphyletic (unless another monotypic family was erected to accommodate *Brandbergia*) and Lisposomidae was therefore synonymised with Bothriuridae.

Given the undeniable morphological evidence

that *Lisposoma* is a basal bothriurid, the present contribution serves to revise its generic diagnosis. Lamoral (1979) regarded the genus as a scorpionid, and thus constructed his diagnosis to contrast *Lisposoma* with the southern African scorpionid genus *Opisthophthalmus* C.L. Koch, 1837, rather than with other genera of Bothriuridae.

A considerable number of new specimens, many representing new records for the two species of *Lisposoma*, have also accumulated since Lamoral's (1979) revision. These new data justify the provision of revised diagnoses and descriptions for the two species, together with a key to their identification, brief summaries of their ecology and conservation status, and a distribution map plotting all known locality records.

Material and methods

Most personally collected specimens were found at night using ultraviolet (UV) detection (Honet-schlager 1965; Stahnke 1972; Sissom *et al.* 1990). A portable UV lamp, comprising two mercury-vapour tubes attached to a chromium parabolic reflector and powered by a rechargeable 7 Amp/hr, 12 V battery, was used for this purpose.

Material examined, including type specimens, is deposited in the following collections: National Museum of Namibia, Windhoek (NMNW); South African Museum, Cape Town (SAMC), some bearing accession numbers from the John Visser Collection (JV); Natal Museum, Pietermaritzburg, South Africa (NMSA); Transvaal Museum, Pretoria, South Africa (TMSA), most bearing accession numbers from the Sebastian Endrödy-Younga Collection (EY), as recorded by Lamoral (1979); American Museum of Natural History, New York (AMNH), some bearing accession numbers from the Alexis Harington Collection (AH); California Academy of Sciences, San Francisco (CASC); Zoological Museum, Lund University, Sweden (ZMLU). A tissue sample of *L. elegans* has been stored (in the vapour phase of liquid nitrogen at -150°C) in the Ambrose Monell Collection for Molecular and Microbial Research (AMC) at the AMNH. DNA sequences from it will be included in a forthcoming analysis of the higher phylogeny of Scorpiones (L. Prendini & W.C. Wheeler, in prep.) as an additional test of the phylogenetic position of the genus.

Photographs were taken in visible light as well as under long wave UV light using a Microptics™

Table 1. Characters and character states employed in cladistic analysis of the family Bothriuridae Simon, 1880 (Prendini 2003). Character states were scored 0 to 4, ? (unknown), or – (inapplicable). Multistate characters were treated nonadditively, except where indicated otherwise.

1. Carapace, lateral ocelli, number of pairs: more than three (0); three (1); two (2).
2. Carapace, median ocular tubercle: raised (0); shallow (1).
3. Carapace, median notch: absent (0); shallow (1); strongly excavated (2).
4. Carapace, median longitudinal furrow: broad, shallow, without suture (0); narrow, suturiform (1).
5. Carapace, median longitudinal furrow: well-developed (0); obsolete (1).
6. Carapace, posterior sutures: absent (0); present (1).
7. Nongranular surfaces of prosoma, mesosoma, metasoma and legs: smooth (0); distinctly punctate (1).
8. Sternum shape: subtriangular (0); subpentagonal (1); transverse (2); equilateral pentagonal (3).
9. Cheliceral movable finger, number of subdistal teeth: one (0); two (1).
10. Cheliceral movable finger, distal external and distal internal teeth: subequal, with distal external tooth only slightly smaller than distal internal tooth, and opposable, i.e., forming a bicuspid (0); unequal, with distal external tooth considerably smaller than distal internal tooth, aligned longitudinally and usually not opposable or, at most, moderately opposable (1).
11. Patella, dorsal surface: flat, dorsomedian and dorsoexternal carinae in same axis (0); convex, dorsomedian carina raised above horizontal axis of dorsoexternal carina (1).
12. Patella, dorsoexternal carina: distinct (0); obsolete (1).
13. Patella, externomedian carina: continuous from proximal to distal edges (0); discontinuous, interrupted two-thirds along (1).
14. Patella, anterior process: absent (0); present (1).
15. Chela, number of carinae: eight (0); ten (1).
16. Chela (♂), dorsal secondary carina: distinct (0); obsolete (1).
17. Chela (♀), dorsal secondary carina: distinct (0); obsolete (1).
18. Chela, dorsal secondary carina: extending full way across dorsal surface, subdigital carina vestigial (0); dorsal secondary carina extending part way across dorsal surface, subdigital carina extending part way across in opposite direction (1).
19. Chela, digital carina: distinct (0); obsolete (1).
20. Chela, ventroexternal carina: distinct (0); obsolete (1).
21. Chela, ventroexternal carina: parallel to longitudinal axis of chela, distal edge connected to external movable finger condyle (0); parallel to longitudinal axis of chela, distal edge disconnected from external movable finger condyle and directed toward a point between external and internal movable finger condyles, but closer to external condyle (1); oblique to longitudinal axis of chela, distal edge disconnected from external movable finger condyle and directed toward (almost connecting) internal movable finger condyle (2). ADDITIVE
22. Chela, ventromedian carina: vestigial or obsolete (0); distinct (1); inapplicable (–).
23. Chela, ventrointernal carina: more strongly developed than internomedian carina, which may be obsolete (0); equally or less strongly developed than internomedian carina (1); inapplicable (–).
24. Chela, ventrointernal carina: equally or more strongly developed than internomedian carina, which may be obsolete (0); less strongly developed than internomedian carina, often obsolete (1); inapplicable (–).
25. Chela (♂), secondary sexual structure: absent (0); hook-like apophysis (1); semicircular, rimmed depression (2); unknown (?). ADDITIVE
26. Chela (♂), hook-like secondary sexual structure with granular ridge at base of fixed finger: present (0); absent (1); unknown (?); inapplicable (–).
27. Chela fingers, number of rows of primary denticles: single (0); double, often fused at the base (1); multiple (2).
28. Chela fingers, dentate margin: entire (0); markedly scalloped (1).
29. Chela (♂), lobe of movable finger: absent or at most weakly developed, close to base movable finger and lacking an obvious notch in fixed finger (0); well-developed, almost midway along movable finger (if dentate margin markedly scalloped, first lobe disproportionately developed), with a distinct notch in fixed finger, lobe rounded dorsally and lacking a sharp conical tooth (1); well-developed, almost midway along movable finger, with a distinct notch in fixed finger, lobe unevenly pointed dorsally, due to the presence of a sharp conical tooth (2); unknown (?). ADDITIVE
30. Femur, number of *e* trichobothria: one (0); two (1); four (2).
31. Femur, position of trichobothrium *i*: internal (0); dorsal (1).
32. Patella, position of trichobothrium *d*₂: dorsal (0); internal (1).
33. Patella, *v* trichobothria: absent (0); three prolaters (1); three or more retrolaterals (2). ADDITIVE
34. Patella, number of *v* trichobothria: absent (0); single row of 3 (1); single row of 4–20 (2); two or more rows, with more than 30 (3).
35. Patella, position of distal *v* trichobothrium: ventral (0); external (1).
36. Patella, number of *e* trichobothria: 7 (0); 13, rarely 12 (1); 14 or more (2). ADDITIVE
37. Chela, number of *i* trichobothria: one (0); two (1); three or more (2). ADDITIVE
38. Chela, position of trichobothrium *it*: basal or midfinger (0); distal (1); inapplicable (–).
39. Chela, position of trichobothria *ib* and *it*: basal (0); midfinger (1); inapplicable (–).
40. Chela, number of *V* trichobothria: one (0); two (1); four (2); five (3); six or more (4).
41. Chela, distance between trichobothria *V*₂ and *V*₃: normal (0); widely separated (1); inapplicable (–).
42. Chela, position of trichobothrium *Db*: external surface (0); dorsal surface (1); inapplicable (–).
43. Chela, position of trichobothrium *Dr*: manus, at proximal end (0); manus, mid-length or slightly less than mid-

length (1); manus, distal half, near base of fixed finger (2); proximal end of fixed finger (3); inapplicable (–).
ADDITIVE

44. Chela, external surface with accessory trichobothria: absent (0); 10–15 (1); more than 20 (2).
 45. Chela, position of trichobothrium *Esr*: distal (0); midpalm (1); inapplicable (–).
 46. Chela, position of trichobothrium *Et₂*: external surface (0); ventral surface (1).
 47. Chela, number of *d* trichobothria: two (0); four (1).
 48. Chela, position of trichobothrium *db*: fixed finger (0); manus (1).
 49. Chela, position of trichobothrium *db*: dorsal (0); internal (1).
 50. Chela, position of trichobothrium *dsb*: below *db–dst* axis (0); in line with *db–dst* axis (1); inapplicable (–).
 51. Chela, position of trichobothrium *eb*: proximal region of fixed finger (0); manus, behind point of articulation between fixed and movable fingers (1); inapplicable (–).
 52. Chela, position of trichobothrium *esb*: manus, behind point of articulation between fixed and movable fingers and below *eb–est–et* axis (0); midway along fixed finger, in line with *eb–est–et* axis (1); inapplicable (–).
 53. Retrolateral pedal spurs: present (0); absent (1).
 54. Telotarsi, laterodistal lobes: truncated, base of median dorsal lobe flush (0); rounded, notches at base of median dorsal lobe (1); secondarily truncated, notches at base of median dorsal lobe (2). ADDITIVE
 55. Telotarsi, laterally compressed: absent (0); present (1).
 56. Telotarsi, well-developed ventromedian row of setae: spiniform (0); setiform (1); absent (2).
 57. Telotarsi I–IV, ventrosulmedian setae distribution: setiform on I–IV (0); setiform on I or I and II, spiniform on III and IV (1); spiniform (or secondarily setiform) on I–IV (2). ADDITIVE
 58. Telotarsi, ventrosulmedian setae type: stout spiniform (0); slender spiniform (1); few secondarily setiform (2); numerous secondarily setiform (3); inapplicable (–).
 59. Basitarsi I and II, retrolateral row of macrosetae: absent (0); spiniform (1); setiform, sand comb (2); unknown (?). ADDITIVE
 60. Stridulatory surface on opposing surfaces of coxae of pedipalps and first walking legs: absent (0); partially developed (1); fully developed (2).
 61. Maxillary lobes, shape of first pair: rounded-truncate anteriorly (0); tapering anteriorly (1).
 62. Embryonic development: apoikogenic (0); katoikogenic (1).
 63. Ovariuterine follicles: sessile (0); stalked (1).
 64. Testis: straight (0); coiled (1); unknown (?).
 65. Genital opercula (♀): separated (0); loosely joined (1); fused (2).
 66. Genital opercula (♂): separated (0); loosely joined (1); unknown (?).
 67. Hemispermatophore: flagelliform (0); fusiform (1); lamelliform (2); unknown (?). ADDITIVE
 68. Hemispermatophore, truncal flexure: absent (0); present (1); unknown (?).
 69. Paraxial organ, internobasal reflection of sperm duct: absent (0); present (1); unknown (?).
 70. Paraxial organ, internal wall of sperm duct: simple (0); with semilunar shelf (1); unknown (?).
 71. Hemispermatophore, distal lamina: smooth (0); with prominent crest (1); unknown (?).
 72. Hemispermatophore, lamellar hook and median lobe: separate (0); fused (1); unknown (?).
 73. Hemispermatophore, position of lamellar hook: basal (0); distal (1); unknown (?); inapplicable (–).
 74. Hemispermatophore, spines in capsular region: absent (0); present (1); unknown (?).
 75. Hemispermatophore, sclerotised mating plug: absent (0); present (1); unknown (?).
 76. Pretergites III–VI with stridulatory granules: absent (0); present (1).
 77. Metasomal segments I–IV, carinae: paired ventrosulmedian carinae (0); single ventromedian carina (1).
 78. Metasomal segments I and IV, carinae: more strongly developed on III and IV than I and II (0); more strongly developed on I and II than III and IV (1); inapplicable (–).
 79. Metasomal segment I, ventromedian carinae with circular configuration: absent (0); present (1).
 80. Metasomal segment V, ventrolateral carinae: continuous from proximal to distal edges (0); discontinuous, interrupted in distal region (1).
 81. Metasomal segment V, ventromedian carina distal portion: straight (0); bifurcating (1); breaking up into numerous granules (2); inapplicable (–).
 82. Metasomal segment V, transverse carina: absent (0); bothriurid type I, discontinuous and merging proximally with ventrolateral carinae (1); bothriurid type II, continuous, not merging proximally with ventrolateral carinae (2). ADDITIVE
 83. Metasomal segment V (♂), dorsal surface with paired androvestigia (metasomal glands): absent (0); present (1).
 84. Vesicle (♂), dorsal surface with androvestigia (metasomal glands): absent (0); single (1); paired (2).
 85. Aculeus: long, shallowly curved (0); very short, sharply curved (1).
 86. Subaculear tubercle: absent (0); distinct (1).
 87. Telson, vesicle (♂), laterally compressed: absent (0); present (1).
 88. Telson, vesicle (♀), laterally compressed: absent (0); present (1).
 89. Telson, vesicle (♂), elongated with pair of distal lobes: absent (0); present (1); unknown (?).
 90. Telson, vesicle, anterodorsal lateral lobes: present (0); absent (1).
 91. Telson, vesicle, ventral surface: with two or more longitudinal granular carinae extending towards aculeus (0); without granules (1).
 92. Telson, vesicle, ventral surface with semicircular carina: absent (0); present (1).
 93. Telson, venom glands: complex (0); simple (1).
 94. Telson, venom pigment: opalescent (0); reddish (1).
 95. Mesosomal percussion: absent (0); present (1).
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ML1000 digital imaging system. Measurements were taken using the ocular micrometer of a Wild M5 stereomicroscope. Color designation follows Smithe (1974, 1975, 1981), trichobothrial notation follows Vachon (1974), and mensuration follows Stahnke (1970), Lamoral (1979) and Prendini (2003). Morphological terminology follows Couzijn (1976) for the segmentation of legs, Hjelle (1990) and Sissom (1990) for the segmentation of pedipalps, and Stahnke (1970), Lamoral (1979), Sissom (1990) and Prendini (2000, 2003) for remaining features.

