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The ground spider genera *Leptodrassex* Murphy, 2007 and *Leptopilos* Levy, 2009 (Araneae: Gnaphosidae) in southern Africa, including the description of a new genus and seven new species

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Abstract

The ground spider genera *Leptodrassex* Murphy, 2007 and *Leptopilos* Levy, 2009 are recorded from southern Africa for the first time, with the description of five new species: *Leptodrassex murphyi* **sp. nov.** (♂ ♀) from Mozambique and South Africa, and *L. capensis* **sp. nov.** (♀) from South Africa; *Leptopilos butleri* **sp. nov.** (♂ ♀) and *L. vasivulva* **sp. nov.** (♂ ♀) from Botswana, South Africa and Zimbabwe, and *L. digitus* **sp. nov.** (♂ ♀) from South Africa. Further, the new genus *Afrodrassex* **gen. nov.** is described, with the type species *A. balrog* **sp. nov.** (♂ ♀) from South Africa and Angola, and *A. catharinae* **sp. nov.** (♂ ♀) from South Africa described therein. Details of the somatic and genitalic morphology of all three genera are examined by scanning electron microscopy, and revised descriptions of *Leptodrassex* and *Leptopilos* are presented.

Key words: Afrotropical, Angola, Botswana, endemic, Leptodrassinae, Mozambique, South Africa, Zimbabwe

Introduction

The Leptodrassinae is a small subfamily of ground spiders (Gnaphosidae), currently known from only four genera, *Leptodrassex* Murphy, 2007, *Leptodrassus* Simon, 1878, *Leptopilos* Levy, 2009 and *Neodrassex* Ott, 2012. To date, only four species of Leptodrassinae have been described from the Afrotropical Region, all belonging to *Leptodrassus*: *L. bergensis* Tucker, 1923 from the Matroosberg Mountains and *L. licentiosus* Dalmas, 1919 from Cape Town, both in south-western South Africa; *L. strandi* Caporiacco, 1947 from Ethiopia; and *L. tropicus* Dalmas, 1919 from Sierra Leone (Dalmas 1919; Tucker 1923; Caporiacco 1947).

During recent surveys of spiders in southern Africa, peculiar tiny gnaphosids were discovered in various biomes and microhabitats. They were particularly interesting because of the consistently small size of the adults (generally 2–3 mm) and their pale colouration without markings, except for black pigment in the ocular region (Figs 1–6). The recent changes in gnaphosid classification (Murphy 2007; Azevedo *et al.* 2018) provided clues as to their subfamilial and generic placement, in either *Leptodrassex* or *Leptopilos* of the Leptodrassinae. None of the species collected matched the descriptions and illustrations of the two *Leptodrassus* described from South Africa, which are larger (5–6 mm in length), light brown in colour, and have different genitalic structures (Dalmas 1919; Tucker 1923).

In establishing *Leptodrassex*, Murphy (2007) transferred three Palaearctic species from *Leptodrassus* and reported two additional undescribed species from Kenya, but no further effort has been made to record or describe any species from the Afrotropical Region. After *Leptodrassus* (11 species), *Leptopilos* is the second largest genus in the subfamily, and is currently represented by seven species distributed from the eastern Mediterranean to Mongolia (World Spider Catalog 2022). Our study therefore represents the first records of *Leptodrassex* and *Leptopilos* from southern Africa.

Here we describe two new species of *Leptodrassex* and three new species of *Leptopilos* from southern Africa, of which two species are described from Botswana, South Africa and Zimbabwe, one from Mozambique and South

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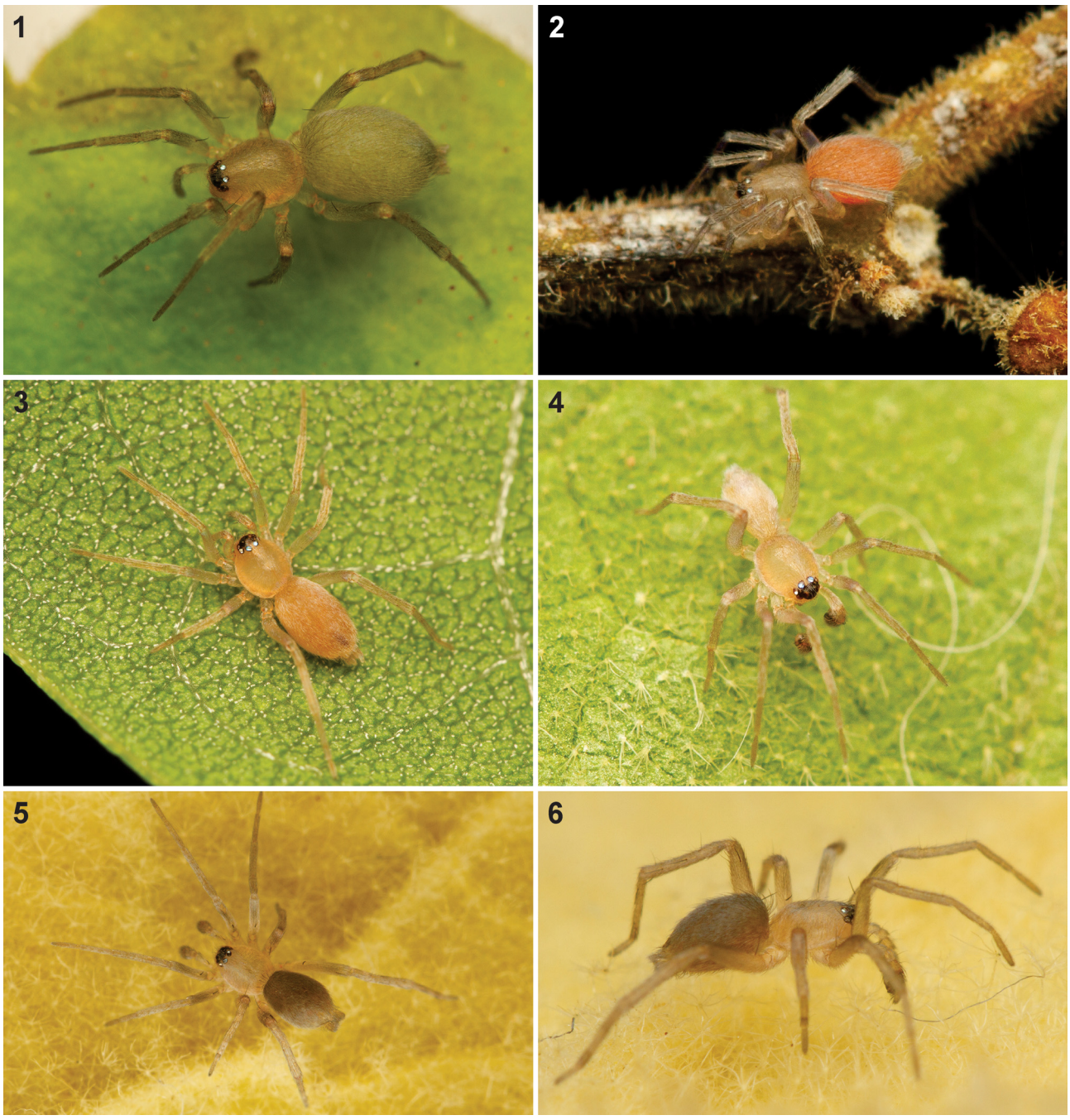
Africa, and the others are endemic to South Africa. Further, we describe a new genus from South Africa and Angola, *Afrodrassex* **gen. nov.**, with two new species recognized by their distinctive genitalic morphology. Considering the updated knowledge of their distribution, it is likely that both *Leptodrassex* and *Leptopilos* occur at least from the Mediterranean southwards, throughout East Africa to South Africa.



FIGURES 1–6. Habitus of living Leptodrassinae spiders from southern Africa: 1. Female and 2. Juvenile *Afrodrassex balrog* **sp. nov.** from Bloemfontein, South Africa; 3. Female and 4. Male *Leptodrassex murphyi* **sp. nov.** from Bloemfontein, South Africa; 5, 6. Male *Leptopilos digitus* **sp. nov.** from Namaqua National Park, South Africa. Photos: R. Booysen.

Material and methods

Material was sorted and identified using a Nikon SMZ800 stereomicroscope, with digital images taken using a coupled Nikon DS-L3 camera system. Between 10–15 photos were taken of the dorsal habitus and genitalia and stacked using CombineZM software (Bercovici *et al.* 2009). Female epigynes were first dissected using 0-size insect

pins before being cleared in a Labcon 5019U ultrasonic bath. Measurements were taken using a measuring eyepiece on the aforementioned microscope. To determine a total length size range and average, only intact specimens (i.e., with both body sections still attached) were measured, unless otherwise indicated. CorelDraw X7/8 was used to trace the initial genitalic figures, as well as for preparing the final figure plates. Final line drawings were digitised and edited using Adobe Photoshop 2019.

For scanning electron microscopy, live specimens were preserved in 96% ethanol. They were transferred to clean 100% ethanol overnight, critical point dried in carbon dioxide, and then stuck onto aluminium stubs using double-sided tape. The material was then sputter-coated with iridium before examination in a Jeol JSM-IT200 scanning electron microscope.

The following abbreviations are used in the descriptions: AL—abdomen length; ALE—anterior lateral eye(s); AME—anterior median eye(s); AW—abdomen width; CL—carapace length; CW—carapace width; MOQ—median ocular quadrangle; PLE—posterior lateral eye(s); PME—posterior median eye(s); TL—total length. Leg spination follows the format of Bosselaers & Jocqué (2000), including the following abbreviations: do—dorsal; pl—prolateral; plv—prolateral ventral; rl—retrolateral; rlv—retrolateral ventral; vt—ventral terminal. Spinneret morphology was interpreted using the descriptions and illustrations of Murphy (2007).

All distribution maps were created using SimpleMappr (Shorthouse 2010). The material examined in this study is deposited in the California Academy of Sciences, San Francisco, U.S.A. (CAS), the National Museum, Bloemfontein, South Africa (NMBA), the Natural History Museum of Zimbabwe, Bulawayo (NMZ), and the National Collection of Arachnida at the Agricultural Research Council in Pretoria, South Africa (NCA).

Taxonomy

Family Gnaphosidae Banks, 1892

Genus *Afrodrassex* gen. nov.

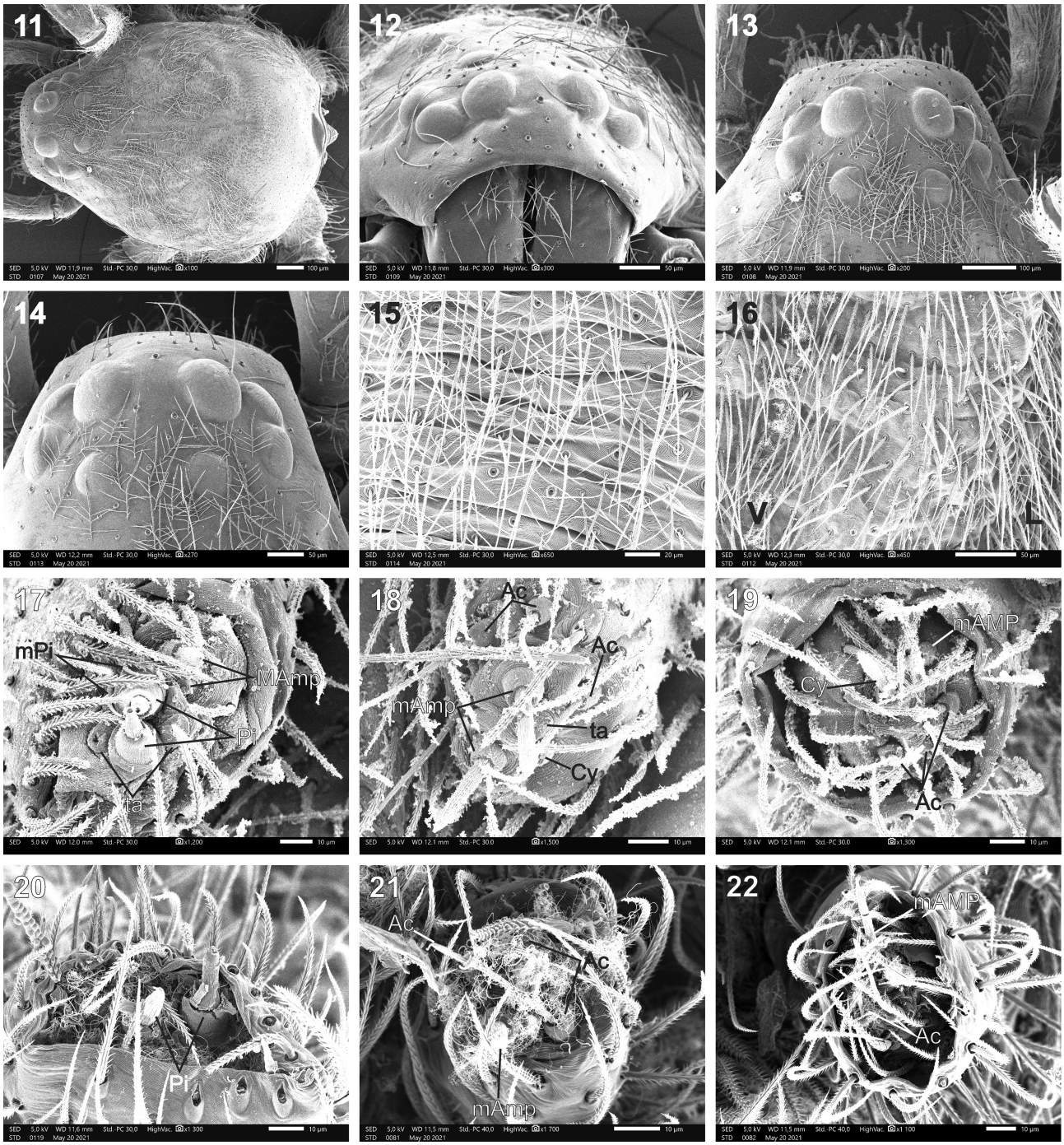
Type species. *Afrodrassex balrog* **sp. nov.**

Etymology. The genus name is a contraction referring to the currently known distribution in the Afrotropical Region, and *Leptodrassex*, to which it is related. Gender masculine.

Diagnosis. *Afrodrassex* **gen. nov.** can be distinguished from all other Leptodrassinae by the distinctive genitalic structure: females have very long copulatory ducts running around the periphery of the epigyne before entering the spermathecae posteriorly (Figs 34, 39), while the male palps have a large curved anterior tegular process, lack a median apophysis, and have a long embolus associated with a large membranous conductor (Figs 36–38, 41–43).