A distribution map was produced using Arc View GIS Version 3.2 (Environmental Systems Research Institute [ESRI], Redlands, California), by superimposing point locality records on coverages depicting the political boundaries of Namibia, the topography (600 m contour interval), and the major sand systems. These coverages were obtained from the website of the Namibian National Biodiversity Task Force (Barnard 1998): <http://www.dea.met.gov.na/programmes/biodiversity/countrystudy.htm>.

In order to create a point locality geographical dataset for mapping distributional ranges, all records of sufficient accuracy were isolated from the material examined. Only a small proportion of the records were accompanied by geographical coordinates or quarter-degree squares (QDS), 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 trace coordinates for as many of the remaining records as possible, by reference to gazetteers, the 1:1000 000 topo-cadastral map of Namibia published by the Surveyor-General (1994), and the GEOnet Names Server (GNS): http://164.214.2.59/gns/html/cntry_files.html. Names of Namibian regions and magisterial districts listed in the material examined follow the most recent system (Surveyor-General 1994).

Spatial analyses were conducted using ArcView in order to ascertain whether patterns of *Lisposoma* distribution are related to present environmental variables, to determine the specific ecological correlates of the distributional ranges of each species, and to calculate statistics that could be used to define their conservation status. Coverages representing the topography, mean annual rainfall, and vegetation types of Namibia, as defined by Giess (1971), were obtained from the website of the Namibian National Biodiversity Task Force

(Barnard 1998), for use in these analyses.

The two species of *Lisposoma* were categorised according to their conservation priority. The number of known locality records, extent of the distributional range, occurrence inside and outside of protected areas, and prevailing land uses that might be construed as threats to the future survival of these species were used to evaluate their conservation status. A coverage depicting protected areas and other land uses in Namibia was obtained from the website of the Namibian National Biodiversity Task Force (Barnard 1998). Both species of *Lisposoma* were assigned one of the IUCN Red List Categories (IUCN 2001) on the basis of these criteria.

Taxonomy

Genus *Lisposoma* Lawrence, 1928

Lisposoma Lawrence, 1928: 281. Type species by monotypy: *Lisposoma elegans* Lawrence, 1928.

Lisposoma: Werner 1934: 274; Kästner 1941: 233; Vachon 1974: 940; Lamoral & Reynders 1975: 544; Lamoral 1979: 661; Francke 1982: 36–38; Francke 1985: 9, 15, 20; Sissom 1990: 88; Nenilin & Fet 1992: 16; Lourenço 1996: 83; Kovářik 1998: 101; Lowe & Fet 2000: 17, 34; Lourenço 2000: 26; Prendini 2000: 20, 28, 29, 40, table 1, 2, 4, 10, fig. 1A; Prendini, 2003: 1, 2, 10.

Lisposoma: Newlands 1978: 688, 689.

Diagnosis. – *Lisposoma* is placed unequivocally in the family Bothriuridae on the basis of the following combination of characters: carapace without median notch in anterior margin; cheliceral movable finger with two subdistal teeth; pedipalp chela ventroexternal carina (as demarcated by trichobothria and macrosetae) oblique to longitudinal axis of chela, distal edge disconnected from external movable finger condyle and directed toward (almost connecting) internal movable finger condyle; pedipalp chela with trichobothrium *db* located on dorsal surface of manus and trichobothrium *Et*₂ located on ventral surface of manus; sternum width greater than twice its length; paraxial organ with semilunar shelf on internal wall of sperm duct invagination; ovariuterine follicles sessile, without diverticula.

Lisposoma differs from all other bothriurid genera, except *Brandbergia*, on the basis of the following characters: pedipalp patella with distal *v* trichobothrium (*v*₃) located on external surface; sternum subpentagonal; genital opercula (♂) fused. It can be separated from *Brandbergia* on the basis

of the following characters: pedipalp chela digital and ventroexternal carinae absent; metasomal segments I–V, ventrolateral carinae and segment V, ventromedian carina, absent or obsolete; cheliceral movable finger with distal external and distal internal teeth unequal, distal external tooth considerably smaller than distal internal tooth, and not closely opposed.

Description. – Only characters relevant to the superfamily Scorpionoidea (family Bothriuridae in particular) are described.

Chelicerae. Cheliceral movable finger with two subdistal teeth; distal external and distal internal teeth unequal, distal external tooth considerably smaller than distal internal tooth, and not closely opposed.

Carapace. Anterior margin without median notch; median longitudinal furrow broad and shallow, without suture; posterior carapacial sutures absent. Three pairs of lateral ocelli. Median ocular tubercle raised. Nongranular surfaces of prosoma, mesosoma, metasoma and legs smooth to weakly punctate.

Pedipalps. Patella with anterior process obsolete but with dorsoexternal carina distinct (becoming obsolete in *L. elegans*). Chela acarinate, all carinae absent or obsolete; ventroexternal carina (as demarcated by trichobothria and macrosetae) oblique to longitudinal axis of chela, with distal edge directed toward and almost connecting with internal movable finger condyle. Chela fingers with a single primary row of denticles.

Trichobothria. Pedipalps orthobothriotaxic major, type C. Pedipalp patella with trichobothrium d_2 located on dorsal surface and distal v trichobothrium (v_3) located on external surface. Pedipalp chela with trichobothria *ib* and *it* located basally on fixed finger; *db* located on dorsal surface of manus; *eb* and *esb* located proximally on fixed finger, *esb* below the *eb–est–et* axis and near articulation of fixed and movable fingers; *Db* located on external surface of manus; *Dt* located proximally on manus; *Est* located distally on manus; *Et*₂ located on ventral surface of manus; V_2 and V_3 not widely separated.

Sternum. Subpentagonal, width greater than twice its length.

Genital operculum. Genital opercula of ♀ fused. Ovariuterine follicles sessile, without diverticula.

Legs. Basitarsi each with a few scattered spiniform setae on prolateral and retrolateral margins,

decreasing in number from anterior to posterior legs. Telotarsi I–IV each with paired ventrosubmedian rows of spiniform setae, increasing in number from anterior to posterior legs, and a ventromedian row of setiform setae; laterodistal lobes truncated, flush with base of median dorsal lobe; retrolateral pedal spurs absent.

Metasoma and telson. Metasomal segments I–IV with paired ventrosubmedian carinae absent, and with paired ventrolateral carinae absent or obsolete; segment V without ventrolateral carinae, ventromedian carina or transverse carina; telson vesicle not laterally compressed, with anterodorsal lateral lobes; aculeus long, shallowly curved, without subaculear tubercle. Venom glands complex; venom pigment opalescent.

Reproductive anatomy. Ovariuterine follicles sessile, without diverticula. Embryonic development apoikogenic.

Hemispermaphore. Paraxial organ with semilunar shelf on internal wall of sperm duct invagination. Hemispermaphore with lamellar hook and median lobe separate; distal lamina without a prominent sclerotised crest.

Included taxa. – Two species, *Lisposoma elegans* Lawrence, 1928 and *Lisposoma joseheermanorum* Lamoral, 1979.

Distribution. – Endemic to central and northern Namibia (Erongo, Khomas, Kunene, Oshikoto and Otjozondjupa Regions), absent from the Namib and Kalahari sand systems. The two component species are allopatric (Fig. 2).

There are no records of *Lisposoma* from north of the Kunene River in Angola. However, the occurrence of *L. elegans* throughout the northern half of Namibia suggests that it may also occur in regions of similar soil and vegetation in southern Angola.

Lisposoma elegans Lawrence, 1928

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

Lisposoma elegans: Werner 1934: 274; Lawrence 1955: 257; Vachon 1974: 940, fig. 92, 102, 134–136; Lamoral & Reynders 1975: 544; Lamoral 1979: 662–665, fig. 318–326, 329, 330; Francke 1982: 36; Lourenço 1996: 85, fig. 2; Kovarik 1998: 101; Lowe & Fet 2000: 34; Lourenço 2000: 39, fig. 20; Prendini 2000: 40, table 3, fig. 2, 6; Prendini 2001: 137.

Type material. – Lectotype (designated by Lamoral 1979: 663): ♀ (SAMC B6980), Okorosave [Korosave, 18°10'S 13°48'E, Opuwo District, Kunene Region],

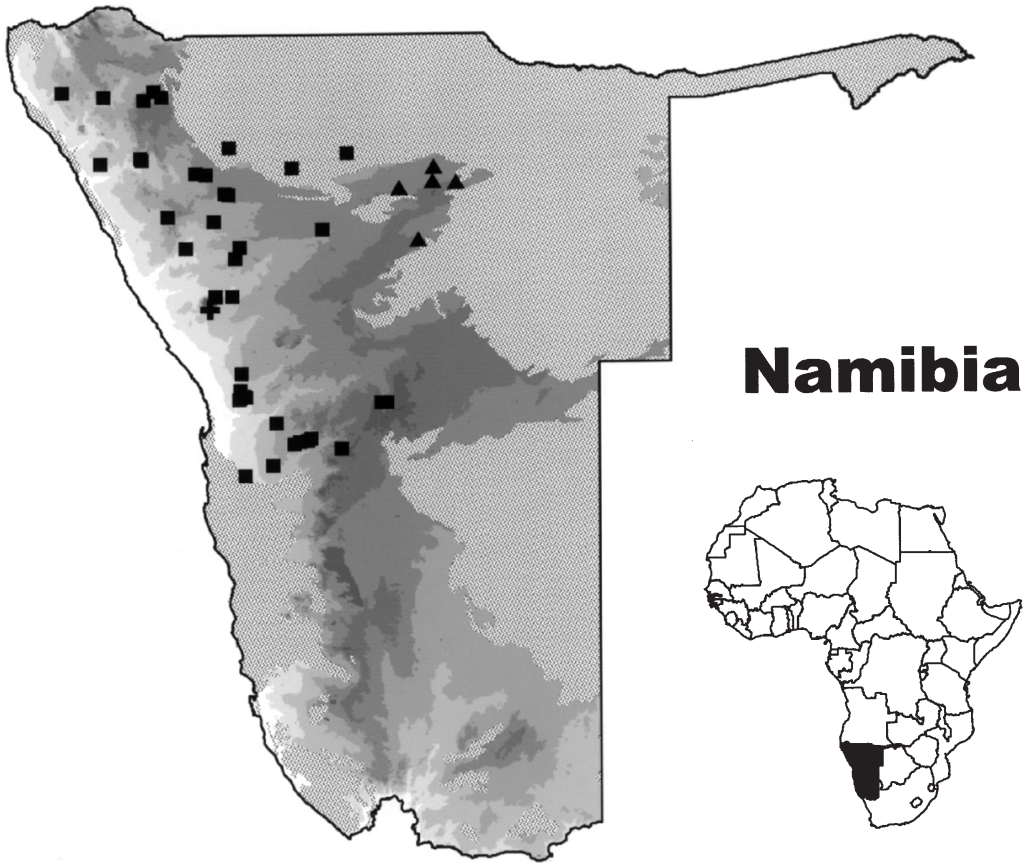


Figure 2. The known distributions of *Brandbergia haringtoni* Prendini, 2003 (+), *Lisposoma elegans* Lawrence, 1928 (■) and *Lisposoma josephermanorum* Lamoral, 1979 (▲) in Namibia (contour interval 600 m; major sand systems stippled).

South West Africa [Namibia], i–iv.1926, S.A. Museum Expedition. Paralectotypes: 1 subad. ♂ (NMSA 16411 ex SAMC B6773), Kamanjab [19°38'S 14°50'E, Outjo District, Kunene Region], South West Africa [Namibia], ii.1925, S.A. Museum Expedition; 1 ♂ 3 subad. ♂ (SAMC B6077), Outjo [20°07'S 16°09'E, Outjo District, Kunene Region], South West Africa [Namibia], i–iv.1926, S.A. Museum Expedition; 1 ♀ 10 subad. ♀ (SAMC B6066/B6077), Sesfontein [19°08'S 13°37'E, Opuwo District, Kunene Region], South West Africa [Namibia], i–iv.1925, S.A. Museum Expedition.

According to Lawrence (1928: 281), the original syntype series consisted of “twenty two specimens from Outjo, Kaoko Otavi, Sesfontein.” At the time of Lamoral’s (1979) revision, 4 ♂ and 12 ♀ syntypes remained in the collection of SAMC, but six were lost. Lamoral (1979) designated one of the remaining syntypes (SAMC B6980) as the lectotype of *L. elegans*, and the remainder as paralectotypes. Lamoral (1979), followed by Fet & Lowe (2000), recorded some of the collection

data for the type specimens erroneously; based on data in the SAMC catalogue, these errors are corrected below. Furthermore, some of the paralectotypes with accession numbers SAMC B6066 and B6077 were originally placed together in the same vial, such that it was impossible to assign specimens to numbers and, hence, collection data (M. Cochrane, pers. comm.). At present, SAMC B6077 comprises four ♂ specimens in two vials, including the single remaining adult ♂, from which Lamoral dissected a hemispermaphore. Another vial contains 11 ♀ specimens belonging to SAMC B6066 and B6077. One of the missing syntypes from SAMC B6773 has also been rediscovered, and is accessioned as NMSA 16411. This specimen was evidently not examined by Lamoral, and is hereby designated as a paralectotype.

The collection data for the other missing syntypes, as recorded in the SAMC catalogue, are as follows: Kaoko Otavi [18°18'S 13°39'E, Opuwo District, Kunene Region], South West Africa [Namibia], i–iv.1926, S.A. Museum Expedition (SAMC B6972); Outjo [20°07'S

16°09'E, Outjo District, Kunene Region], South West Africa [Namibia], i-iv.1926, S.A. Museum Expedition (SAMC B6981, B6983).

Additional material. – NAMIBIA: Erongo Region: Karibib District: 20 km E Namib-Naukuft Park gate on Us Pass road, 23°07'S 15°44'E, 15.xi.1974, S. Endrödy-Younga, pitfall trap, 1 subad. ♂ (TMSA 12420 [EY 470B]); 30 km E Namib-Naukuft Park gate on Us Pass road, 23°05'S 15°49'E, 15.xi.1974, S. Endrödy-Younga, pitfall trap, 2 ♂ (TMSA 12422–12423 [EY 471G]). Omaruru District: 20 km S of Omatjetje-Khorixas junction [21°03'S 14°53'E], 6.ii.1981, A. Harington, near rocky hill, ground was sandy, area basically flat, 1 ♂ (AMNH [AH 2133]); Tsisab ravine foot [Brandberg], 21°05'S 14°40'E, 27.ii–20.vi.1995, E. Marais, preservative pitfall trap, 1 juv. ♀ (NMNW 1861). Swakopmund District: Rössing Mine, Arandis Control Site, 22°08'S 15°00'E, 13.iii–9.iv.1984, E. Griffin, preservative pitfall traps, 1 ♂ 1 subad. ♂ 3 juv. ♀ (NMNW 826), same data, except '9.iv–8.v.1984', 1 ♀ (NMNW 832); Rössing Mine, Arandis Site, 22°22'S 14°59'E, 11.ii–11.iii.1985, J. Irish & H. Rust, preservative pitfall traps, 1 juv. ♂ (NMNW 890), same data, except '11.iii–9.iv.1985', 1 subad. ♂ (NMNW 901); Rössing Mine, Crusher Dust Area, 22°27'S 15°02'E, 13.iii–9.iv.1984, E. Griffin, preservative pitfall traps, 1 ♂ (NMNW 829), same data, except '9.iv–8.v.1984', 1 ♀ (NMNW 839); Rössing Mine, Crusher Dust Area, 22°28'S 15°02'E, 11.ii–11.iii.1985, J. Irish & H. Rust, preservative pitfall traps, 6 ♀ 3 ♀ 1 subad. ♂ (NMNW 897), same data, except '11.iii–9.iv.1985', 1 ♀ 1 juv. ♂ (NMNW 910); Rössing Mine, Dome Gorge, 22°28'S 15°04'E, 11.ii–11.iii.1985, J. Irish & H. Rust, preservative pitfall traps, 2 ♂ 1 subad. ♂ 2 subad. ♀ 1 juv. ♀ (NMNW 898), same data, except '11.iii–9.iv.1985', 1 ♂ (NMNW 912), same data, except '5.iv–6.v.1985', 1 juv. [sex indet.] (NMNW 918); Rössing Mine, Lower Ostrich Gorge, 22°30'S 14°58'E, 11.iii–9.iv.1985, J. Irish & H. Rust, preservative pitfall traps, 1 subad. ♂ (NMNW 909); Rössing Mine, Upper Ostrich Gorge, 22°29'S 14°59'E, 11.ii–11.iii.1985, J. Irish & H. Rust, preservative pitfall traps, 1 ♂ 1 ♀ 1 juv. ♂ (NMNW 891), same data, except '11.iii–9.iv.1985', 1 ♀ (NMNW 905), same data, except '5.iv–6.v.1985', 1 subad. ♂ (NMNW 915). Namib-Naukluft Park: Gobabeb [23°34'S 15°03'E], 26.i.1975, S. Endrödy-Younga, pitfall trap, 1 ♀ (TMSA 11111); 42 km along Mirabib road from Gobabeb [23°25'S 15°26'E], 28.ii.1975, S. Endrödy-Younga, pitfall trap, 1 subad. ♀ 1 juv. ♂ (TMSA 11104); Volstruushoogte [23°00.64'S 15°24.74'E], 26.i.1998, L. Prendini & E. Scott, under ironstone, 360 m, 1 ♂ (AMC 119793). Khomas Region: Windhoek District: 44 km E Namib-Naukuft Park gate on Us Pass road, 23°04'S 15°56'E, 24.i.1975, S. Endrödy-Younga, pitfall trap, 1 juv. ♀ (TMSA 12427 [EY 583B]), same data, except '5.vi.1975', 1 ♀ (TMSA 12429 [EY 586E]), 1 subad. ♂ (TMSA 12430 [EY 586E]); 46 km E Namib-Naukuft Park gate on Us Pass road, 23°03'S 15°58'E, 2.iii.1974, S. Endrödy-Younga, pitfall trap, 1 subad. ♂ (TMSA 12428 [EY 719]), same data, except '3.vi.1975', 1 subad. ♂ 2 juv. ♀ (TMSA 12459 [EY 857G]), same data, except '5.vi.1975', 1 subad. ♂ (TMSA 12431 [EY 857]), 1 subad. ♀ (TMSA 12432 [EY 857]), 1 subad. ♀ (TMSA 12433 [EY 857]); Top of Us Pass, 23°03'S 15°58'E,