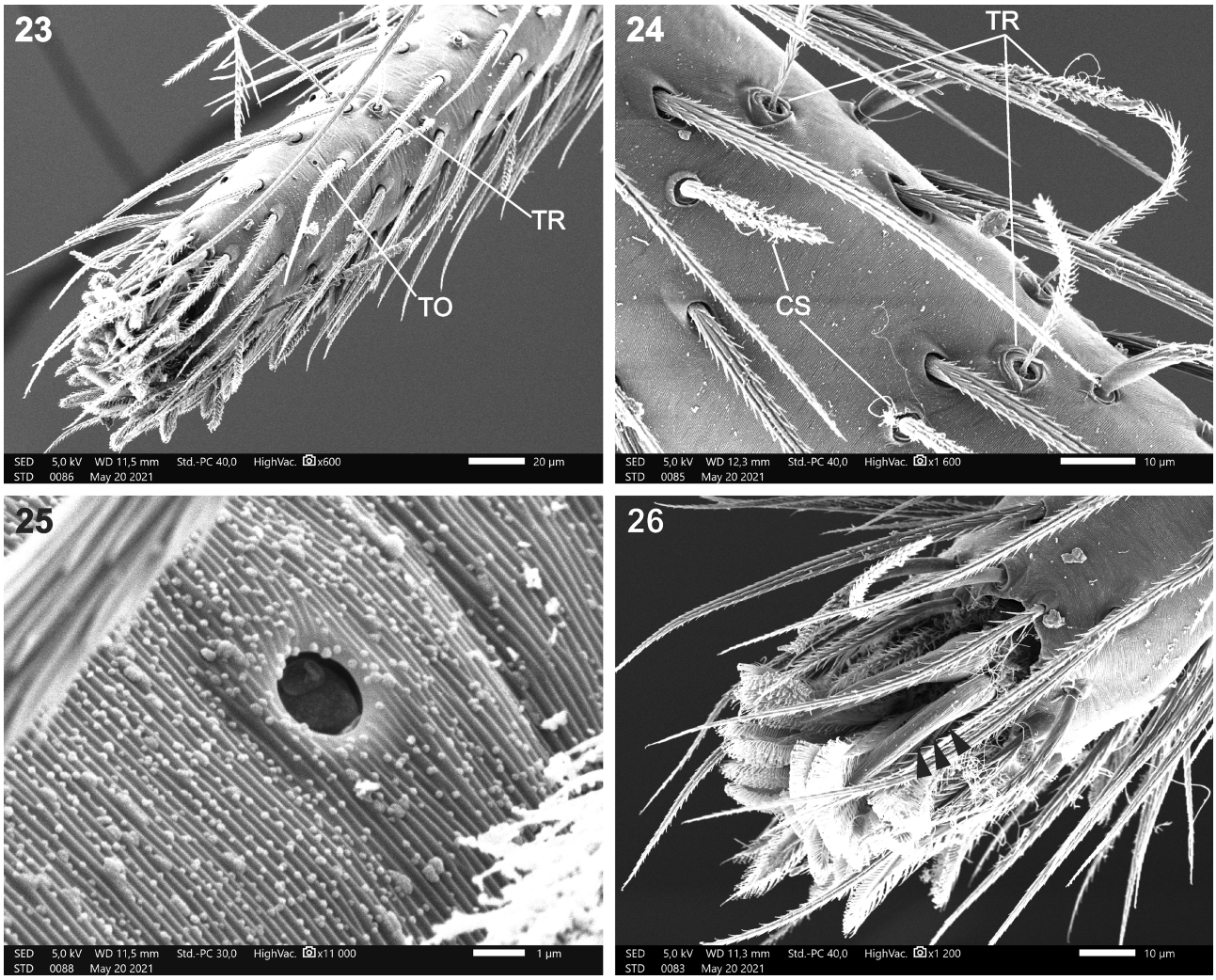
FIGURES 7–10. Dorsal habitus of *Afrodrassex* **gen. nov.** species: 7, 8. *A. balrog* **sp. nov.** female (7) and male (8); 9, 10. *A. catharinae* **sp. nov.** female (9) and male (10). Scale bars = 1.0 mm.

Description. Small pale spiders (Figs 1, 2, 7–10), females 2.23–3.20 mm and males 1.85–2.75 mm in length; carapace creamy-white to yellow; carapace oval, eye region narrow, broadest between coxae II and III, without fovea (Fig. 11); posterior margin straight or slightly concave; carapace gradually elevated from eye region, highest at 3/4 its length, with steep posterior slope; carapace smooth and matte, densely covered in feathery setae, with long straight setae in eye region (Figs 11–14). All eyes surrounded by black rings, pigment continuous between anterior eyes (Figs 7–10); AER procurved in anterior view, slightly recurved in dorsal view (Figs 12–14); clypeus height slightly larger than AME diameter; AME largest, separated by approximately 1/2 their diameter, separated



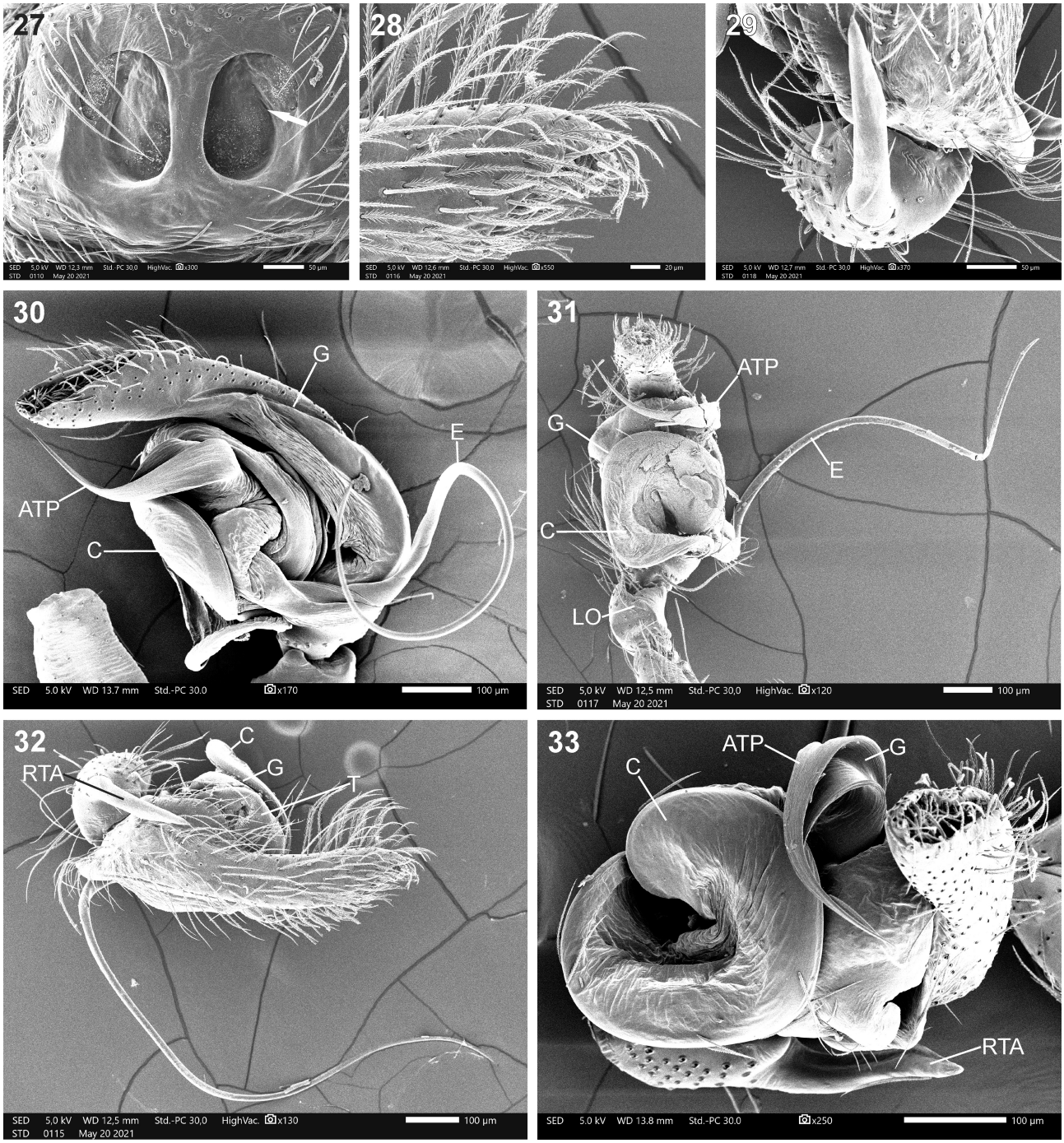
FIGURES 11–22. Scanning electron micrographs of *Afrodrassex balrog* **sp. nov.** female (11–13, 16–19) and male (14, 15, 20–22): 11. Carapace, dorsal view; 12. Eye region, anterior view; 13, 14. Same, dorsal view; 15. Dorsal abdominal setae; 16. Ventral (V) and lateral (L) abdominal setae; 17, 20. Anterior lateral spinnerets; 18, 21. Posterior median spinnerets; 19, 22. Posterior lateral spinnerets. Abbreviations: Ac—aciniform gland spigot(s); Cy—cylindrical gland spigot(s); MAmp—major ampullate gland spigot(s); mAmp—minor ampullate gland spigot(s); mPi—modified piriform gland spigot(s); n—nubbin; Pi—piriform gland spigot(s); Ta—tartipore.

from ALE by 1/8 ALE diameter; PER strongly procurved in dorsal view (Figs 13, 14); PME oval and flattened, PLE round, PME slightly larger than PLE; PME separated from each other and from PLE by distance between 1/2 to equal to their diameter; ALE and PLE almost touching (Figs 13, 14); MOQ narrower posteriorly than anteriorly, anterior width slightly larger than MOQ length. Cheliceral dentition: promargin with three teeth, usually middle tooth largest, distal tooth smallest, a tiny denticle; retromargin with two subequal teeth, larger than promarginal teeth; endites with slightly depressed lateral margins, distal margins rounded, with distinct serrula and maxillar



FIGURES 23–26. Scanning electron micrographs of *Afrodrassex balrog* **sp. nov.** male: 23. Tarsus III, dorsal view, indicating trichobothrium (TR) and tarsal organ (TO); 24. Tarsus I, indicating dorsal TR and chemosensory setae (CS); 25. Tarsus III, detail of tarsal organ; 26. Tarsus I, dorsal view, claws and claw tufts, arrowheads indicating teeth on tarsal claws.

hair tuft; labium trapezoid, rounded anteriorly, slightly longer than wide. Pleural bars weakly sclerotised, isolated; sternum oval, approximately 1¼ times longer than broad, broadest at coxa II, surface smooth, sparsely covered in straight setae; precoxal triangles present, intercoxal sclerites present between all coxal pairs. Abdomen oval, as broad as or slightly broader than carapace, dorsal scutum absent in both sexes (Figs 7–10); dorsum with single pair of sigilla, usually indistinct; dorsum and sides densely covered in feathery setae, with scattered fine plumose setae (Figs 15, 16), venter only with fine plumose setae (Fig. 16). Spinnerets (only observed in *A. balrog* **sp. nov.**; spinnerets of male partly retracted and obscured by silk threads): ALS of female with two major ampullate gland spigots anteriorly, two large piriform gland spigots mesally, two slender modified piriform gland spigots lateral to anterior piriform gland spigot, and two tartipores posteriorly (Fig. 17); PMS of female with two large minor ampullate gland spigots mesally, one small cylindrical gland spigot posteriorly, one tartipore, and five small aciniform gland spigots peripherally (Fig. 18); PLS of female (partly retracted) with only one small minor ampullate gland spigot anteriorly, one large cylindrical gland spigot mesally, and three aciniform gland spigots posteriorly (Fig. 19); ALS of male with only two large piriform gland spigots distinguishable (Fig. 20); PMS of male with only one posterior



FIGURES 27–33. Scanning electron micrographs of *Afrodrassex balrog* **sp. nov.** female (27) and male (28–33) genitalia: 27. Epigyne, ventral view, arrow indicating copulatory opening; 28. Distal end of cymbium, retrolateral view; 29. Enlargement of palpal tibia, retrolateral view; 30. Right palp, prolateral-ventral view; 31. Right palp, ventral view; 32. Left palp, retrolateral view; 33. Left palp, ventro-apical view. Abbreviations: ATP—anterior tegular process; C—conductor; E—embolus; G—groove in ATP/cymbium/conductor; LO—lyriform organ; P—plug; RTA—retrolateral tibial apophysis.

minor ampullate gland spigot and three peripheral aciniform gland spigots distinguishable (Fig. 21); PLS of male with single large anterior minor ampullate gland spigot and two aciniform gland spigots distinguishable (Fig. 22). Leg formula 4123 or 4213; legs densely covered in feathery setae, with scattered straight plumose setae between them, feathery setae sparse on tarsi; patellae with narrow indentation and small lyriform organ on retrolateral side, with single proximal and distal erect long seta dorsally on patellae III and IV that are usually missing, presumably easily damaged and lost during preservation; metatarsi with well-developed dorsal stopper distally; tarsi with sparse chemosensory setae, two pairs of dorsal trichobothria, oval tarsal organ and dense claw tufts (Figs 23–26); tarsal

claws with at least three small ventral teeth (Fig. 26). Female epigyne with shallow paired ovoid atria, separated by median septum (Figs 27, 34, 39), with atria frequently filled with secretory plugs; internally with extremely lengthened copulatory ducts, with spermathecae posteromedially positioned, with posteriorly-directed fertilization ducts. Male palpal femur and patella without apophyses, except *A. catharinae* **sp. nov.**, with a small ventral patellar denticle (Figs 41, 43); palpal patella with retrolateral lyriform organ (Fig. 31); palpal tibia with retrolateral apophysis singular, variable in shape (Figs 29, 38, 41, 43); cymbium narrower than tegulum, with dense setae distally on dorsal surface (Fig. 28); tegulum generally ovoid, with slender embolus originating proximally or prolaterally; embolus free of subtegulum, associated basally with large membranous conductor; embolus extending towards or around distal end of tegulum, closely associated with prolateral groove in cymbium (Fig. 30) and conductor (Fig. 31), and at its distal end with deep groove in apical tegular process (Figs 30–33, 36–38, 41–43); median apophysis absent.