7.vii.1978, S. Endrödy-Younga, pitfall trap, 1 ♀ (TMSA 12217 [EY 1474]), 4 subad. ♂ (TMSA 12213–12216 [EY 1474]); Daan Viljoen [Game Reserve], near Windhoek [22°32'S 16°58'E], 12.xii.1978, A. Harington, under a very large stone, 1 juv. ♀ (AMNH [AH 833]); Farm Portsmut 33, Hakos Mountains, 23°11'S 16°24'E, 7.ii.1969, B. Lamoral & R. Day, 2 ♂ 1 subad. ♀ (NMSA 10035 [B.6773]); Goreangab Dam, Windhoek, 22°32'S 17°02'E, 19.xii.1973, State Museum staff, 1 ♀ [not examined] (NMNW 503). Kunene Region: Khorixas District: Farm Annabis 677, 20°00'S 14°38'E, 23–24.ii.1969, B. Lamoral & R. Day, 1 ♀ (NMSA 10032); Farm Vrede 719, 20°23'S 14°14'E, 31.iii.1976, B. Lamoral & L. Ferguson, on surface near rocky and sandy marginal area south of road at night, 1 ♀ (NMSA 10885); 2 km E Khorixas [20°22'S 14°59'E], 19.iv.1980, L. Harington, drowned in water trough, 1 ♀ (AMNH [AH 1448]); Farm Welbedacht 584 [Welbedacht 394], near Khorixas [20°31'S 14°55'E], 20.iv.1980, A. Harington, under an irregular rock on a fairly steep, extremely rocky hillside, sparse grass, 1 ♀ (AMNH [AH 1345]); Hobatere Lodge, Farm Marenphil 641, 19°20'S 14°23'E, 19–20.i.1998, L. Prendini & E. Scott, 1050 m, granitic hills and sandy loam flats near camp, UV detection at night, 3 ♂ (AMNH); Palm, 19°57'S 13°59'E, 21.i.1998, L. Prendini & E. Scott, 1000 m, dolerite rocky flats, loam soil, UV detection at night, 1 ♂ (AMNH). Opuwo District: Anabib (Orupembe) [18°11'S 12°31'E], 100 mi W Ohopoho [Opuwo], 8.vi.1951, P. & G. Brinck, G. & I. Rudebeck, on plain covered by dry vegetation, 4 mi SW of the waterhole, 1 ♂ 2 ♀ (ZMLU); between Anabib [Orupembe, 18°11'S 12°31'E] and Omutati [Okomutati, 18°15'S 13°05'E], 6.vi.1951, P. & G. Brinck, G. & I. Rudebeck, on dry hill side with scattered mopane bushes, 1 ♂ (ZMLU); Orumana [18°15'S 13°54'E], 10.ii.1975, 1 subad. ♂ (NMNW 593); Sontfontein, 10 km W of clinic, 19°07'S 13°36'E, 4.iv.1976, B. Lamoral & L. Ferguson, on gritty and stoney ground at night, 7 ♀ [2 missing] 1 subad. ♀ (NMSA 10886); Sima Hill, 3 km NW [19°11'S 13°03'E], 1.iv–30.vi.1985, pitfall trap, 1 ♂ 1 ♀ (NMNW 1164); Sima Hill, 4 km W [19°11'S 13°03'E], 1.iv–30.vi.1985, pitfall trap, 2 ♀ (NMNW 1158). Etosha National Park: Helio, 19°03'S 16°29'E, 14.ii–23.iii.1987, E. Griffin, preservative pitfall traps, 2 ♂ 2 ♀ 1 subad. ♂ 3 subad. ♀ 1 juv. ♂ 5 juv. ♀ (NMNW 999), same data, except '27.iii–4.v.1988', 1 ♀ 1 juv. ♀ (NMNW 1091); Karossfontein, 19°21'S 14°31'E, 9.ii–20.iii.1987, E. Griffin, preservative pitfall traps, 1 ♂ 1 ♀ (NMNW 984); Olifantsrus, 18°58'S 14°51'E, 8.vi–8.vii.1987, E. Griffin, in reptile trap, 1 specimen [not examined] (NMNW 1204); Ondundozonananandana Mts, 19°15'S 15°43'E, 10.x–30.xi.1986, E. Griffin, preservative pitfall traps, 3 specimens [not examined] (NMNW 961).

Diagnosis. – *Lisposoma elegans* is most closely related to *L. josehermanorum* (Lamoral 1979; Prendini 2000, 2003), but can be separated from the latter by means of the following characters: pedipalp chela, dentate margin of fixed and movable fingers with inner row of 5 and 6 denticles, respectively; metasomal segments I–IV, dorsosubmedian carinae absent or obsolete, except for a



Figures 3–6. *Lisposoma elegans* Lawrence, 1928, habitus of ♂ (AMNH) and ♀ (NMSA 10886). 3. Dorsal aspect, ♂. 4. Ventral aspect, ♂. 5. Dorsal aspect, ♀. 6. Ventral aspect, ♀. Scale bars = 1 mm.

single distal spiniform granule, and dorsolateral carinae absent. This is the smaller of the two species, adults reaching a maximum length of 30 mm, but usually much less (Figs 3–6).

Description. – The following description, which supplements those by Lawrence (1928) and Lamoral (1979), is based on the lectotype ♀ (SAMC B6980), a paralectotype ♂ (SAMC B6077), and an additional ♂ (AMNH [AH 2133]) and ♀ (AMNH [AH 1345]).

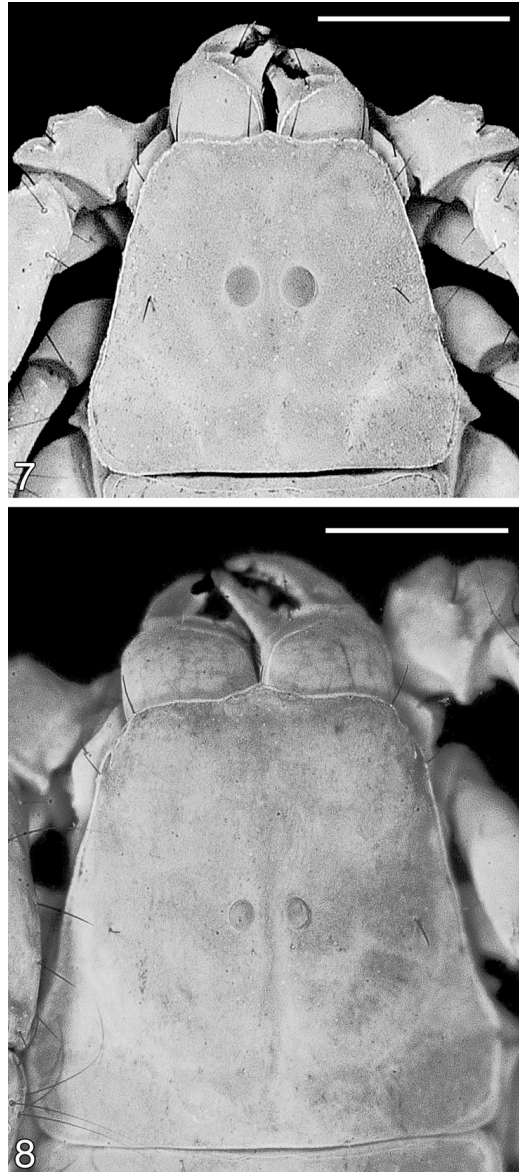
Color (based on AMNH [AH 1345]). Carapace, pedipalp femur (distal half), patella and chela fingers, tergites, metasomal segment V and telson (distal half), Sepia No. 219; chelicerae, Dark Drab No. 119B; pedipalp femur (proximal half), chela manus, legs (dorsoexternal surfaces), metasomal segments I–IV and telson (proximal half), Buff No. 124; legs (ventrointernal surfaces), sternites, pectines and genital operculum, Pale Horn Color No. 92.

Chelicerae. Movable finger with two subdistal teeth (Figs 7, 8); distal external and distal internal teeth unequal, distal external tooth considerably smaller than distal internal tooth, and not closely opposed. Ventral aspect of fingers and manus with long, dense macrosetae.

Carapace. Three pairs of lateral ocelli, considerably smaller than median ocelli (Figs 7, 8). Median ocular tubercle raised, with distinct interocular sulcus, but superciliary carinae obsolete. Anterior margin of carapace sublinear, without median notch, but with small median projection. Anteromedian sulcus broad and shallow, without suture; posterior furcated sutures absent. Posteromedian sulcus distinct, shallow; posteromarginal sulcus obsolete. Carapace entirely smooth (♀), or entirely covered with very fine and even granulation, imparting a matt appearance (♂).

Pedipalps. Femur pentacarinat, but only dorsointernal, internomedian and ventrointernal carinae (♂) or dorsointernal and ventrointernal carinae (♀) distinct, granular, all other carinae obsolete; all intercarinal surfaces smooth (♀) or dorsal, ventral and internal intercarinal surfaces finely granular, and external intercarinal surface smooth (♂). Femur length 58% (♂) to 69% (♀) greater than width (Table 2).

Patella pentacarinat, but only dorsointernal, internomedian and ventrointernal carinae distinct, granular (♂), or all carinae obsolete (♀); all intercarinal surfaces smooth, except for dorsointernal



Figures 7–8. *Lisposoma elegans* Lawrence, 1928, carapace. 7. ♂ (AMNH [AH 2133]). 8. ♀ (NMSA 10886). Scale bars = 1 mm.

intercarinal surfaces, which may be finely granular (♂ only); anterior process obsolete. Patella length 57% (♀) to 60% (♂) greater than width (Table 2).

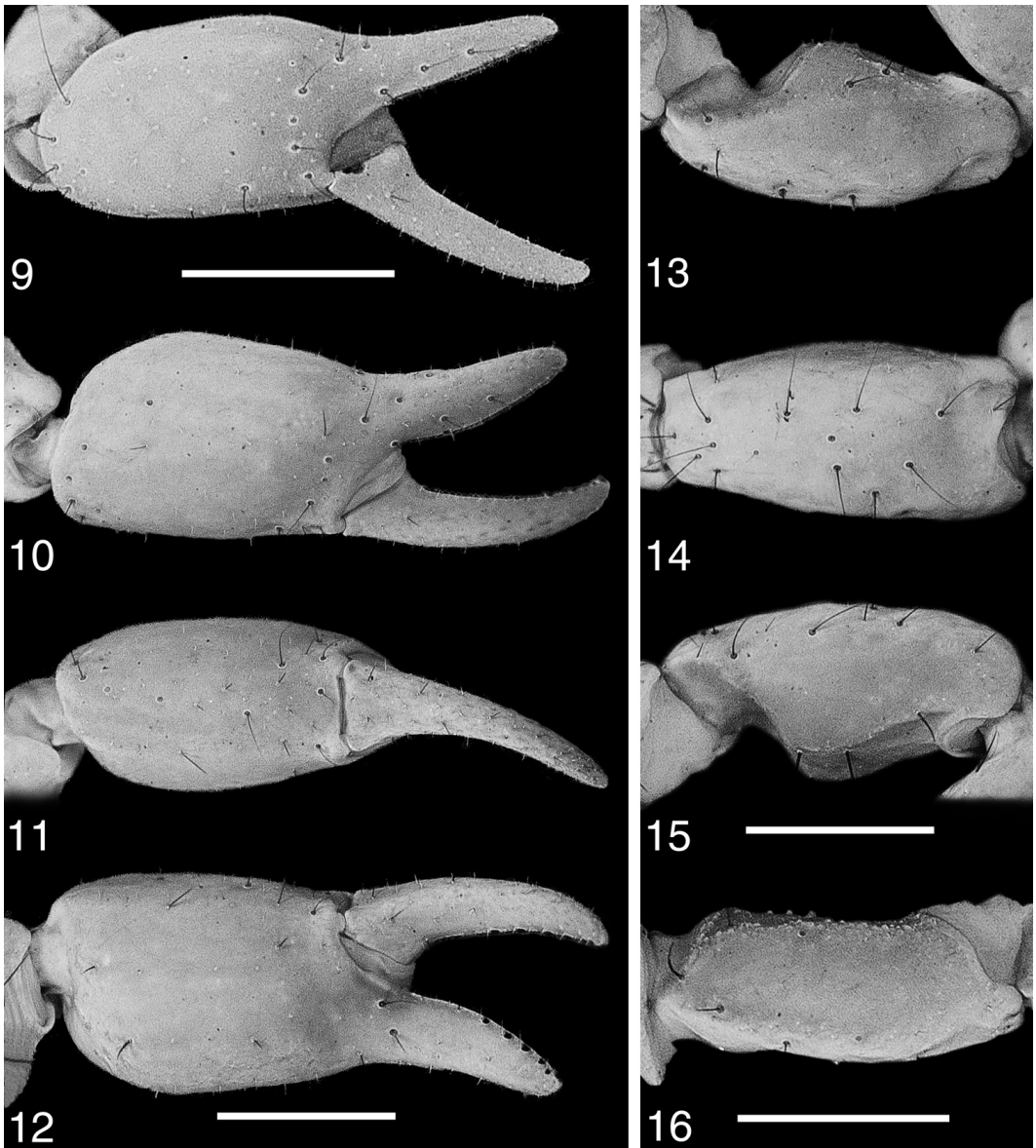
Chela acarinate, all carinae absent or obsolete (Figs 9, 10); ventroexternal carina (as demarcated

Table 2 Meristic data for specimens of *Lisposoma elegans* Lawrence, 1928 and *L. joseehermanorum* Lamoral, 1979. Measurements (mm) following Stahnke (1970) and Lamoral (1979). Data for the holotype of *Brandbergia haringtoni* Prendini, 2003 are included for comparison. ¹Measured from base of condyle to tip of fixed finger. ²Sum of metasomal segments I–V and telson. ³Sinistral telotarsus II missing, counts for NMSA 10697.

Sex	Collection Number	<i>Brandbergia</i>		<i>L. elegans</i>		<i>L. joseehermanorum</i>	
		♀ AH	♂ AH	♀ AH	♂ CASC	♂ SAMC	♀ C4331
Carapace:	anterior width	2.3	1.0	1.1	1.7	1.6	
	posterior width	5.0	1.8	1.8	3.2	3.1	
	length	4.9	1.6	1.9	3.3	2.9	
Chela:	maximum width	2.9	1.0	0.8	2.5	1.5	
	maximum height	2.5	0.9	0.7	2.0	1.4	
	length ¹	9.1	2.6	2.6	5.5	4.5	
	length of ventroexternal carina	4.4	1.3	1.2	2.8	2.4	
	length of movable finger	5.1	1.4	1.4	3.0	2.5	
Patella:	maximum width	2.0	0.6	0.6	1.2	1.0	
	maximum height	1.7	0.5	0.5	1.1	0.9	
	length	4.6	1.5	1.4	3.1	2.6	
Femur:	maximum width	1.6	0.5	0.4	1.1	0.7	
	maximum height	1.5	0.4	0.4	1.0	0.7	
	length	4.4	1.2	1.3	2.6	2.1	
Pedipalp:	total length (including trochanter)	19.9	5.8	5.8	12.3	10.2	
Mesosoma:	total length (tergites)	12.0	3.8	4.3	7.6	6.8	
Sternite VII:	width	4.4	1.4	1.5	3.5	2.5	
	length	2.9	0.8	1.1	1.7	1.4	
Metasoma I:	maximum width	2.4	1.0	1.1	2.2	1.5	
	maximum height	2.0	0.9	0.9	1.6	1.4	
	length	2.8	0.9	1.0	2.0	1.4	
Metasoma II:	maximum width	2.2	1.0	1.0	2.2	1.5	
	maximum height	1.09	0.9	0.9	1.6	1.4	
	length	3.0	1.1	1.1	2.1	1.5	
Metasoma III:	maximum width	2.0	1.0	1.0	2.1	1.5	
	maximum height	1.8	0.9	0.9	1.6	1.4	
	length	3.2	1.2	1.2	2.2	1.7	
Metasoma IV:	maximum width	2.0	1.0	1.0	2.0	1.4	
	maximum height	1.6	0.8	0.8	1.5	1.3	
	length	4.2	1.5	1.5	2.7	2.0	
Metasoma V:	maximum width	2.0	0.9	1.0	2.0	1.4	
	maximum height	1.6	0.8	0.8	1.5	1.2	
	length	6.3	2.7	2.1	4.5	3.2	
Telson:	maximum width	1.9	0.9	1.0	2.0	1.4	
	maximum height	1.9	0.7	0.7	1.5	1.0	
	aculeus length	2.2	0.8	0.6	1.5	1.0	
	total length	5.7	2.5	2.0	4.7	3.4	
Metasoma:	total length ²	25.2	9.9	8.9	18.2	13.2	
Total length:	prosoma + mesosoma + metasoma	42.1	15.3	15.1	29.1	22.9	
Pectines:	total length	5.5	1.6	1.5	3.0	2.0	
	length along dentate margin	4.7	1.7	1.4	3.3	1.9	
	tooth count (left/right)	30/30	13/13	12/13	21/20	17/17	
Telotarsi I:	spiniform setal count prolateral row (left/right)	2/2	1/1	1/1	1/1	1/1	
	spiniform setal count retrolateral row (left/right)	1/1	0/0	0/0	1/1	1/1	
Telotarsi II:	spiniform setal count prolateral row (left/right)	3/3	3/3	3/3	3/3 ³	3/3	
	spiniform setal count retrolateral row (left/right)	2/2	2/2	2/2	2/2	2/2	
Telotarsi III:	spiniform setal count prolateral row (left/right)	3/3	3/3	3/3	3/3	3/3	
	spiniform setal count retrolateral row (left/right)	3/3	3/3	3/3	3/3	3/3	
Telotarsi IV:	spiniform setal count prolateral row (left/right)	3/3	3/3	3/3	3/3	3/3	
	spiniform setal count retrolateral row (left/right)	3/3	3/3	3/3	3/3	3/3	

by trichobothria and macrosetae) aligned obliquely to longitudinal axis of chela, with distal edge directed toward and almost connecting with inter-

nal movable finger condyle (Fig. 11); all intercarnal surfaces smooth. Dentate margins of chela fingers linear (without lobe or notch); fixed and mov-



Figures 9–16. *Lisposoma elegans* Lawrence, 1928, distribution of trichobothria and macrosetae on the dextral pedipalpal segments of ♂ (AMNH [AH 2133]) and ♀ (NMSA 10886). 9. Chela, dorsal aspect, ♂. 10. Chela, dorsal aspect, ♀. 11. Chela, ventral aspect, ♀. 12. Chela, internal aspect, ♀. 13. Patella, dorsal aspect, ♀. 14. Patella, external aspect, ♀. 15. Patella, ventral aspect, ♀. 16. Femur, dorsal aspect, ♀. Scale bars = 1 mm.

able fingers with a single inner row of 5 and 6 denticles, respectively. Chela length along ventroexternal carina 23% (♂) to 33% (♀) greater than chela width (Table 2); chela width 10% (♂) to 13%

(♀) greater than chela height; length of movable finger 7% (♂) to 14% (♀) greater than length along ventroexternal carina.

Trichobothria. Orthobothriotaxic, type C (Figs

9–16), with the following segment totals: femur 3 (1 *d*; 1 *i*; 1 *e*), patella 19 (2 *d*; 1 *i*; 3 *v*; 13 *e*) and chela 26 (16 manus, including 4 *V*; 10 fixed finger). Total number of trichobothria per pedipalp, 48. Pedipalp patella with trichobothrium *d*₂ located on dorsal surface and distal *v* trichobothrium (*v*₃) located on external surface. Pedipalp chela with trichobothria *ib* and *it* located proximally on fixed finger; *db* located on dorsal surface of manus; *eb* and *esb* located proximally on fixed finger, *esb* below the *eb–est–et* axis and near articulation of fixed and movable fingers; *Db* located on external surface of manus; *Dt* located proximally on manus; *Est* located distally on manus; *Et*₂ located on ventral surface of manus; *V*₂ and *V*₃ not widely separated.

Mesosoma. Tergites each with paired submedian depressions and obsolete median carina. Pretergites smooth and shiny (Figs 3, 5). Post-tergites entirely smooth (♀), or covered with very fine and even granulation, becoming coarser distally, and imparting a matt appearance (♂). Sternites smooth to faintly punctate and shiny, each with a pair of shallow longitudinal depressions internal to spiracles. Sternite VII acarinate, with a shallow notch in distal apex. Sternite VII 27% (♀) to 43% (♂) wider than long (Table 2).

Sternum. Subpentagonal, width greater than twice its length.

Genital operculum. Subcordate, genital opercula (♀) fused.

Pectines. First proximal median lamella of each pecten with mesial margin angular, pectinal teeth present along entire posterior margin (Figs 4, 6). Pectinal teeth: 15–16 (♂), 12–16 (♀).

Legs. Femora each with (♂) or without (♀) a granular carina on prolateral surface. Basitarsi each with a few scattered spiniform setae on pro-

lateral and retrolateral margins, decreasing in number from anterior to posterior legs. Telotarsi I–IV each with paired ventrosabmedian rows of spiniform macrosetae and a ventromedian row of setiform macrosetae; counts of spiniform macrosetae in the pro- and retrolateral rows, 1/0 for telotarsi I, 3/2 for II, and 3/3 for III and IV, respectively. Telotarsal laterodistal lobes truncated, flush with base of median dorsal lobe. Telotarsal ungues short, distinctly curved, and of equal length. Retrolateral pedal spurs absent.

Metasoma and telson. Metasomal segments I–V progressively increasing in length, with segment V 52% (♀) to 67% (♂) longer than segment I (Table 2). Metasoma stout, width percentage of length for segment I, 110%; for II, 91%; for III, 83%; for IV, 67%; and for V, 41%. Telson vesicle oval in shape, with flattened dorsal surface and curved ventral surface, height 32% of length, and not laterally compressed; anterodorsal lateral lobes present but weakly developed. Aculeus fairly short, 31% of vesicle length, shallowly curved, and without subaculear tubercle. Total length of metasoma 30% (♀) to 45% (♂) longer than combined length of prosoma and mesosoma.

All metasomal carinae obsolete to absent, but dorsosubmedian carinae of segments I–IV each represented by a distal spiniform granule (Figs 3–6). Dorsal surfaces of segments I–III smooth (♀) or coarsely granular (♂), ventral surface of segment IV smooth or occasionally coarsely granular (♂ only), ventral surface of segment V smooth or coarsely granular distally; all other intercarinal surfaces smooth. Telson entirely smooth; sparsely covered in macrosetae. Venom glands complex.

Reproductive anatomy. Ovariuterine follicles sessile, without diverticula. Embryonic development apoikogenic.

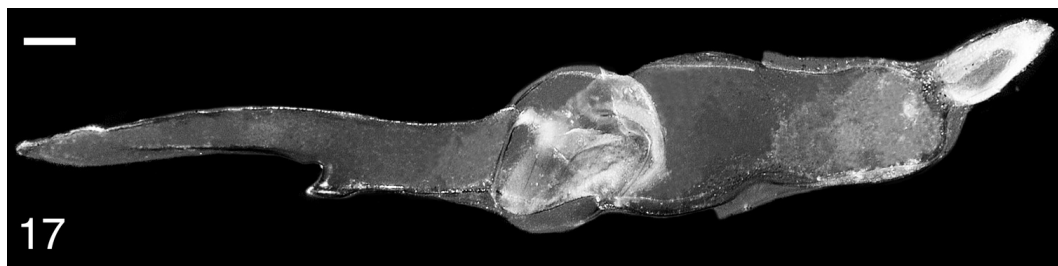


Figure 17. *Lisposoma elegans* Lawrence, 1928, paralectotype ♂ (SAMC B6077), hemispermatophore, ental aspect. Scale bar = 1 μm.

Hemispermatothore. Lamelliform. Differing diagnostically from *L. joseehermanorum* in the shape and size of the distal lamina, hook notch, distal crest of distal lamina, and in having an accessory crest on the ental side of the median lobe (Fig. 17).

Geographic variation. Specimens from low altitudes in the southwestern part of distributional range (the gravel plains of the Central Namib) are considerably paler in overall colouration, and lack many of the characteristic infuscations of specimens from higher altitudes further north and east. Presumably, this is an adaptation to the pale, sandy substratum inhabited by the Namib populations of *L. elegans*.

Ontogenetic variation. ♂ resembles ♀ very closely until the final instar. However, juveniles and subadults can be readily sexed by examination of the pectines and genital aperture.

Sexual dimorphism. Besides the increased granulation and higher pectinal tooth count, noted above, the adult ♂ differs from the adult ♀ in the more globose pedipalp chela manus, more slender mesosoma, and longer metasoma (Figs 3–6).

Distribution. – Endemic to central and northwestern Namibia, north of the central Namib sand system and the Central Highlands, east of the Skeleton Coast and Engo-Kunene dunefields, and west of the western limit of the Kalahari sand system (Fig. 2). Recorded from the Kunene region (Khorixas, Opuwo and Outjo districts), the Khomas region (Windhoek district), and the Erongo region (Karibib, Omaruru and Swakopmund districts). This species may yet be discovered north of the Kunene River in southern Angola.