***Afrodrassex balrog* sp. nov.**
Figures 1, 2, 7, 8, 11–38

Type material. Holotype ♀: **SOUTH AFRICA:** *Free State*: Bloemfontein, Langenhoven Park, 29°05.105'S, 26°09.563'E, 1420 m a.s.l., 9.III.2015, leg. C. Haddad (on walls of house at night) (NCA 2014/1936).

Paratypes: Same data as holotype but 26.I.2015, 1♂ (NCA 2014/1939); Same data as holotype but 18.X.2020, 3♀ (NCA 2020/703). **SOUTH AFRICA:** *Northern Cape*: Richtersveld National Park, Sendelingsdrift, 28°07.805'S, 16°53.503'E, 9.X.2015, leg. P.J. Goede (home on wood), 1♀ (NCA 2016/3487); Rooipoort Nature Reserve, 28°38.220'S, 24°16.800'E, 23.III.2013, leg. M. Stiller (canopy fogging, *Acacia tortilis*), 1♀ (NCA 2015/4269). *Limpopo*: Little Leigh, 22°56.518'S, 29°52.735'E, 21.III.2006, leg. F. Maanda (*Kirkia wilmsi*, above knee searching), 1♀ (NCA 2009/719).

Etymology. The species name is a noun in apposition of the fictional character referred to as the "Balrog", a demon from the Lord of the Rings trilogy by author J.R.R. Tolkien. In Peter Jackson's movies based on the books, the Balrog is depicted as wielding a long whip of fire, reminiscent of the very long embolus of this species.

Diagnosis. *Afrodrassex balrog* **sp. nov.** females can be distinguished from *A. catharinae* **sp. nov.** by the small copulatory openings and transversely oval spermathecae (Figs 27, 34, 35) compared to the large copulatory openings and globular spermathecae in *A. catharinae* **sp. nov.** (Figs 39, 40), and males by the single elongate spike-like retrolateral tibial apophysis in retrolateral view (Figs 29, 38) compared to the small sharp tooth-like apophysis of *A. catharinae* **sp. nov.** (Figs 41, 43).

Description. Female (holotype, NCA 2014/1936). Colouration (Fig. 7): carapace and chelicerae creamy-yellow; endites and labium cream, labium slightly darker; sternum cream, margins brown; femora cream, remaining segments creamy-yellow. Abdomen cream dorsally and ventrally, with grey mottling on dorsum posteriorly above spinnerets.

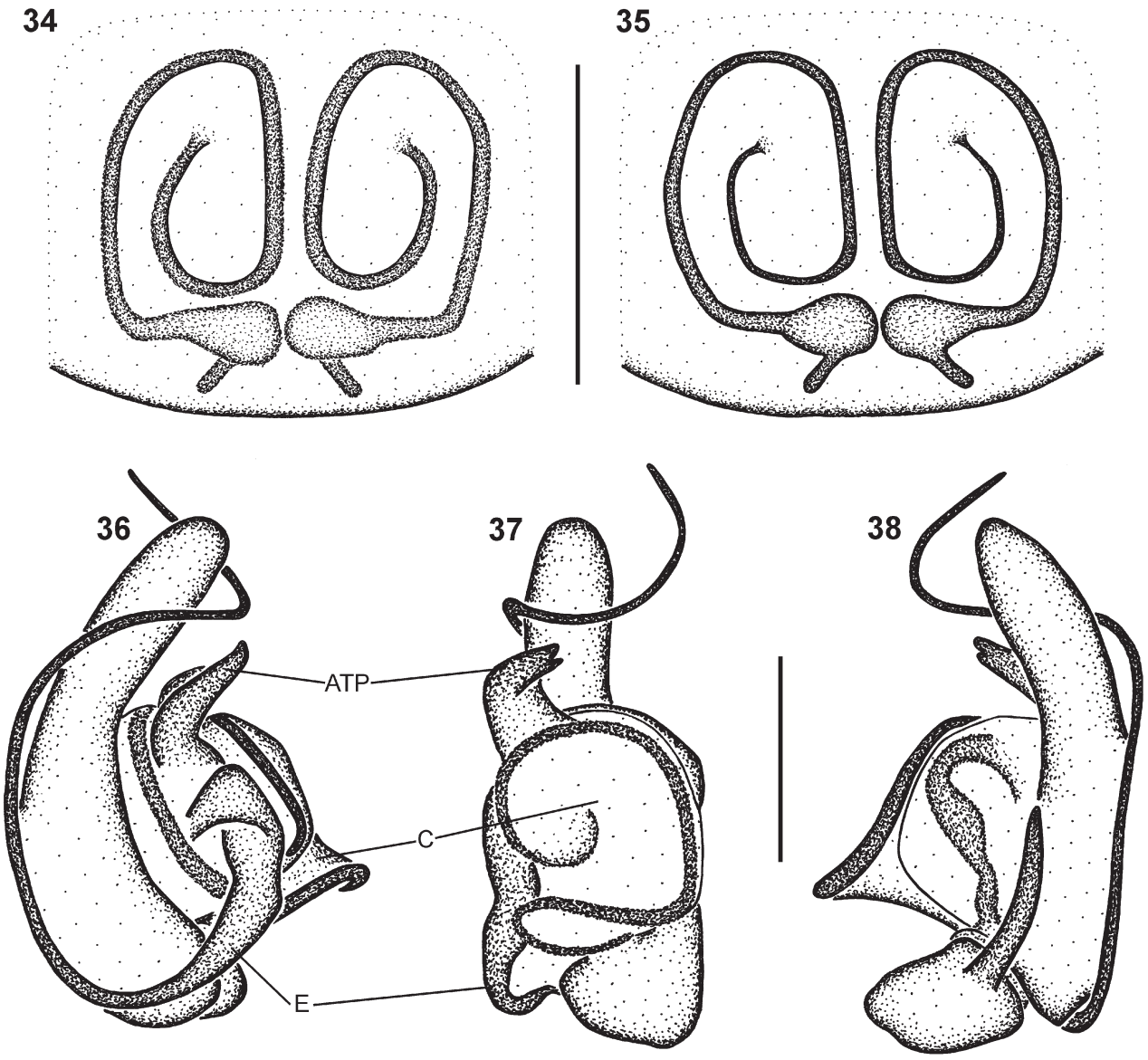
Measurements: CL 1.11, CW 0.90, AL 1.49, AW 1.16, TL 2.73. Eye diameters and interdistances: AME 0.11, ALE 0.08 PME 0.08, PLE 0.07, AME–AME 0.04, AME–ALE 0.01, PME–PME 0.08, PME–PLE 0.04, ALE–PLE 0.01. Leg measurements: I 0.71, 0.35, 0.56, 0.51, 0.38 = 2.51; II 0.76, 0.38, 0.44, 0.52, 0.24 = 2.34; III 0.62, 0.33, 0.44, 0.41, 0.24 = 2.04; IV 1.02, 0.41, 0.73, 0.87, 0.30 = 3.33.

Leg spination: femora: I do 2, II do 1, III do 1 rl 1, IV do 2 rl 1; patellae: spineless; tibiae: I plv 2 rlv 2, II plv 1 rlv 2, III pl 2 rl 1 plv 1, IV pl 2 rl 2 plv 1 vt 2; metatarsi: I plv 1 rlv 1, II plv 1-2 rlv 1, III pl 3 rl 1 plv 1 rlv 1 vt 3, IV pl 3 rl 2 plv 1 vt 3; palp: femur do 1, patella spineless, tibia pl 2 plv 1, tarsus pl 2 rl 1 plv 2 rlv 1.

Epigyne with large figure-6-shaped ridges, coursing around periphery of epigynal plate, with tiny copulatory openings originating centrally at start of ridges (Figs 27, 34); copulatory ducts narrow, following path of external ridges, on lateral sides continuing posteriorly, looping mesally before entering transverse oval spermathecae on their lateral margins; fertilization ducts on posterior margin of spermathecae, directed posterolaterally (Fig. 35).

Male (paratype, NCA 2014/1939). Colouration (Fig. 8): similar to female, but grey mottling dorsally on abdominal posterior extending to middle.

Measurements: CL 0.97, CW 0.81, AL 0.95, AW 0.63, TL 1.85. Eye diameters and interdistances: AME 0.10, ALE 0.07, PME 0.08, PLE 0.06, AME–AME 0.06, AME–ALE 0.01, PME–PME 0.07, PME–PLE 0.05, ALE–PLE 0.01. Leg measurements: I 0.76, 0.33, 0.62, 0.52, 0.38 = 2.61; II 0.78, 0.35, 0.65, 0.60, 0.40 = 2.78; III 0.67, 0.32, 0.43, 0.51, 0.27 = 2.20; IV 0.98, 0.38, 0.71, 0.86, 0.30 = 3.23.



FIGURES 34–38. *Afrodrassex balrog* **sp. nov.**, female epigyne in ventral (34) and dorsal (35) views, and male palp in prolateral (36), ventral (37) and retrolateral (38) views. Abbreviations: ATP—anterior tegular process; C—conductor; E—embolus. Scale bars: 0.25 mm.

Leg spination: femora: I do 1, II do 1, III do 1, IV do 2 rl 1; patellae spineless; tibiae: I rlv 1, II spineless, III pl 1 rl 1 plv 1, IV pl 1 rl 2 plv 1 vt 2; metatarsi: I plv 1 rlv 1, II plv 1 rlv 1, III pl 2 rl 2 plv 1 rlv 1 vt 3, IV pl 3 rl 2 plv 1 vt 3; palp: spineless.

Palp: tibia broader than long, partly obscured by tegulum and membranous conductor, with elongate, slightly curved spike-like retrolateral apophysis (Figs 29, 38); tegulum largely obscured by massive bean-shaped membranous conductor; embolus long and very slender, originating prolaterally, looping proximally, then dorsally and distally above cymbium, with tip looping around ventral aspect of cymbium (Figs 30–33, 36–38); apical tegular process large, bending towards retrolateral side of palp, with split tip and deep groove along distal margin (Fig. 33); median apophysis absent.

Additional material examined. SOUTH AFRICA: *Free State*: Bloemfontein, Langenhoven Park, 29°05.105'S, 26°09.563'E, 1420 m a.s.l., 3.X.2020, leg. C. Haddad (on ceiling at night), 1♂ (S.E.M. preparations); Same locality, 29°05.384'S, 26°09.392'E, 23.VII.2020, leg. R. Booysen (in garden on plants at night), 1 imm. 1 subadult ♂ 1♀ (S.E.M. preparations). **ANGOLA:** *Malanje*: Malange [09°32'S, 16°20'E], 11.IX.1949, leg. B. Malkin, 1 imm. 1♀ (CAS, CASENT 9058549).

Variation. Total length: females 2.23–3.10 (average 2.71, n = 6); males: only the single paratype described.

Habitat and biology. All seven examined females (including the S.E.M. specimen, epigyne cleared) had plugged epigynes (Fig. 27). This species has been recorded from three biomes (desert, grassland and savanna), although the majority of the specimens were collected inside houses and gardens in central South Africa, where they were active at night.

Distribution. Widely distributed in South Africa, but only known from four localities (Fig. 44). The precise locality of the specimen from Angola is unclear, as coordinates are missing from the specimen label. According to the global gazetteer, there are three towns in Angola called Malange: one in the Kwanza Sul Region (09°57'S, 14°55'E), one in the Lunda Norte Region (08°05'S, 19°00'E), and one in the Malanje Region (09°32'S, 16°20'E). Considering the similarity in the town name and that of the latter region, we have plotted the latter co-ordinates on the distribution map (Fig. 44).

Afrodrassex catharinae **sp. nov.**

Figures 9, 10, 39–43

Type material. Holotype ♀: **SOUTH AFRICA:** *KwaZulu-Natal*: Ndumo Game Reserve, Crocodile farm, 26°54.426'S, 32°19.185'E, 12.I.2007, leg. C. Haddad (under rocks) (NCA 2007/3068).

Paratypes: **SOUTH AFRICA:** *KwaZulu-Natal*: Ndumo Game Reserve, Nyamiti Pan, 26°53.409'S, 32°17.576'E, 35 m a.s.l., 3.XII.2019, leg. C. Haddad & V. Swart (canopy fogging, *Pappea capensis*), 2♂ 1♀ (NCA 2020/270).

Etymology. The species is named for Catharine Hanekom, Regional Ecologist of Ezemvelo KZN Wildlife for the Maputaland Region, in recognition of more than twenty years of logistical support to the senior author during arachnid surveys in northern KwaZulu-Natal Province.

Diagnosis. This species is most similar to *A. balrog* **sp. nov.**, but females can be distinguished by their large copulatory openings and globular spermathecae (Figs 39, 40), which are small and transversely oval, respectively, in *A. balrog* **sp. nov.** (Figs 34, 35). Males of *A. catharinae* **sp. nov.** have a small sharp tooth-like retrolateral tibial apophysis in lateral view (Figs 41, 43), compared to an elongate spike-like retrolateral tibial apophysis in *A. balrog* **sp. nov.** (Figs 29, 38).

Description. Female (holotype, NCA 2007/3068). Colouration (Fig. 9): carapace and chelicerae yellow; labium and endites creamy-yellow; sternum cream, margins yellow-brown at coxae; femora creamy-yellow, remaining segments yellow; abdomen cream dorsally and ventrally.

Measurements: CL 1.16, CW 0.98, AL 1.73, AW 1.17, TL 3.20. Eye diameters and interdistances: AME 0.11, ALE 0.08, PME 0.09, PLE 0.08, AME–AME 0.05, AME–ALE 0.01, PME–PME 0.08, PME–PLE 0.04, ALE–PLE 0.01. Leg measurements: I 0.78, 0.38, 0.59, 0.56, 0.41 = 2.72; II 0.87, 0.40, 0.65, 0.64, 0.44 = 3.00; III 0.72, 0.37, 0.49, 0.59, 0.30 = 2.47; IV 1.11, 0.44, 0.81, 0.95, 0.33 = 3.64.