Lisposoma elegans generally occurs at lower altitudes than *L. joseehermanorum* (Fig.18). Known locality records fall within the following range of altitudes (percentage of locality records indicated in parentheses): 300–600 m (20.5%), 600–900 m (26%), 900–1200 m (28%), 1200–1500 m (18%), 1500–1800 m (7.5%).

The distributional range of *L. elegans* falls mostly within the Savanna biome (Irish 1994), where locality records occur in the Mopane Savanna (51%) and Highland Savanna (7.5%) vegetation zones (Giess 1971). However, a significant proportion of records fall within the Desert and Nama Karoo biomes (Irish 1994), in the following vegetation zones (Giess 1971): Central Namib

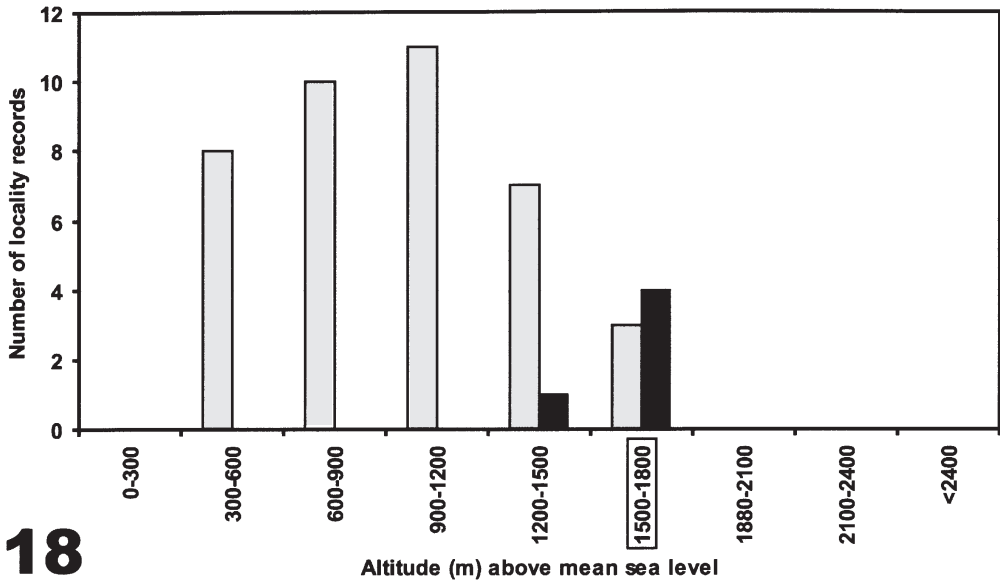
(26%), Semi-desert and Savanna Transition (13%), Northern Namib (2.5%).

This species inhabits an extremely arid region, receiving less than 450 mm annual rainfall (Fig.19), all of which falls in the late to very late Summer (February to May). It has even been collected on the gravel plains of the Central Namib, which may receive no rainfall for years on end. In this habitat, *L. elegans* may obtain moisture from incoming fog, as is the case with many other Namib inhabitants (Seely 1978; Robinson & Seely 1980). Known locality records fall within the following mean annual rainfall ranges: 0–50 mm (28%), 50–100 mm (13%), 100–150 mm (15%), 150–200 mm (5%), 200–250 mm (8%), 250–300 mm (15%), 350–400 mm (13%), 400–450 mm (3%).

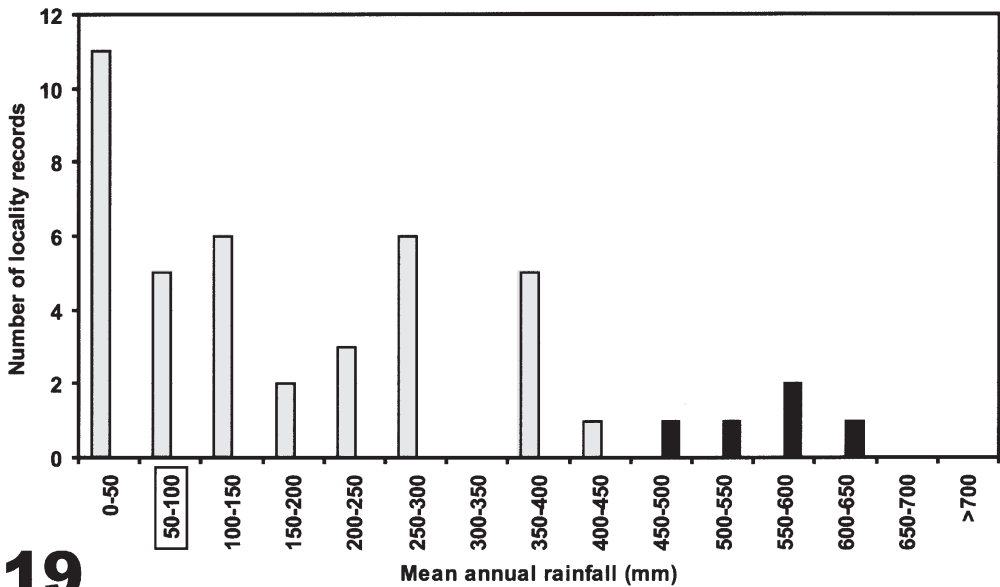
Ecology. – Most specimens of *L. elegans* were collected in pitfall traps or by means of UV detection at night. However, several specimens were found under stones, and the species is certainly lapidicolous (Prendini 2001). All specimens for which habitat data are available were collected in stony areas with hard, gritty substrata (hardness ranging from 4–6 kg.cm⁻²; Lamoral 1979). Whether *L. elegans* constructs burrows remains unknown, but the species does not display any obvious morphological characters suggestive of a fossorial existence.

The distributional range of *L. elegans* is allopatric with that of *L. joseehermanorum* (Fig. 2) However, the species has been collected in sympatry with several other scorpion species, including the bothriurids, *Parabuthus brevimanus* (Thorell, 1876), *P. gracilis* Lamoral, 1979, *P. granulatus* (Ehrenberg, 1831), *P. kraepelini* Werner, 1902, *P. namibensis* Lamoral, 1979, *P. villosus* (Peters, 1862), *Uroplectes otjimbinguensis* (Karsch, 1879), *U. pilosus* (Thorell, 1876), and *U. planimanus* (Karsch, 1879); the ischnurid, *Hadogenes taeniurus* (Thorell, 1876); the scorpionids, *Opisthophthalmus brevicauda* Lawrence, 1928, *O. carinatus* (Peters, 1861), *O. cavimanus* Lawrence, 1928, *O. coetzeei* Lamoral, 1979, and *O. gibbericauda* Lamoral, 1979.

Conservation. – *Lisposoma elegans* is presently known from ca. 41 localities, falling within 32 QDS. The species inhabits a region of low agricultural potential (Barnard 1998) and, besides mining, which occurs at sporadic sites (e.g., Rössing) across its distributional range, there are few other threats to its survival. Furthermore, a substantial



18



19

□ *Lisposoma elegans*

■ *Lisposoma joseehermanorum*

Figures 18–19. Environmental correlates of the distributional ranges of *Lisposoma elegans* Lawrence, 1928 and *Lisposoma joseehermanorum* Lamoral, 1979. The number of known locality records for both species are grouped according to the gradients of altitude (Fig. 18) and mean annual rainfall (Fig. 19) occurring within Namibian borders. *Lisposoma joseehermanorum* inhabits higher altitudes, receiving greater precipitation, than *L. elegans*. The altitude and rainfall ranges at which *Brandbergia haringtoni* Prendini, 2003 occurs are each enclosed in a box.

portion of its range falls within two major national parks, the Etosha National Park (with four confirmed records) and the Namib-Naukluft Park (with three confirmed records). The species is also protected in the smaller Daan Viljoen Game Reserve (one confirmed record). It is therefore assigned the Least Concern IUCN Red List Category.

Lisposoma josehermanorum Lamoral, 1979

Lisposoma josehermana Lamoral, 1979: 665–668, fig. 327, 328, 331–340.

Lisposoma josehermana: Francke 1982: 36; Kovařík 1998: 101; Prendini 2000: 40, table 3, fig. 2, 6, 8A.

Lisposoma josehermanorum: Lowe & Fet 2000: 34; Prendini 2001: 137.

Type material. – Holotype: ♂ (NMSA 10697 [Type No. 2223]), Farm Elandshoek 771, 19°26'S 17°42'E, Otavi Highlands [Tsumeb District, Oshikoto Region], Namibia, 8.iii.1969, B. Lamoral & R. Day. Paratypes: 1 subad. ♂ (NMNW 765 ex NMSA 11110), 2 juv. ♂ (NMSA 11110 [Type No. 2224]), same data as holotype; 1 subad. ♀ (NMSA 11388 [Type No. 2297]), Märchenhöhle, Farm Uisib 427, 19°32'S 17°14'E [Tsumeb District, Oshikoto Region], Namibia, 13.ii.1977, P. von Wrede, found in cave; 1 ♀ (NMSA 11389 [Type No. 2298]), same data, except '7.viii.1977'; 1 subad. ♂ (NMSA 11390 [Type No. 2299]), Kempton (Höhle), ges. im Lehm Canon [Farm Uisib 427, Tsumeb District, Oshikoto Region], Namibia, 6.viii.1977, P. von Wrede, found in cave.

Additional material. – NAMIBIA: Oshikoto Region: Tsumeb District: Farm Elandshoek 771, ca. 10 km SW Tsumeb, Otavi Highlands [19°26'S 17°42'E], 25.iv.1980, A. Harington, under ill fitting stones on S slope of hillside, no burrows or scrapes, leaf littered, 1 ♀ 1 juv. ♀ (AMNH), 1 subad. ♂ (AMNH [AH 1342]), 1 subad. ♀ (AMNH [AH 1344]), 1 juv. ♂ (AMNH [AH 1343]); Elandshoek, Tsumeb, 19°14'S 17°43'E, 1–16.iv.1984, J. Visser, 1 ♂ (SAMC C4333 [JV 3207]), 1 ♀ (SAMC C4331 [JV 3157]), 1 ♀ (SAMC C4332 [JV 3208]); Märchenhöhle [19°32'S 17°14'E], 30.viii.1990, E. Marais, 1 ♀ (NMNW 1352), 30.viii.1990–7.iv.1991, E. Marais, preservative pitfall trap, 1 ♀ (NMNW 1622). Otjozondjupa Region: Grootfontein District: Tsumeb, 27 mi SE [19°27'S 18°02'E], 19–20.xii.1966, E.S. Ross & K. Lorenzen, 1400 m, 1 ♂ 2 ♀ (CASC). Otjiwarongo District: Waterberg, 15 mi NE [20°15'S 17°30'E], 21.xii.1966, E.S. Ross & K. Lorenzen, 1470 m, 1 ♀ (CASC).

Remarks. – Lamoral (1979) named this species '*josehermana*' after his parents, Marie-José and Herman Lamoral. Lowe & Fet (2000) corrected the species name to '*josehermanorum*' in accordance with Article 31(a)(ii) of the ICZN (1985).

Diagnosis. – *Lisposoma josehermanorum* is most

closely related to *L. elegans* (Lamoral 1979; Prendini 2000, 2003), but can be separated from the latter by means of the following characters: pedipalp chela, dentate margins of fixed and movable fingers each with inner row of 10–16 denticles; metasomal segments I–IV, dorsosubmedian and dorsolateral carinae distinct, granular to costate granular. This is the larger of the two species, adults reaching at least 35 mm in total length (Figs 20–23).

Description. – The following description, which supplements that by Lamoral (1979), is based on the holotype ♂ (NMSA 10697), a paratype ♀ (NMSA 11389) and an additional ♂ (CASC) and ♀ (SAMC C4331).

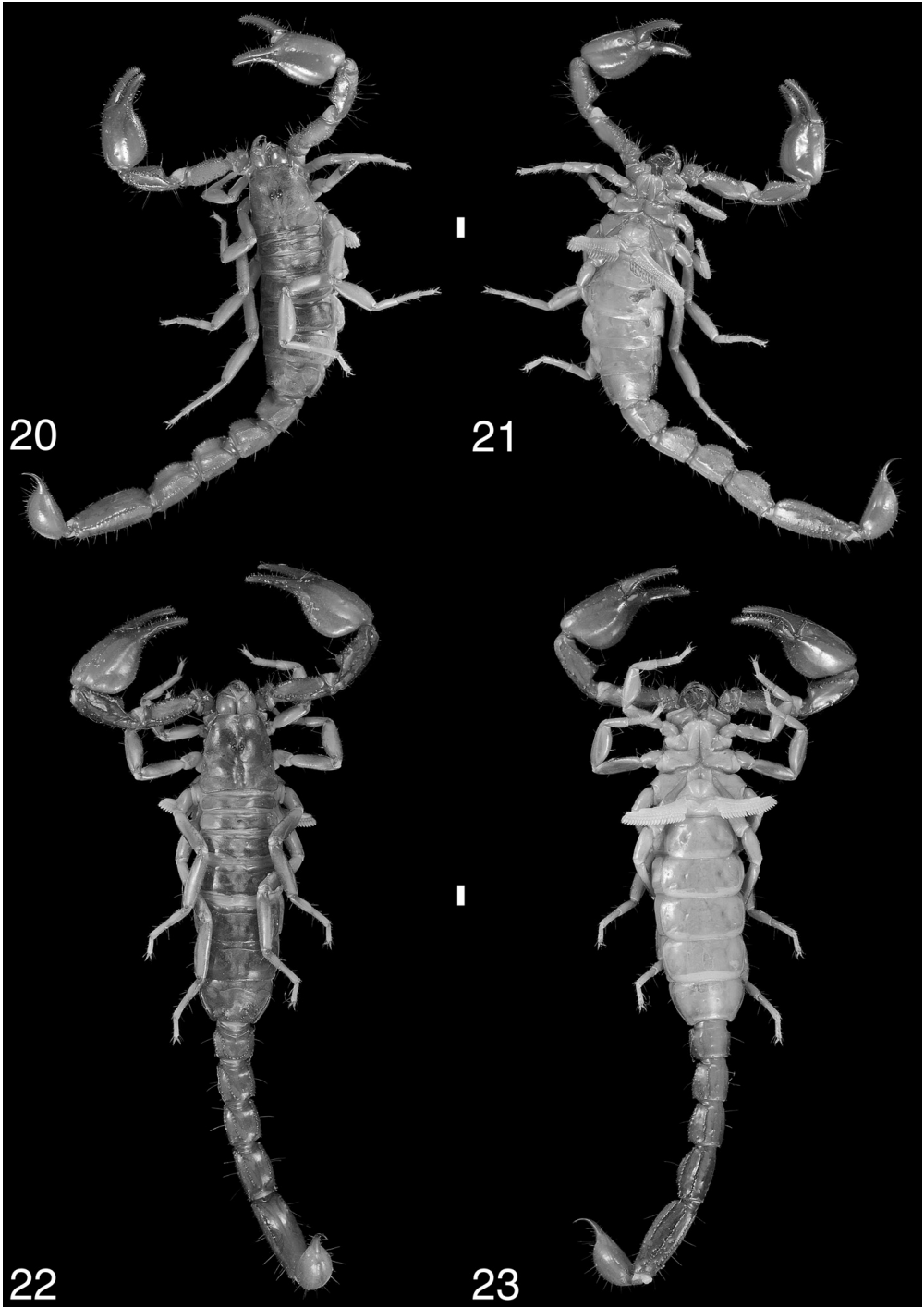
Color (based on SAMC C4331). Carapace, tergites, metasomal segment V and telson, Dark Brownish Olive No. 129; legs (dorsoexternal surfaces), pedipalp femur, patella and chela fingers, Brownish Olive No. 29; chelicerae, pedipalp chela manus, metasomal segments I–IV, Clay Color No. 26; sternites and legs (ventrointernal surfaces), Tawny Olive No. 223D; pectines and genital operculum, Pale Horn Color No. 92.

Chelicerae. Movable finger with two subdistal teeth (Figs 24, 25); distal external and distal internal teeth unequal, distal external tooth considerably smaller than distal internal tooth, and not closely opposed. Ventral aspect of fingers and manus with long, dense macrosetae.

Carapace. Three pairs of lateral ocelli, considerably smaller than median ocelli (Figs 24, 25). Median ocular tubercle raised, with distinct interocular sulcus, but superciliary carinae obsolete. Anterior margin of carapace sublinear, without median notch or small median projection. Anteromedian sulcus broad and shallow, without suture; posterior furcated sutures absent. Posteromedian sulcus distinct, shallow; posteromarginal sulcus obsolete. Carapace uniformly finely granular, except for interocular and posteromedian surfaces, which are smooth.

Pedipalps. Femur pentacarinat, ventroexternal carina obsolete, reduced to a few granules proximally, all other carinae granular; dorsal, ventral and internal intercarinal surfaces finely granular, external intercarinal surface smooth. Femur length 58% (♂) to 67% (♀) greater than width (Table 2).

Patella pentacarinat, with dorsointernal, internomedian and ventrointernal carinae distinct, granular; dorsoexternal carina distinct, granular



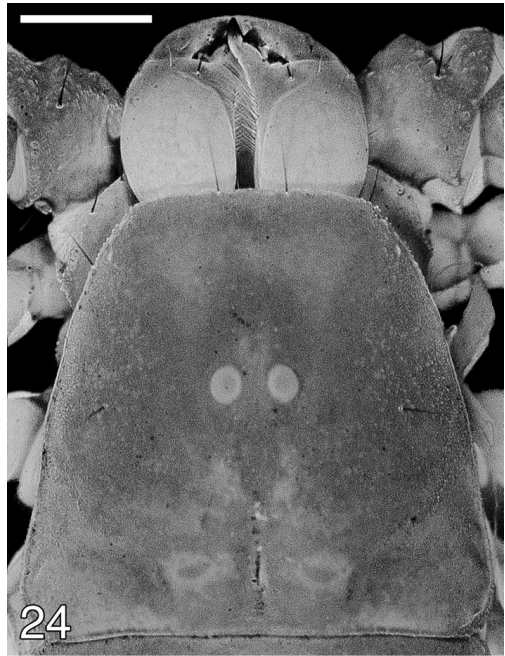
Figures 20–23. *Lisposoma josehermanorum* Lamoral, 1979, habitus of ♂ (CASC) and paratype ♀ (NMSA 11389). 20. Dorsal aspect, ♂. 21. Ventral aspect, ♂. 22. Dorsal aspect, ♀. 23. Ventral aspect, ♀. Scale bars = 1 mm.

(♂), or obsolete (♀); ventroexternal carina obsolete; dorsal, internal and ventral intercarinal surfaces finely granular, external intercarinal surfaces smooth (♂), or all surfaces smooth, except for internal intercarinal surfaces, which may be finely granular (♀); anterior process obsolete, although small spiniform granules may be evident (♂ only). Patella length 61% (♂) to 62% (♀) greater than width (Table 2).

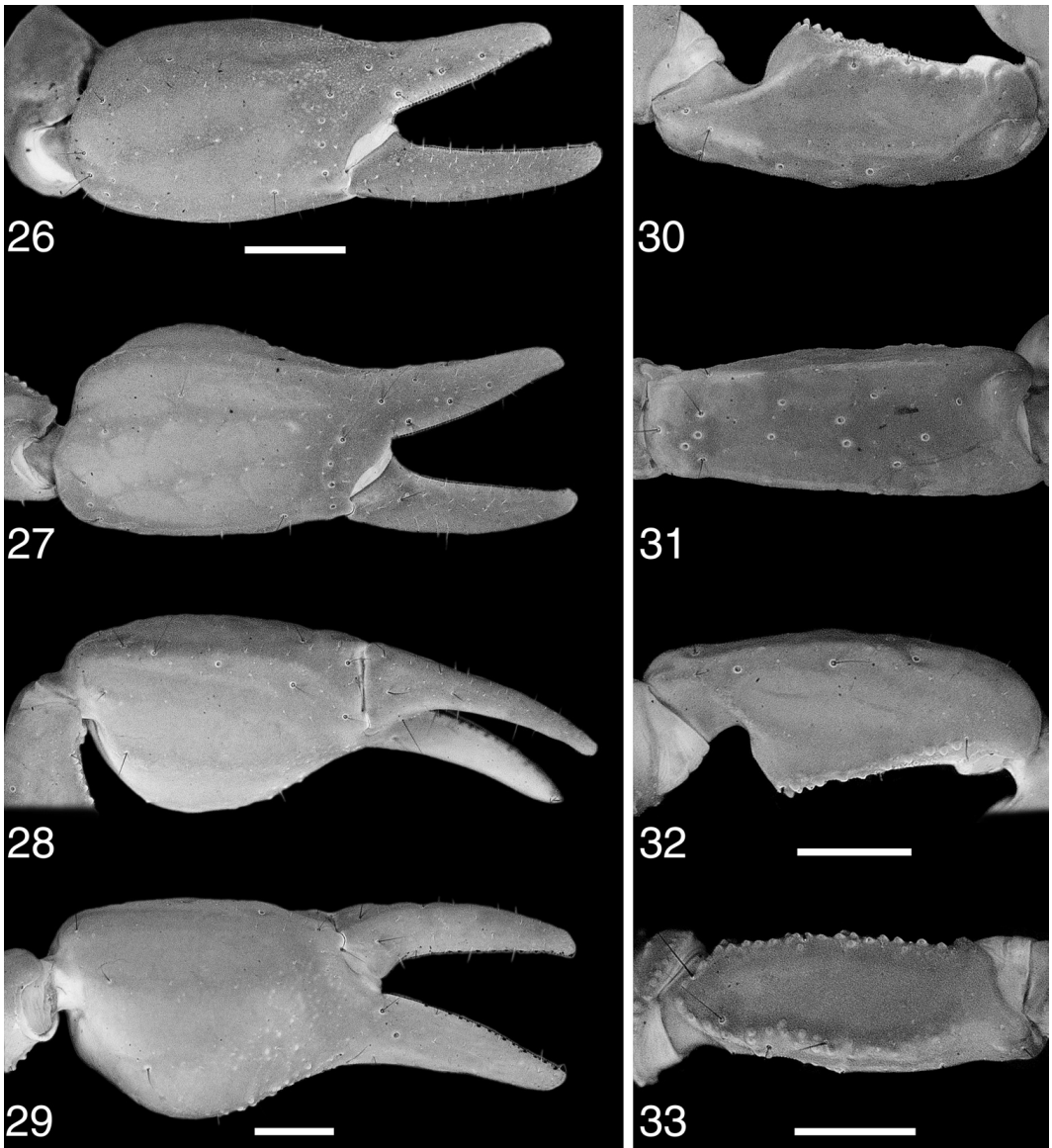
Chela acarinate, all carinae absent or obsolete (Figs 26, 27); ventroexternal carina (as demarcated by trichobothria and macrosetae) aligned obliquely to longitudinal axis of chela, with distal edge directed toward and almost connecting with internal movable finger condyle (Fig. 28); all intercarinal surfaces smooth, except for distal region of dorsointernal surface and base of fixed finger, which are finely granular. Dentate margins of chela fingers linear (without lobe or notch), each with a single inner row of 10–16 denticles. Chela length along ventroexternal carina 11% (♂) to 38% (♀) greater than chela width (Table 2); chela width 6% (♀) to 20% (♂) greater than chela height; length of movable finger 4% (♀) to 7% (♂) greater than length along ventroexternal carina.