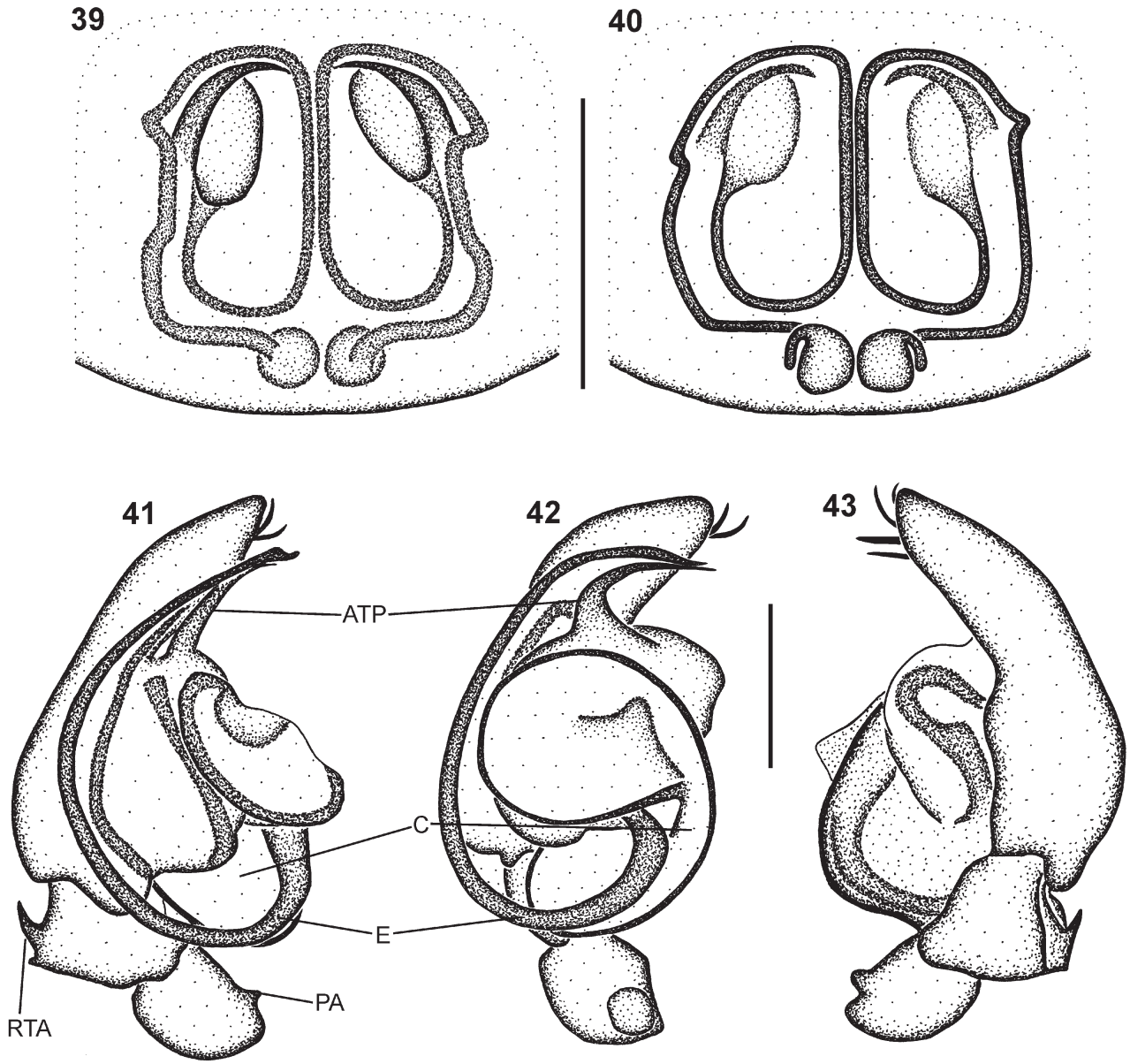
Leg spination: femora: I do 2, II do 2, III do 2 rl 1, IV do 3 rl 1; patellae: spineless; tibiae: I plv 2 rlv 2, II plv 2 rlv 2, III pl 2 rl 1 plv 2, IV pl 2 rl 2 plv 1 vt 2; metatarsi: I plv 1 rlv 1, II plv 1 rlv 1, III pl 2 rl 1 plv 1 vt 3, IV pl 3 rl 2 plv 1 vt 3; palp: femur do 1, patella spineless, tibia pl 2 plv 1, tarsus pl 1 rl 1 plv 4 rlv 2.

Epigyne with elongate curved 6-shaped copulatory openings at anterior of epigynal plate (Fig. 39); copulatory ducts narrow, initially directed posteriorly, looping mesally and anteriorly before following path of faint external ridges around periphery of epigyne, laterally with distinct kink before continuing posteriorly, bending mesally before entering small globular spermathecae on their ventral surface; fertilization ducts on anterolateral margin of spermathecae, directed posteriorly (Figs 39, 40).

Male (paratype, NCA 2020/270). Colouration (Fig. 10): as for female.

Measurements: CL 1.16, CW 0.94, AL 1.19, AW 0.84, TL 2.35. Eye diameters and interdistances: AME 0.11, ALE 0.08, PME 0.09, PLE 0.09, AME–AME 0.06, AME–ALE 0.01, PME–PME 0.07, PME–PLE 0.05, ALE–PLE 0.01. Leg measurements: I missing; II 0.90, 0.41, 0.76, 0.67, 0.44 = 3.18; III 0.79, 0.37, 0.55, 0.62, 0.33 = 2.66; IV 1.24, 0.44, 0.88, 1.02, 0.37 = 3.95.

Leg spination (leg I derived from second male paratype in NCA 2020/270): femora: I do 2, II do 2, III do 3 rl 1, IV pl 1 do 3 rl 1; patellae spineless; tibiae: I plv 2 rlv 2, II plv 2 rlv 2, III pl 2 rl 1 plv 2 rlv 1, IV pl 2 rl 2 plv 1 vt 2; metatarsi: I plv 1 rlv 1, II plv 1 rlv 1, III pl 3 rl 1 plv 1 vt 3; IV pl 3 rl 2 plv 1 vt 3; palp: femur do 1, other segments spineless.



FIGURES 39–43. *Afrodrassex catharinae* **sp. nov.**, female epigyne in ventral (39) and dorsal (40) views, and male palp in prolateral (41), ventral (42) and retrolateral (43) views. Abbreviations: ATP—anterior tegular process; C—conductor; E—embolus; PA—patellar apophysis; RTA—retrolateral tibial apophysis. Scale bars: 0.25 mm.

Palp: patella with small proximal ventral bump-like apophysis; tibia slightly longer than broad, with small sharp tooth-like apophysis, with additional tiny basal tooth (Figs 41, 43); tegulum ovoid, with large curved apical tegular process distally; median apophysis absent; conductor massive, translucent and comma-shaped, covering most of ventral aspect of tegulum; embolus originating proximally on tegulum, curling proximally and prolaterally, curving gradually along prolateral margin of tegulum, bending sharply near distal end of cymbium (Figs 41–43).

Additional material examined. None.

Variation. Total length: females 3.03–3.20 (average 3.12, n = 2); males 2.35–2.75 (average 2.55, n = 2).

Habitat and biology. Both of the known females had plugged epigynes. This species was sampled from the ground and canopies of a short tree (*Pappea capensis*) in savanna habitats.

Distribution. Only known from the type locality in northern KwaZulu-Natal, South Africa (Fig. 44).

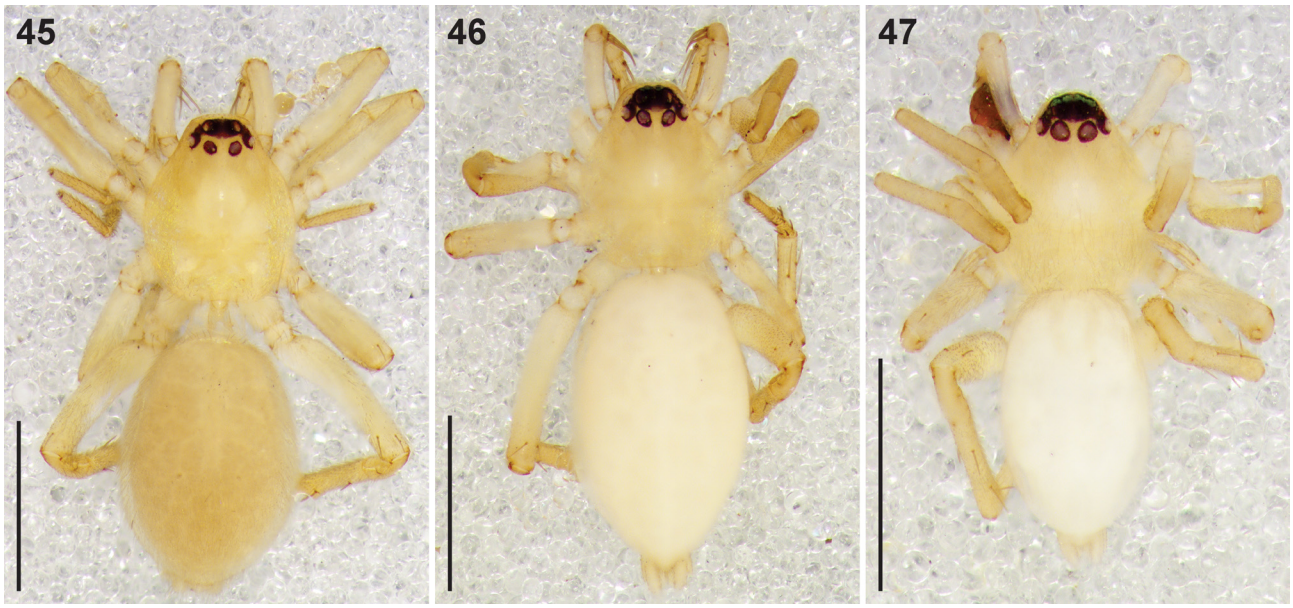
FIGURE 44. Distribution of *Afrodrassex balrog* **sp. nov.** (black stars), *A. catharinae* **sp. nov.** (inverted triangle), *Leptodrassex capensis* **sp. nov.** (black triangles) and *L. murphyi* **sp. nov.** (open circles) in southern and central Africa.

Genus *Leptodrassex* Murphy, 2007

Type species. *Leptodrassus simoni* Dalmas, 1919, by original designation.

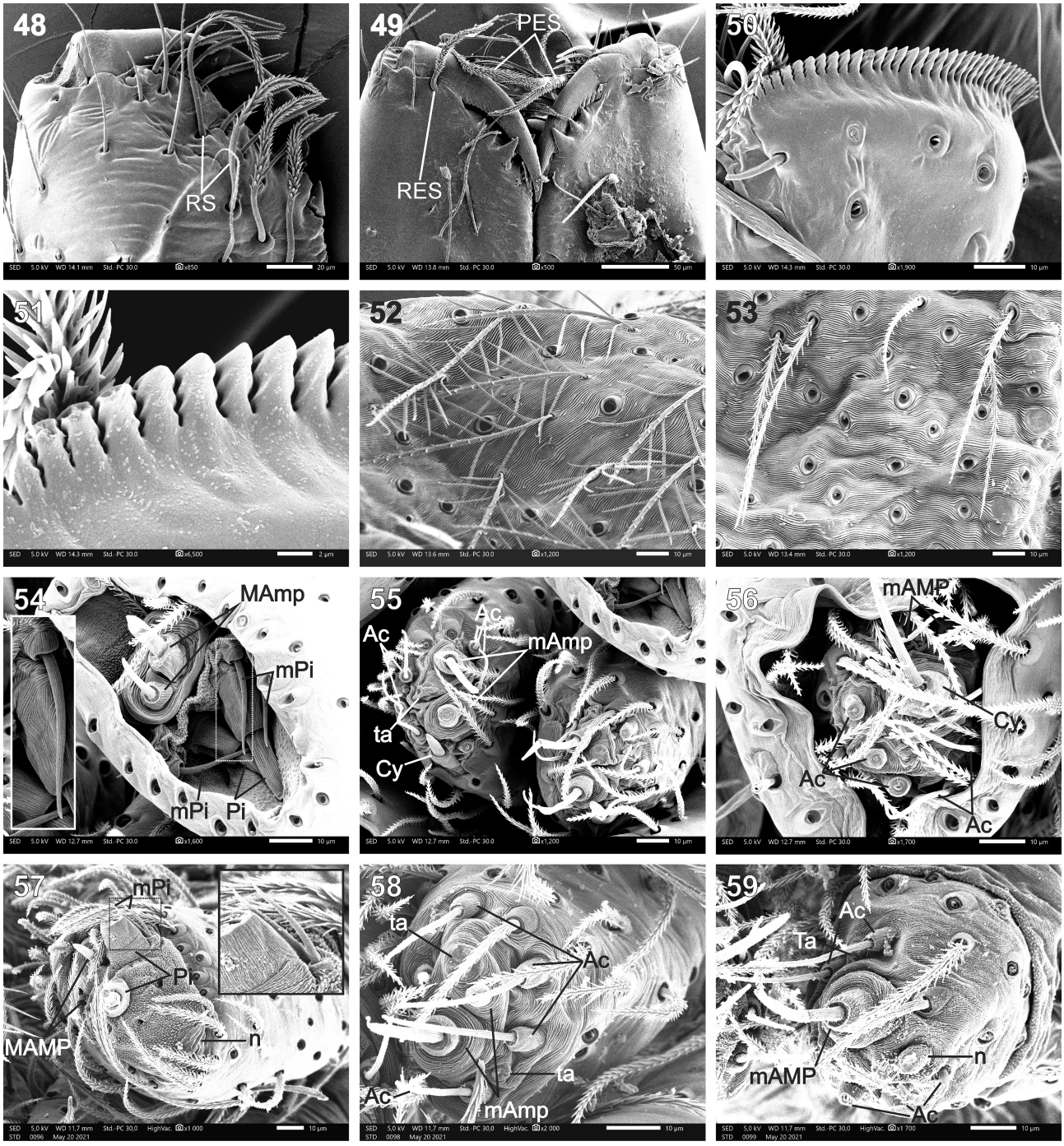
Diagnosis. *Leptodrassex* was defined by Murphy (2007) as a group of small, pale spiders usually 2–4 mm in length, with small teeth on the chelicerae (2–4 promarginal and 2 or 3 retromarginal teeth), with males lacking a dorsal scutum and the AME larger than the other eyes. The two new species described in this paper are very consistent in the presence of all of these characters, but the genitalic morphology differs slightly from the three currently known species from the Mediterranean, being more similar to the undescribed species from Kenya that Murphy (2007) included in his book. *Leptodrassex* can be separated from *Leptodrassus* by the cheliceral dentition, with the latter having two large angular translucent teeth on the promargin and four or five small conical teeth on the retromargin (Murphy 2007). It can be distinguished from *Leptopilos* by the genitalic structure, with females of the latter having an epigyne with an anterior hood and males having a palp with several laminae (Levy 2009). It can be separated from

Neodrassex by the female genitalic structure, with the latter possessing a large, divided atrium and paired posterior epigynal processes (Ott 2012, 2013), which are lacking in *Leptodrassex*. Lastly, it differs from *Afrodrassex* **gen. nov.** by the shorter embolus and presence of a median apophysis, and the short copulatory ducts of females.

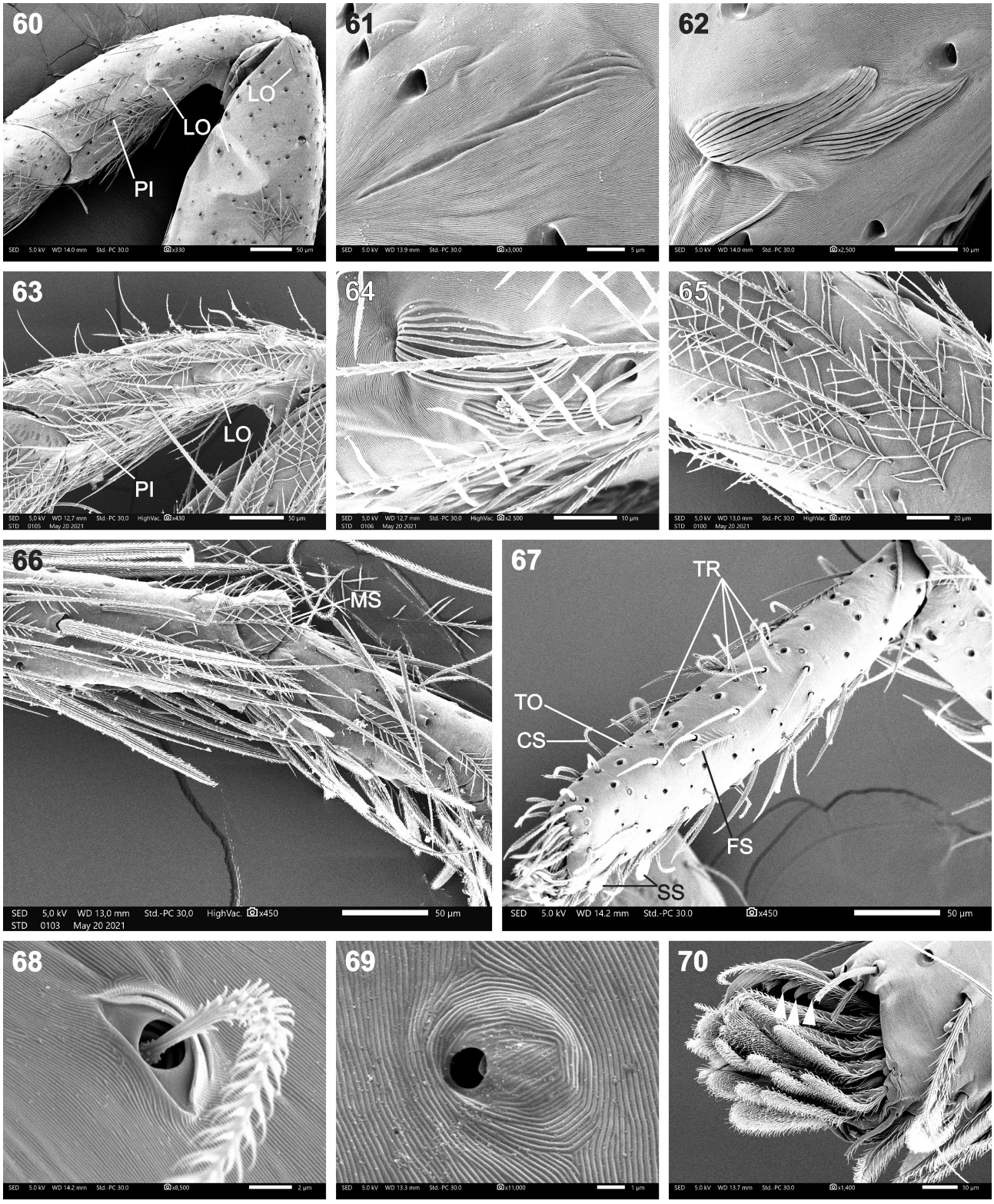


FIGURES 45–47. Dorsal habitus of *Leptodrassex* species: 45. *L. capensis* **sp. nov.** female; 46, 47. *L. murphyi* **sp. nov.** female (46) and male (47). Scale bars = 1.0 mm.

Description. Small pale spiders (Figs 3, 4, 45–47), females 1.80–3.60 mm and males 1.65–2.80 mm in length; carapace creamy-white to yellow; carapace oval, eye region narrow, broadest between coxae II and III, without fovea; posterior margin straight or slightly concave; carapace gradually elevated from eye region, highest at 3/4 its length, with steep posterior slope; carapace smooth and matte, densely covered in feathery setae, with long straight setae in eye region. All eyes surrounded by black rings, pigment continuous between anterior eyes (Figs 45–47); AER procurved in anterior view, slightly recurved in dorsal view; clypeus height slightly larger than AME diameter; AME largest, separated by approximately 1/2 to 3/4 their diameter, separated from ALE by 1/8 ALE diameter; PER strongly procurved in dorsal view; PME oval and flattened, PLE round, PME approximately 3/4 times PLE diameter; PME separated from each other and from PLE by distance between 1/2 to equal to their diameter; ALE and PLE almost touching; MOQ narrower anteriorly than posteriorly, anterior width slightly larger than MOQ length. Cheliceral dentition (southern African species): promargin with three teeth, usually middle tooth largest, distal tooth smallest, a tiny denticle; promargin with escort seta and rake setae (Fig. 48); retromargin with two or three subequal teeth and retromarginal escort seta (Fig. 49); endites with slightly depressed lateral margins, distal margins rounded, with distinct serrula and maxillar hair tuft (Fig. 50); serrula teeth with undulating sides (Fig. 51); labium trapezoid, slightly longer than wide, with rounded anterior margin. Pleural bars weakly sclerotised, isolated; sternum oval, approximately 1¼ times longer than broad, broadest at coxa II, surface smooth, sparsely covered in straight setae; precoxal triangles present, intercoxal sclerites present between all coxal pairs. Abdomen oval, as broad as or slightly broader than carapace, dorsal scutum absent in both sexes (Figs 45–47); dorsum with single pair of sigilla, usually indistinct; dorsum and sides densely covered in feathery setae (Fig. 52), with scattered fine plumose setae, venter only with fine plumose setae (Fig. 53). Spinnerets (only observed in *L. murphyi* **sp. nov.**): ALS of female with two major ampullate gland spigots anteromesally, two large piriform gland spigots mesally, and three adjacent slender modified piriform gland spigots (Fig. 54); PMS of female with two large minor ampullate gland spigots mesally, one small cylindrical gland spigot posteriorly, one tartipore, and several small aciniform gland spigots peripherally (Fig. 55); PLS of female with only one large cylindrical gland spigot medially, two small minor ampullate gland spigots anteriorly, and six aciniform gland spigots peripherally (Fig. 56); ALS of male with two small major ampullate gland spigots anteromesally, two large piriform gland spigots medially, two slender modified piriform gland spigots adjacent to the anterior piriform gland spigot, and posterior nubbin (Fig. 57); PMS of male with two medial minor ampullate gland spigots, two tartipores, and several peripheral aciniform gland spigots (Fig. 58); PLS of male with

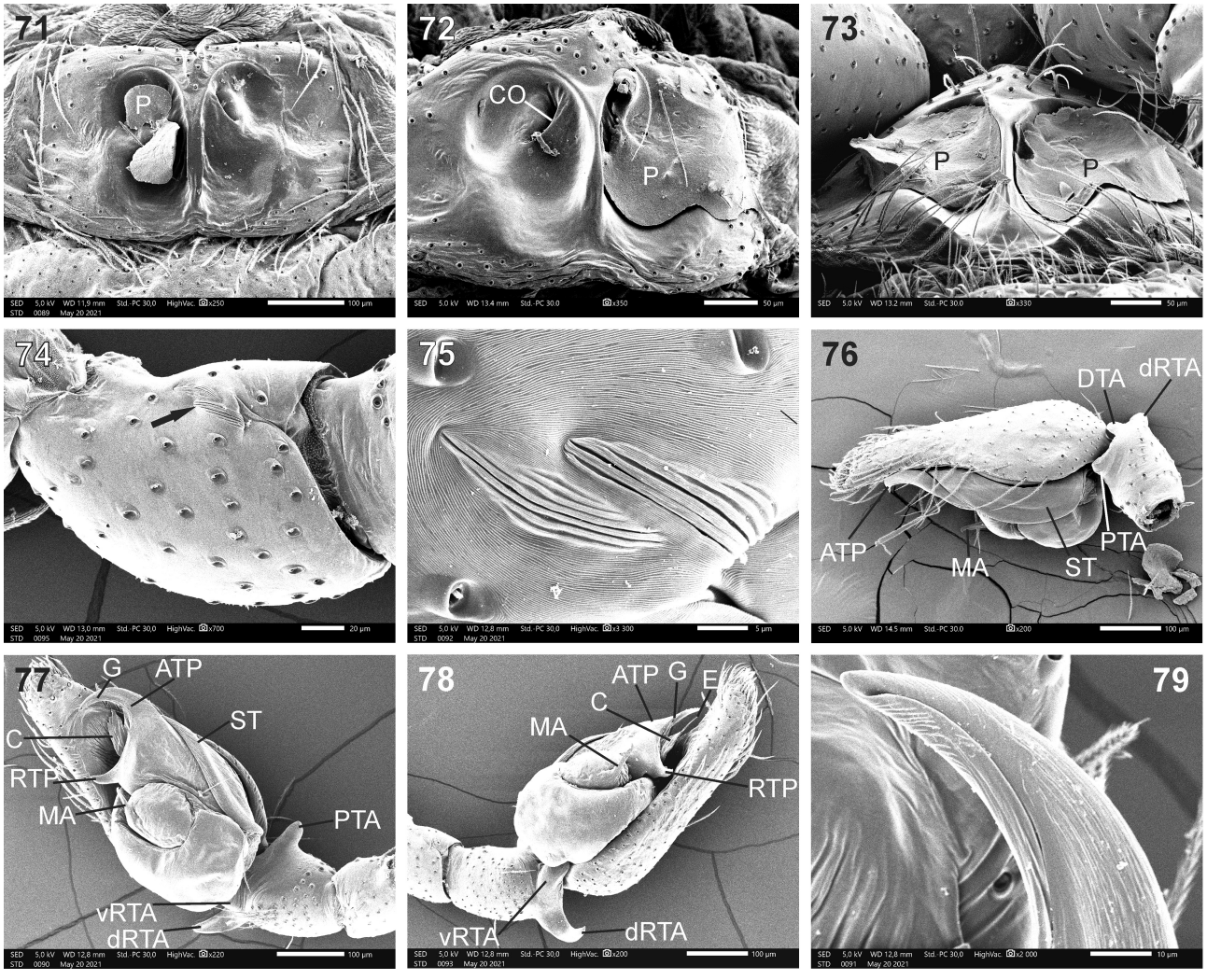


FIGURES 48–59. Scanning electron micrographs of *Leptodrassex murphyi* **sp. nov.** female (54–56) and male (57–59): 48. Cheliceral paturon, anterodistal view; 49. Chelicerae, posterior view; 50. Endite and serrula, ventral view; 51. Same, detail of serrula teeth; 52. Dorsal abdominal setae; 53. Ventral abdominal setae; 54, 57. Anterior lateral spinnerets, insets showing enlargement of modified piriform gland spigot(s) in the stippled frame; 55, 58. Posterior median spinnerets; 56, 59. Posterior lateral spinnerets. Abbreviations: Ac—aciniform gland spigot(s); Cy—cylindrical gland spigot(s); MAmp—major ampullate gland spigot(s); mAmp—minor ampullate gland spigot(s); mPi—modified piriform gland spigot(s); n—nubbin; PES—promarginal escort setae; RES—retromarginal escort setae; RS—rake setae; Pi—piriform gland spigot(s); Ta—tartipore.



FIGURES 60–70. Scanning electron micrographs of *Leptodrassex murphyi* **sp. nov.** female (60–62, 70) and male (63–69): 60. Distal femur and patella IV, most setae removed, retrolateral view, indicating patellar indentation (PI) and lyriform organs (LO); 61. Detail of LO on femur; 62, 64. Detail of LO on patella; 63. Patella IV, setae intact, retrolateral view, indicating PI and LO; 65. Patella I, ventral view, detail of feathery setae; 66. Metatarsus and tarsus IV, indicting metatarsal stopper (MS); 67. Tarsus III, dorsal view, indicating chemosensory setae (CS), feathery setae (FS), scopulate setae (SS), tarsal organ (TO) and trichobothria (TR); 68. Tarsus III, detail of trichobothrium base; 69. Tarsus II, tarsal organ; 70. Tarsus IV, tarsal claws and claw tufts, arrowheads indicating claw teeth.

single large minor ampullate gland spigot, one anterior tartipore, one posterior nubbin, and five peripheral aciniform gland spigots (Fig. 59). Leg formula 4213; legs densely covered in feathery setae, with scattered straight plumose setae between them, feathery setae sparse on tarsi (Figs 63–67); femora with distal retrolateral lyriform organ (Figs 60, 61); patellae with narrow indentation and lyriform organ on retrolateral side (Figs 62–64), with single proximal and distal erect long seta dorsally on patellae III and IV, sometimes lost during preservation; metatarsi with well-developed dorsal stopper distally (Fig. 66); tarsi with sparse chemosensory setae, two pairs of dorsal trichobothria, followed by single median trichobothrium, oval tarsal organ, and dense claw tufts (Figs 67–70); tarsal claws with three small ventral teeth (Fig. 70). Female epigyne with shallow paired ovoid atria, separated by narrow median septum, with atria frequently filled with secretory plugs (Figs 71–73); internal structure with short copulatory ducts, with spermathecae laterally positioned, with mesally-directed fertilization ducts. Male palpal femur and patella without apophyses, palpal patella with retrolateral lyriform organ (Figs 74, 75); palpal tibia with small prolateral and dorsal apophyses (Fig. 76) and dorsal and ventral retrolateral apophyses (Figs 76–78); cymbium pear-shaped, with dense setae distally on dorsal surface; tegulum generally ovoid, with very slender embolus originating proximally, entering groove in large membranous prolateral subtegulum, leading embolus to large prolateral distal apical tegular process with fine groove (Figs 76–79); retrolateral tegular process shorter, slightly curved (Fig. 77); median apophysis present in Palaearctic species and *L. murphyi* **sp. nov.**, hook- (e.g. Murphy 2007: fig. 513) or spike-like (Figs 76–78).