Trichobothria. Orthobothriotaxic, type C (Figs 26–33), with the following segment totals: femur 3 (1 *d*; 1 *i*; 1 *e*), patella 19 (2 *d*; 1 *i*; 3 *v*; 13 *e*) and chela 26 (16 manus, including 4 *V*; 10 fixed finger). Total number of trichobothria per pedipalp, 48. Pedipalp patella with trichobothrium *d*₂ located on dorsal surface and distal *v* trichobothrium (*v*₃) located on external surface. Pedipalp chela with trichobothria *ib* and *it* located proximally on fixed finger; *db* located on dorsal surface of manus; *eb* and *esb* located proximally on fixed finger, *esb* below the *eb-est-et* axis and near articulation of fixed and movable fingers; *Db* located on external surface of manus; *Dt* located proximally on manus; *Est* located distally on manus; *Et*₂ located on ventral surface of manus; *V*₂ and *V*₃ not widely separated.

Mesosoma. Tergites each with paired submedian depressions and obsolete median carina (Figs 20, 22). Pre-tergites smooth and shiny. Post-tergites entirely granular (less densely in ♂), with granulation becoming noticeably coarser laterally and distally, especially on tergite VII. Sternites smooth to faintly punctate and shiny, each with a pair of shallow longitudinal depressions internal to spiracles. Sternite VII acarinate, with a shallow notch in distal apex. Sternite VII 44% (♀) to 51%



Figures 24–25. *Lisposoma joseehermanorum* Lamoral, 1979, carapace. 24. Holotype ♂ (NMSA 10697). 25. Paratype ♀ (NMSA 11389). Scale bars = 1 mm.



Figures 26–33. *Lisposoma josehermanorum* Lamoral, 1979, distribution of trichobothria and macrosetae on the dextral pedipalpal segments of holotype ♂ (NMSA 10697) and paratype ♀ (NMSA 11389). 26. Chela, dorsal aspect, ♂. 27. Chela, dorsal aspect, ♀. 28. Chela, ventral aspect, ♀. 29. Chela, internal aspect, ♀. 30. Patella, dorsal aspect, ♀. 31. Patella, external aspect, ♀. 32. Patella, ventral aspect, ♀. 33. Femur, dorsal aspect, ♀. Scale bars = 1 mm.

(♂) wider than long (Table 2).

Sternum. Subpentagonal, width greater than twice its length.

Genital operculum. Subcordate, genital opercula (♀) fused.

Pectines. First proximal median lamella of each pecten with mesial margin angular, pectinal teeth present along entire posterior margin (Figs 21, 23). Pectinal teeth: 19–21 (♂), 17–21 (♀).

Legs. Femora each with a granular carina on

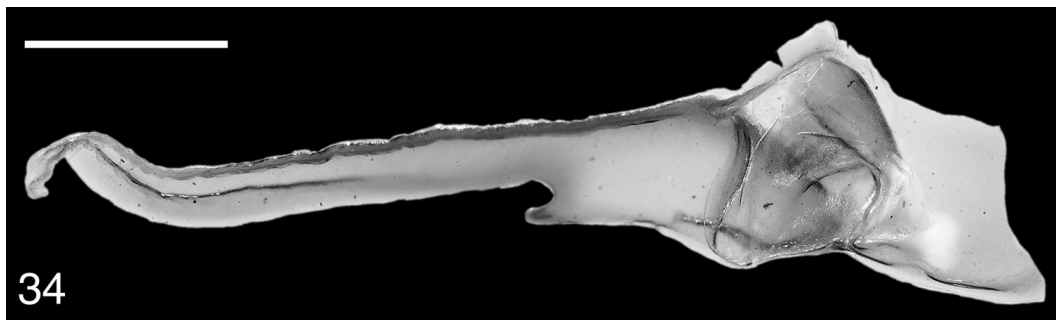


Figure 34. *Lisposoma joseehermanorum* Lamoral, 1979, holotype ♂ (NMSA 10697), hemispermatophore (damaged), ental aspect. Scale bar = 1 mm.

prolateral surface. Basitarsi each with a few scattered spiniform setae on prolateral and retrolateral margins, decreasing in number from anterior to posterior legs. Telotarsi I–IV each with paired ventrosubmedian rows of spiniform macrosetae and a ventromedian row of setiform macrosetae; counts of spiniform macrosetae in the pro- and retrolateral rows, 1/1 for telotarsi I, 3/2 for II, and 3/3 for III and IV, respectively. Telotarsal laterodistal lobes truncated, flush with base of median dorsal lobe. Telotarsal ungues short, distinctly curved, and of equal length. Retrolateral pedal spurs absent.

Metasoma and telson. Metasomal segments I–V progressively increasing in length, with segment V 56% longer than segment I (Table 2). Metasoma stout, width percentage of length for segment I, 110%; for II, 100%; for III, 92%; for IV, 72%; and for V, 44%. Telson vesicle oval in shape, with flattened dorsal surface and curved ventral surface, height 30% of length, and not laterally compressed; anterodorsal lateral lobes present but weakly developed. Aculeus fairly short, 31% of vesicle length, shallowly curved, and without subaculear tubercle. Total length of metasoma 27% (♀) to 40% (♂) longer than combined length of prosoma and mesosoma.

Six carinae on segments I–III, four carinae on segment IV, and no carinae on segment V (Figs 20–23). Dorsosubmedian and dorsolateral carinae distinct, costate granular to granular throughout length of segments I–IV, obsolete to absent on segment V. Dorsosubmedian carinae of metasomal segments I–IV each terminating distally with a slightly enlarged, spiniform granule. Median lateral carinae fully developed on segment I, reduced to a few granules distally on segments II and III,

absent from segments IV and V. Ventrolateral carinae and ventrosubmedian carinae absent from segments I–V.

Lateral surfaces of segments I–III, and ventral surface of segment V, coarsely granular; all other intercarinal surfaces smooth. Telson smooth dorsally and laterally, ventrally smooth (♀) to weakly granular in proximal region (♂); sparsely covered in macrosetae. Venom glands complex.

Reproductive anatomy. Ovariuterine follicles sessile, without diverticula. Embryonic development apoikogenic.

Hemispermatophore. Lamelliform. Differing diagnostically from *L. elegans* in the shape and size of the distal lamina, hook notch, and distal crest of distal lamina (Fig. 34).

Geographic variation. No distinctive variation.

Ontogenetic variation. ♂ resembles ♀ very closely until the final instar. However, juveniles and subadults can be readily sexed by examination of the pectines and genital aperture.

Sexual dimorphism. As with *L. elegans*, the adult ♂ of *L. joseehermanorum* differs from the adult ♀ in the more globose pedipalp chela manus, which is subcircular in cross-section, rather than suboval, and in the longer metasoma (Figs 20–23).

Distribution. – Endemic to the Otavi Highlands of northeastern Namibia (Tsumeb district, Oshikoto region and Grootfontein district, Otjozondjupa region), with a single record northeast of the Waterberg Plateau (Otjiwarongo district, Otjozondjupa region). All records occur west of the western limit of the Kalahari sand system (Fig. 2).

Lisposoma joseehermanorum occurs at higher altitudes than *L. elegans* (Fig. 18). Known locality

records fall within the following range of altitudes (percentage of locality records indicated in parentheses): 1200–1500 m (20%), 1500–1800 m (80%).

The distributional range of *L. joseehermanorum* falls entirely within the Savanna biome (Irish 1994), with locality records in the following vegetation zones (Giess 1971): Mountain Savanna and Karstveld (80%); Tree Savanna and Woodland (20%). This region receives a much higher rainfall than that inhabited by *L. elegans* (Fig. 19): 450–650 mm falls during the summer months (November to May). Known locality records occur within the following mean annual rainfall ranges: 450–500 mm (20%), 500–550 mm (20%), 550–600 mm (40%), 600–650 mm (20%).

Ecology. – Most specimens of *L. joseehermanorum*, for which collection data are available, were taken from under stones or captured in pitfall traps. Several specimens were found in caves (Märchenhöhle and Kemptenhöhle). According to Lamoral (1979), the types from Elandshoek were all found in burrows, deep below the undersurface of large boulders half imbedded in hard, slightly damp soil, on south-facing hills supporting a fairly dense Mopane/Acacia forest. No specimens were collected on south-facing hills supporting less dense vegetation. The habitat of *L. joseehermanorum* is mesic, compared with that of *L. elegans*, and its facultative occurrence in caves prompted Lamoral (1979) to describe it as an endogean species occupying a euedaphic habitat.

Alexis Harington (pers. comm.) revisited Elandshoek and confirmed the habitat of *L. joseehermanorum* to be as described by Lamoral (1979), but did not find any evidence for Lamoral's claim that this species is fossorial. As with *L. elegans*, *L. joseehermanorum* does not display any obvious morphological characters suggestive of a fossorial existence and it seems unlikely that this species is capable of burrowing, although it is evidently lapidicolous.

The distributional range of *L. joseehermanorum* is allopatric with that of *L. elegans* (Fig. 2). *Opisthophthalmus carinatus* (Scorpionidae) is the only other scorpion species thus far recorded in sympatry with *L. joseehermanorum*.

Conservation. – *Lisposoma joseehermanorum* is presently known from only six localities, all of which fall within four QDS. Several factors suggest that it is more vulnerable than *L. elegans* and

requires some form of protection. Unlike *L. elegans*, this species inhabits a region that receives some of the highest rainfall in Namibia and thus has a relatively high agricultural potential (Barnard 1998), at least compared with other regions in this arid country. Mining also occurs at several sites (e.g., Tsumeb) across its distributional range. Both landuse practices result in major habitat modification and it is doubtful that *L. joseehermanorum* would continue to exist in areas where these practices take place.

Such threats, together with a restricted distributional range, which falls entirely outside of existing protected areas, suggests that *L. joseehermanorum* should be assigned the Vulnerable IUCN Red List Category. This species is characterised by an acute restriction in both its area of occupancy and number of known localities. It would thus be prone to the effects of human activities (or stochastic events, the impact of which is increased by human activities) within a very short period of time in an unforeseeable future, and is capable of becoming Critically Endangered or even Extinct in a very short period.

Key to identification of the African species of Bothriuridae Simon, 1880

1. Pedipalp chela, digital and ventroexternal carinae distinct, costate to costate granular; metasomal segments I–V, ventrolateral carinae, and segment V, ventromedian carina, well developed; cheliceral movable finger, distal external and distal internal teeth subequal, distal external tooth slightly smaller than distal internal tooth, and opposable *Brandbergia haringtoni*
- Pedipalp chela, digital and ventroexternal carinae absent or obsolete; metasomal segments I–V, ventrolateral carinae, and segment V, ventromedian carina, absent; cheliceral movable finger, distal external and distal internal teeth unequal, distal external tooth considerably smaller than distal internal tooth, and not closely opposed.....2 (*Lisposoma*)
2. Pedipalp chela, dentate margins of fixed and movable fingers with inner row of 5 and 6 denticles, respectively; metasomal segments I–IV, dorsosubmedian carinae absent or obsolete, except for a single distal spiniform granule, and dorsolateral carinae absent ..*Lisposoma elegans*
- Pedipalp chela, dentate margins of fixed and movable fingers each with inner row of 10–16 denticles; metasomal segments I–IV, dorsosubmedian and dorsolateral carinae distinct, granular to costate granular
..... *Lisposoma joseehermanorum*

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