FIGURES 71–79. Scanning electron micrographs of *Leptodrassex murphyi* **sp. nov.** females (71–73) and male (74–79): 71–73. Epigynes, ventral view, showing contrasting extent of plugs (P) and copulatory opening (CO); 74. Palpal patella, arrow indicating retrolateral lyriform organ; 75. Same, detail of lyriform organ; 76. Palp, prolateral view; 77. Palp, ventral view; 78. Palp, retrolateral view; 79. Detail of groove at distal end of anterior tegular process. Abbreviations: ATP—anterior tegular process; C—conductor; dRTA—dorsal retrolateral tibial apophysis; DTA—dorsal tibial apophysis; E—embolus; G—groove in ATP; LO—lyriform organ; MA—median apophysis; PTA—prolateral tibial apophysis; RTP—retrolateral tegular process; vRTA—ventral retrolateral tibial apophysis.

***Leptodrassex capensis* sp. nov.**
Figures 45, 80, 81

Type material. Holotype ♀: **SOUTH AFRICA:** *Western Cape*: Fisherhaven, near Hermanus, 34°21.430'S, 19°07.557'E, 30.IX.2007, leg. C. Haddad & R. Lyle (sifting leaf litter) (NCA 2008/360).

Paratype: **SOUTH AFRICA:** *Western Cape*: Outeniquastrand, near George, 34°02.754'S, 22°17.037'E, 7.I.2015, leg. C. Haddad (base of grass tussocks), 1♀ (NCA 2015/1755).

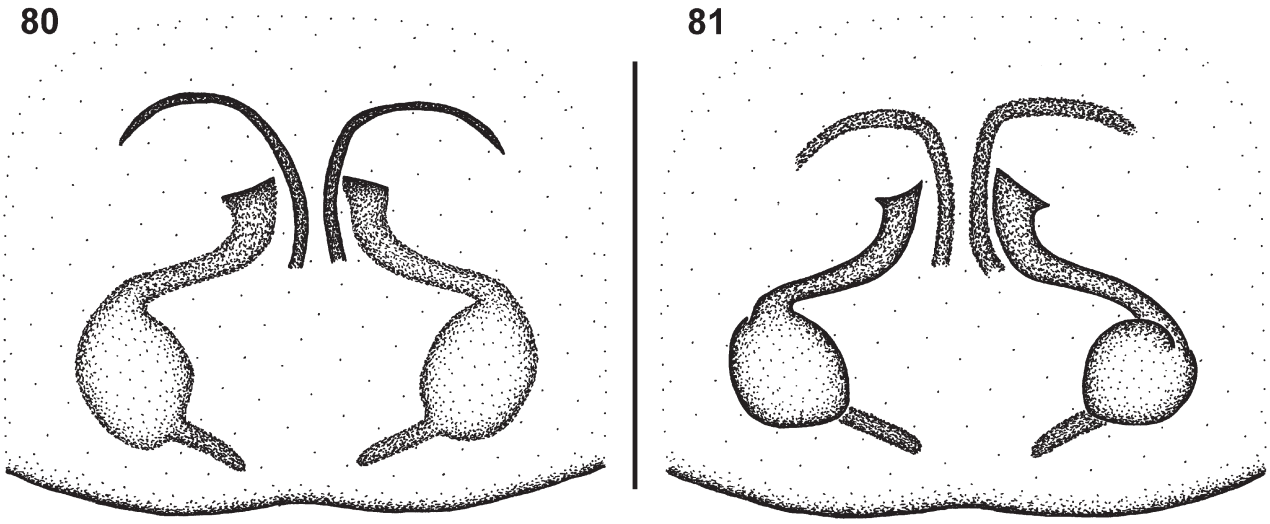
Etymology. This species is named for *terra typica*, the Western Cape Province of South Africa, from which it is known.

Diagnosis. Females of *L. capensis* **sp. nov.** are most similar to those of *L. murphyi* **sp. nov.**, but differ by the smaller copulatory openings and the slight curvature of the copulatory ducts (Fig. 80), which are respectively larger and strongly curved in the latter species (Fig. 82). Male unknown.

Description. Female (holotype, NCA 2008/360). Colouration (Fig. 45): carapace and chelicerae creamy-yellow; endites and labium cream; sternum cream, margins yellow-brown at coxae; femora cream, remaining segments creamy-yellow. Abdomen cream dorsally and ventrally.

Measurements: CL 1.04, CW 0.85, AL 1.52, AW 1.02, TL 2.85. Eye diameters and interdistances: AME 0.09, ALE 0.08, PME 0.09, PLE 0.08, AME–AME 0.07, AME–ALE 0.02, PME–PME 0.06, PME–PLE 0.05, ALE–PLE 0.01. Leg measurements: I 0.76, 0.34, 0.57, 0.48, 0.35 = 2.50; II 0.79, 0.37, 0.61, 0.54, 0.39 = 2.70; III 0.63, 0.33, 0.44, 0.40, 0.25 = 2.05; IV 1.00, 0.57, 0.76, 0.82, 0.22 = 3.37.

Leg spination: femora: I and II spineless, III do 1, IV do 1 rl 1; patellae spineless; tibiae: I plv 2 rlv 2, II rlv 2, III pl 2 plv 1, IV pl 2 rl 2 plv 1 vt 2; metatarsi: I plv 1-4 rlv 1-3, II plv 0-1 rlv 1-2, III pl 2 rl 1 plv 1 vt 3, IV pl 3 rl 2 plv 1 vt 3; palp: femur and patella spineless, tibia pl 2 plv 1 rlv 1, tarsus pl 2 plv 2 rlv 1.



FIGURES 80–81. *Leptodrassex capensis* **sp. nov.**, female epigyne in ventral (80) and dorsal (81) views. Scale bar: 0.25 mm.

Epigyne with weakly sclerotized recurved hemispherical ridges anteriorly, continuing along midline into posterior half, forming oval atria; copulatory openings transverse, situated in anteromesal part of atria; copulatory ducts narrow and initially directed posteriorly, bending laterally and diverging, with slight lateral bend before entering ovoid lateral spermathecae along their anterior margin; fertilization ducts on posteromesal margin of spermathecae, directed mesally (Figs 80, 81).

Additional material examined. None.

Variation. The single female paratype is 2.57 mm in total length.

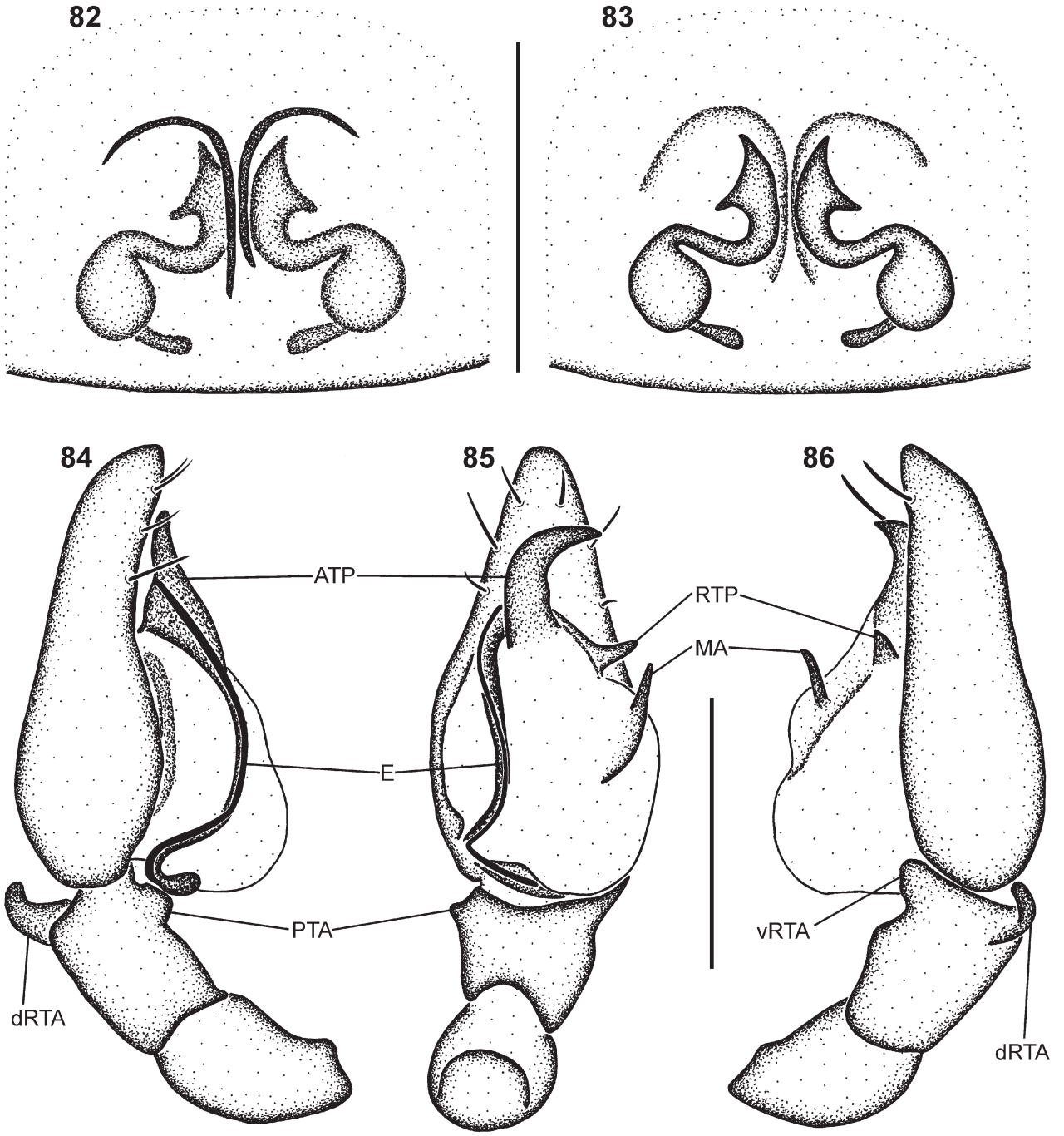
Habitat and biology. Both of the known females had plugged epigynes. This species was sampled from the ground (leaf litter and grass tussocks) in the Fynbos and Thicket biomes of South Africa.

Distribution. Only known from two localities in the coastal parts of south-western South Africa (Fig. 44).

***Leptodrassex murphyi* sp. nov.**
Figures 46–79, 82–86

Leptodrassex sp. Rodrigues & Rheims, 2020: figs 8H, 19A, 22C, 24B, 28B, 29B.

Type material. Holotype ♀: **SOUTH AFRICA:** *KwaZulu-Natal*: Ndumo Game Reserve, Main Camp, 26°54.516'S, 32°18.861'E, 13.VI.2005, leg. C. Haddad (grass litter) (NCA 2005/969).



FIGURES 82–86. *Leptodrassex murphyi* **sp. nov.**, female epigyne in ventral (82) and dorsal (83) views, and male palp in prolateral (84), ventral (85) and retrolateral (86) views. Abbreviations: ATP—anterior tegular process; dRTA—dorsal retrolateral tibial apophysis; E—embolus; MA—median apophysis; PTA—prolateral tibial apophysis; RTP—retrolateral tegular process; vRTA—ventral retrolateral tibial apophysis. Scale bars: 0.25 mm.

Paratypes: Together with holotype, 1♂ (NCA 2005/969); **MOZAMBIQUE:** *Gaza*: Bilene, Praia do Bilene, 25°16'S, 33°18'E, 27 m a.s.l., 20.XII.2007, leg. C. Haddad, R. Lyle & R. Fourie (leaf litter, coastal forest), 1♀ (NMBA 11318). *Inhambane*: Bartholomew Dias Point, 21°16'S, 35°07'E, 5 m a.s.l., 10.XII.2007, leg. C. Haddad, R. Lyle & R. Fourie (leaf litter, mangroves), 3♂ 5♀ (NMBA 11244); Vilankulos, Casa Chibububo, 22°01'S, 35°19'E, 3 m a.s.l., 12.XII.2007, leg. C. Haddad, R. Lyle & R. Fourie (leaf litter, coastal bush), 1♂ (NMBA 11358). *Maputo*: Near Marracuene, Blue Anchor Inn, 25°35'S, 32°40'E, 50 m a.s.l., 28.XI.2007, leg. C. Haddad & R. Lyle (leaf litter, savanna), 1♂ 2♀ (NMBA 11414). **SOUTH AFRICA:** *Free State*: Bloemfontein, Shelleyvale-Rayton road, 29°04'S, 26°12'E, 21.V.2015, leg. C. Haddad & N. Jolintini (*Sorghum bicolor* tussocks), 2♂ (NCA 2015/2512); Luckhoff district, Farm Bankfontein, 30°04.980'S, 24°54.170'E, 22.I.2015, leg. C. Haddad (base of grass tussocks, wetland), 1♂ (NCA 2015/1651).

Etymology. This species is named for the late John Murphy, who described the genus and included in his book an undescribed species from Kenya that closely resembles this species (Murphy 2007).

Diagnosis. The female of this species most closely resembles that of *L. capensis* **sp. nov.**, but can be recognised by the more strongly bent copulatory ducts and the larger copulatory openings (compare Figs 80 and 82). Males most closely resemble those of the undescribed *Leptodrassex* sp. 1 of Murphy (2007), but have a much shorter retrolateral tegular process and shorter dorsal retrolateral tibial apophysis (compare Figs 84–86 with Murphy 2007: fig. 515).

Description. Female (holotype, Ndumo, NCA 2005/969). Colouration (Fig. 46): carapace, endites and chelicerae creamy-yellow, sternum creamy-white, margins yellow-brown at coxae; femora creamy-white, remaining segments creamy-yellow. Abdomen creamy-white dorsally and ventrally.

Measurements: CL 0.99, CW 0.83, AL 1.57, AW 0.67, TL 2.70. Eye diameters and interdistances: AME 0.10, ALE 0.09, PME 0.07, PLE 0.08, AME–AME 0.06, AME–ALE 0.01, PME–PME 0.06, PME–PLE 0.04, ALE–PLE 0.01. Leg measurements: I 0.71, 0.35, 0.57, 0.48, 0.37 = 2.48; II 0.76, 0.37, 0.63, 0.53, 0.40 = 2.69; III 0.62, 0.33, 0.44, 0.41, 0.24 = 2.04; IV 1.01, 0.40, 0.79, 0.84, 0.25 = 3.29.

Leg spination: femora: I and II spineless, III do 1 rl 1, IV do 1 rl 1; tibiae: I plv 2 rlv 2, II rlv 2, III pl 3 rl 2 plv 2, IV pl 2 rl 2 plv 1 vt 2; metatarsi: I plv 1 rlv 1, II plv 1 rlv 1, III pl 2 rl 1 plv 1 vt 3, IV pl 2 rl 2 plv 1 vt 3; palp: femur do 2, patella spineless, tibia pl 2 plv 1, tarsus pl 1 rl 1 plv 2 rlv 4 vt 2.

Epigyne with recurved hemispherical ridges anteriorly, continuing along midline into posterior half, forming bean-shaped atria (Figs 71–73), narrowly separated by median septum; copulatory openings oblique, procurved, situated in anterior part of atria; copulatory ducts S-shaped, broad initially but narrowing quickly, initially directed posteriorly, curving laterally at midpoint, with sharp lateral bend before entering ovoid lateral spermathecae; fertilization ducts on posteromesal margin of spermathecae, directed mesally (Figs 82, 83).

Male (paratype, Ndumo, NCA 2005/969). Colouration (Fig. 47): similar to female, slightly paler.

Measurements: CL 0.86, CW 0.71, AL 1.08, AW 0.67, TL 1.98. Eye diameters and interdistances: AME 0.09, ALE 0.05, PME 0.08, PLE 0.05, AME–AME 0.06, AME–ALE 0.01, PME–PME 0.03, PME–PLE 0.03, ALE–PLE 0.01. Leg measurements: I 0.68, 0.30, 0.56, 0.46, 0.34 = 2.34; II 0.71, 0.32, 0.58, 0.48, 0.36 = 2.45; III 0.59, 0.30, 0.40, 0.38, 0.24 = 1.91; IV 0.95, 0.35, 0.72, 0.76, 0.25 = 3.03.

Leg spination: femora: I and II spineless, III do 1, IV do 1 rl 1; tibiae: I plv 2 rlv 2, II rlv 2, III pl 2 rl 1 plv 1, IV pl 2 rl 2 vt 2; metatarsi: I plv 1 rlv 1, II plv 1 rlv 1, III pl 2 rl 1 plv 1 vt 3, IV pl 2 rl 2 plv 1 vt 3; palp: femur do 2 plv 1-2, patella spineless, tibia plv 1, tarsus plv 2 rlv 2.

Palp: tibia longer than broad, with small lobate prolateral apophysis, small dorsal apophysis, slightly larger ventral retrolateral apophysis, and slender ventrally curved dorsal tibial apophysis (Figs 76–78, 84–86); tegulum ovoid, with large curved apical tegular process, smaller spike-like retrolateral tegular process, and slender straight median apophysis (Figs 77, 85); fine laminate conductor hidden behind apical tegular process (Fig. 77); embolus very slender, originating proximally and entering groove in subtegulum, continuing along prolateral margin distally, before entering groove in apical tegular process (Figs 77–79).

Additional material examined. SOUTH AFRICA: *Free State*: Amanzi Private Game Reserve, 28°35.785'S, 26°26.335'E, 1–30.IX.2012, leg. V. Butler (pitfall traps, *Vachellia karroo* woodland), 1♀ (NCA 2013/3379); Same locality, Obstacle course, 28°35.994'S, 26°25.650'E, 30.XII.2020, leg. C. Haddad (base of grass tussocks), 2♂ 1♀ (S.E.M. preparations); Bloemfontein, Free State National Botanical Gardens, 29°02'S, 26°12'E, 8.VI.2015, leg. C. Haddad & N. Jolintini (*Hyparrhenia hirta* tussocks), 1♀ (NCA 2015/2521); Same locality, 21.V.2015, leg. C. Haddad & N. Jolintini (*H. hirta* tussocks), 2♂ (NCA 2015/2503); Brandfort, Florisbad Research Station, 28°46'S,

26°05’E, 21.XII.1987–5.I.1988, leg. L. Lotz (pitfalls), 1♀ (NMBA 8435); Gariep Dam Nature Reserve, 30°35’S, 25°32’E, 1340 m a.s.l., 10.IV.2017, leg. M. Morake & N. Tshabalala (sifting leaf litter, Nama Karoo veld), 1♀ (NCA 2019/896); Harrismith, Platberg Nature Reserve, 28°16.842’S, 29°12.024’E, 2040 m a.s.l., 13.XI.2015–26.I.2016, leg. C. Haddad, D. Fourie & Z. Mbo (pitfall traps, alpine grassland), 1♂ 3♀ (NCA 2015/2300); Sterkfontein Dam Nature Reserve, 28°24.925’S, 29°02.529’E, 1700 m a.s.l., 11.XI.2015, leg. C. Haddad (under rocks, shore of dam), 1♀ (NCA 2015/2125). *Gauteng*: Pretoria, Pretoria National Botanical Gardens, 25°44’S, 28°16’E, 6.X–24.XI.2007, leg. E. Kassimatis (pitfalls), 1♀ (NCA 2010/2262). *KwaZulu-Natal*: Enseleni Nature Reserve, 28°41.350’S, 31°59.900’E, 12.X.2020, leg. R. Booysen & R. Steenkamp (hand collecting, grass tussocks), 2♂ (NCA 2020/727); iSimangaliso Wetlands Park, Mission Rocks picnic site, 28°15.879’S, 32°28.922’E, 90 m a.s.l., 29.XI.2015, leg. C. Haddad (base of grass tussocks, coastal forest), 1♀ (NCA 2015/2257). *Limpopo*: Soutpansberg Mountains, Lajuma Mountain Retreat, 23°02.306’S, 29°26.633’E, 6.II.2008, leg. R. Lyle & R. Fourie (beats, Afromontane forest), 1♀ (NCA 2008/494). *Northern Cape*: Benfontein Nature Reserve, 28°49’S, 24°49’E, 4.I.2006, leg. R. Lyle (pitfalls, dry savanna), 1♀ (NCA 2006/1128); Kathu, Farm Pniel, 28°35.420’S, 24°31.967’E, 31.X.2005, leg. R. Lyle (pitfalls, dry savanna), 1♀ (NCA (2006/1093).

Variation. Total length: females 1.80–3.10 (average 2.44, n = 22); males 1.65–2.28 (average 1.96, n = 11).

Habitat and biology. Approximately 80% of the examined females had plugged epigynes. This species occupied a broad range of biomes (Nama Karoo, grassland, savanna, forest, Indian Ocean Coastal Belt), where it was predominantly sampled from the ground by pitfalls, litter sifting, beneath rocks or from grass tussocks, and only rarely from woody vegetation by beating.

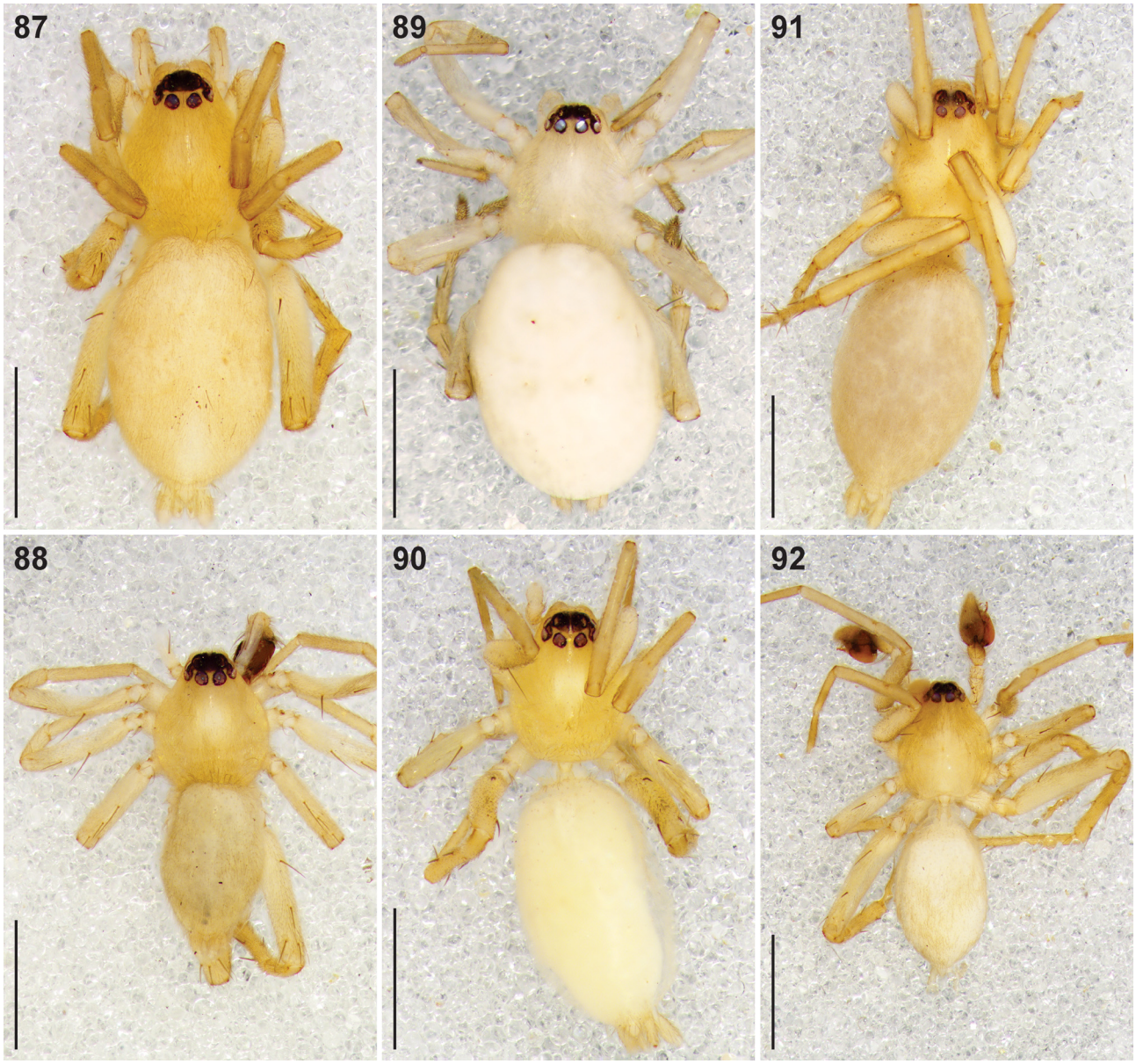
Distribution. Widely distributed in southern Mozambique and the eastern half of South Africa (Fig. 44).

Genus *Leptopilos* Levy, 2009

Type species. *Drassus tenerrimus* O. Pickard-Cambridge, 1872, by original designation.

Diagnosis. *Leptopilos* can be recognised from other Leptodrassinae by the presence of an anterior median hood in the female epigyne, and a male palp armed with closely grouped, often pointed distal laminae (tegular processes), and a single retrolateral tibial apophysis (Levy 2009).

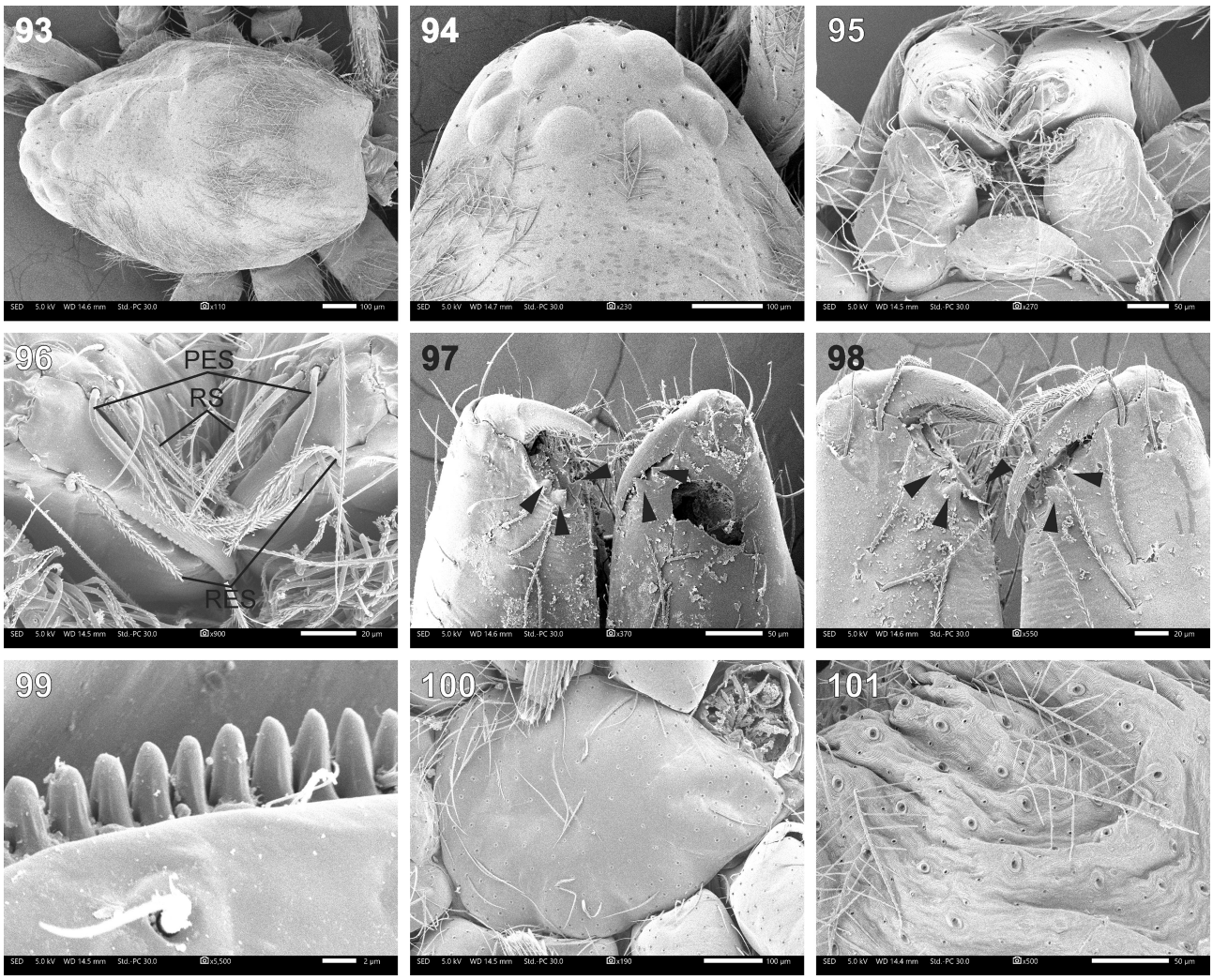
Description. Small pale spiders (Figs 5, 6, 87–92), females 2.15–3.80 mm and males 1.77–2.98 mm in length; carapace creamy-white to yellow; carapace oval, eye region narrow, broadest between coxae II and III, without fovea (Fig. 93); posterior margin slightly concave; carapace gradually elevated from eye region, highest at approximately 3/4 its length, with steep posterior slope; carapace smooth and matte, densely covered in feathery setae (Figs 93, 94), with long straight setae in eye region. All eyes surrounded by black rings, pigment continuous between anterior eyes (Figs 87–92); AER procurved in anterior view, slightly recurved in dorsal view (Fig. 94); clypeus height slightly larger than AME diameter; AME largest, separated by approximately 1/2 their diameter, separated from ALE by 1/8 ALE diameter; PER strongly procurved in dorsal view (Fig. 94); PME oval and flattened, PLE round, PME slightly larger than PLE; PME separated from each other by approximately 3/4 their diameter, from PLE by approximately 1/2 PME diameter; ALE and PLE almost touching (Fig. 94); MOQ slightly narrower posteriorly than anteriorly, anterior width slightly larger than MOQ length. Chelicerae: with promarginal escort seta and rake setae, and single retromarginal escort seta (Fig. 96); cheliceral dentition (southern African species): promargin with one tooth; retromargin with two teeth, proximal tooth larger than distal (Figs 97, 98); endites with slightly depressed lateral margins, distal margins rounded, with distinct serrula and maxillar hair tuft; serrula teeth with weakly undulating lateral margins (Fig. 99); labium trapezoid, slightly longer than wide, with rounded anterior margin. Pleural bars weakly sclerotised, isolated; sternum shield-shaped, approximately 1¼ times longer than broad, broadest at coxa II, surface smooth, sparsely covered in straight setae (Fig. 100); precoxal triangles present, intercoxal sclerites present between all coxal pairs. Abdomen oval, slightly broader than carapace, dorsal scutum absent in both sexes (Figs 87–92); dorsum with single pair of indistinct sigilla; dorsum and sides densely covered in feathery setae, with scattered fine plumose setae (Fig. 101), venter only with fine plumose setae. Spinnerets (only observed in *L. digitus* **sp. nov.**): ALS of female with two major ampullate gland spigots anteriorly, two large piriform gland spigots mesally, and two slender modified piriform gland spigots, one anterior and one posterior to anterior piriform gland spigot (Fig. 102); PMS of female with two large minor ampullate gland spigots mesally, two small cylindrical gland spigots posteriorly, single mesal tartipore, and eight small aciniform gland spigots peripherally (Fig. 103); PLS of



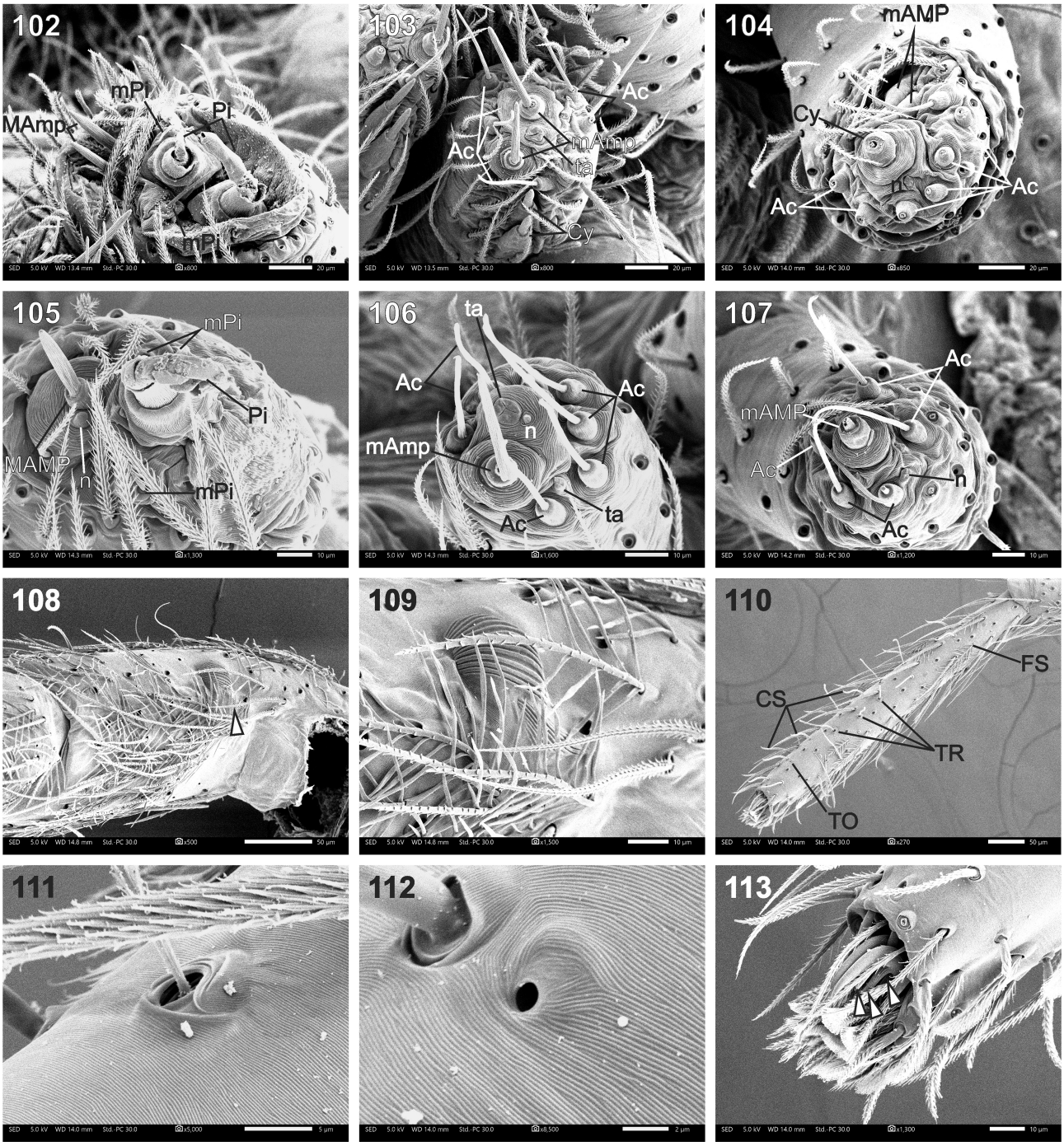
FIGURES 87–92. Dorsal habitus of *Leptopilos* species: 87, 88. *L. butleri* **sp. nov.** female (87) and male (88); 89, 90. *L. digitus* **sp. nov.** female (89) and male (90); 91, 92. *L. vasivulva* **sp. nov.** female (91) and male (92). Scale bars = 1.0 mm.

female with two small minor ampullate gland spigots anteriorly, one large cylindrical gland spigot mesally, single mesal nubbin, and nine aciniform gland spigots peripherally (Fig. 104); ALS of male with one large major ampullate gland spigot with adjacent nubbin anteromesally, one large piriform gland spigot mesally, and three slender modified piriform gland spigots, two anterior and one posterior to anterior piriform gland spigot (Fig. 105); PMS of male with one posterior minor ampullate gland spigot, one tartipore and nubbin anterior to it, one posterior tartipore, and seven peripheral aciniform gland spigots (Fig. 106); PLS of male with single large anterior minor ampullate gland spigot, one posterior nubbin, and five aciniform gland spigots peripherally (Fig. 107). Leg formula 4123; legs densely covered in feathery setae, with scattered straight plumose setae between them, feathery setae sparse on tarsi (Figs 108–110); patellae with narrow indentation and lyriform organ on retrolateral side (Figs 108, 109), with single distal erect long seta dorsally on all patellae; metatarsi with well-developed dorsal stopper distally (Fig. 110); tarsi with sparse chemosensory setae, three pro- and retrolateral dorsal trichobothria in alternating arrangement, oval tarsal organ and dense claw tufts (Figs 110–113); tarsal claws with three ventral teeth (Fig. 113). Female epigyne with median anterior hood (Figs 121, 131) or pair of anterior ridges (Fig. 126), with atria frequently filled with secretory plugs (Fig. 114); internally with short copulatory ducts, initially directed laterally, then looping anteriorly

and mesally, entering teardrop-shaped spermathecae anteriorly, with posteriorly-directed fertilization ducts. Male palpal femur and patella without apophyses; palpal patella with retrolateral lyriform organ (Fig. 117); palpal tibia with single retrolateral apophysis (Figs 115, 116, 118); cymbium ovoid, with dense setae distally on dorsal surface (Fig. 115); tegulum generally ovoid, with very slender embolus originating proximally, entering prolateral groove in subtegulum, leading embolus to distal apical tegular process, with embolus tip in narrow retrolateral groove (Figs 119, 120); retrolateral tegular process closely associated with apical tegular process (Figs 119, 124, 129, 134); median apophysis hook-like, originating retrolaterally (Fig. 119).



FIGURES 93–101. Scanning electron micrographs of *Leptopilos digitus* **sp. nov.** male (93–96, 98–101) and female (97): 93. Carapace, dorsal view; 94. Eye region, anterior view; 95. Mouthparts, ventral view; 96. Distal ends of chelicerae, ventral view; 97, 98. Distal ends of chelicerae, posterior views, arrows indicating cheliceral teeth; 99. Serrula teeth; 100. Sternum, ventral view; 101. Dorsal abdominal setae. Abbreviations: PES—promarginal escort setae; RES—retromarginal escort setae; RS—rake setae.

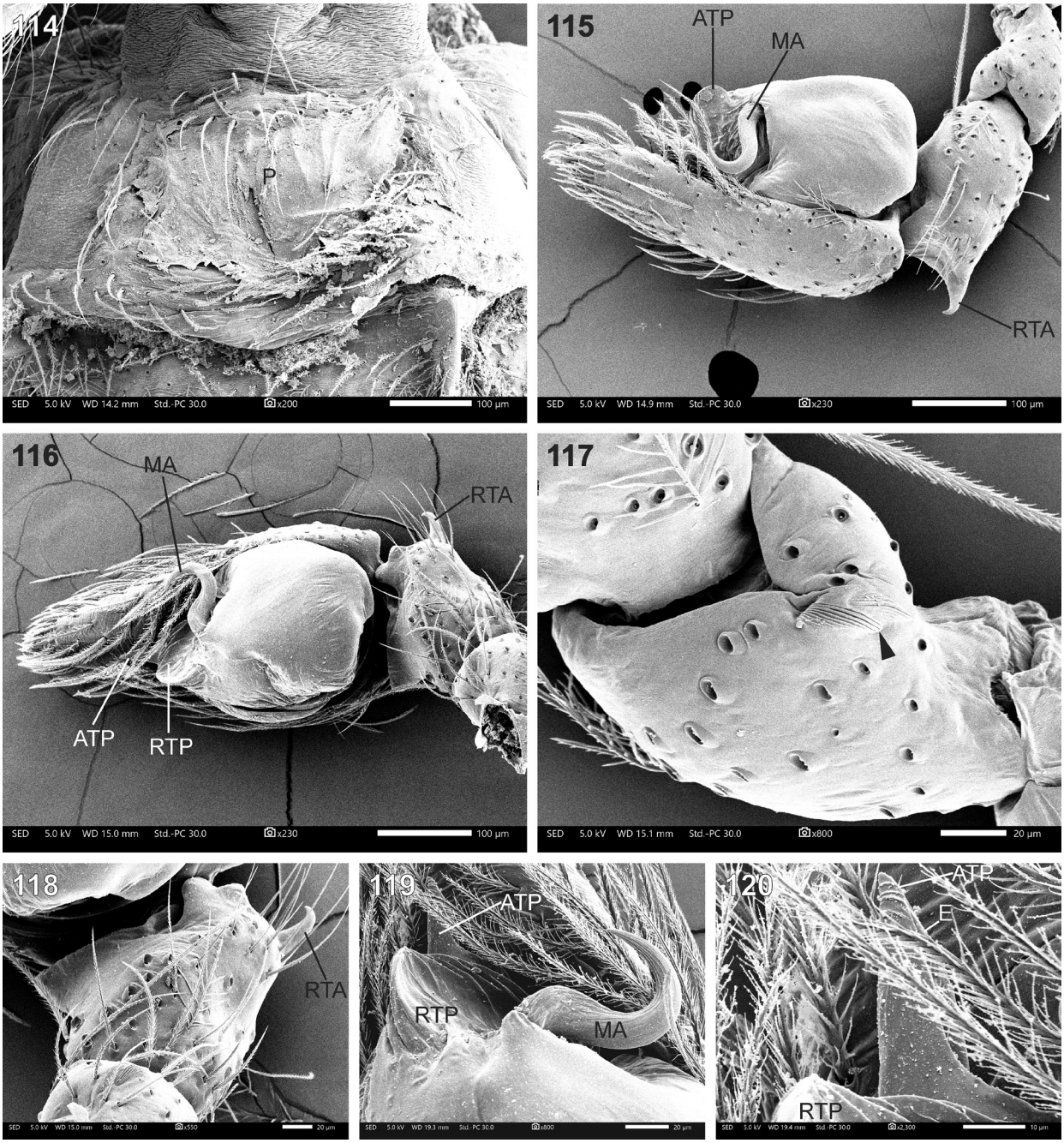


FIGURES 102–113. Scanning electron micrographs of *Leptopilos digitus* **sp. nov.** female (102–104) and male (105–113): 102, 105. Anterior lateral spinnerets; 103, 106. Posterior median spinnerets; 104, 107. Posterior lateral spinnerets; 108. Patella IV, retrolateral view, arrow indicating lyriform organ at proximal end of patellar indentation; 109. Same, detail of LO; 110. Tarsus I, indicating chemosensory setae (CS), feathery setae (FS), tarsal organ (TO) and trichobothria (TR); 111. Same, detail of trichobothrium base; 112. Same, tarsal organ; 113. Same, tarsal claws, retrolateral-dorsal view, arrowheads indicating claw teeth. Abbreviations: Ac—aciniform gland spigot(s); CS—chemosensory setae; Cy—cylindrical gland spigot(s); FS—feathery setae; MAmp—major ampullate gland spigot(s); mAmp—minor ampullate gland spigot(s); mPi—modified piriform gland spigot(s); n—nubbin; Pi—piriform gland spigot(s); Ta—tartipore; TO—tarsal organ; TR—trichobothria.

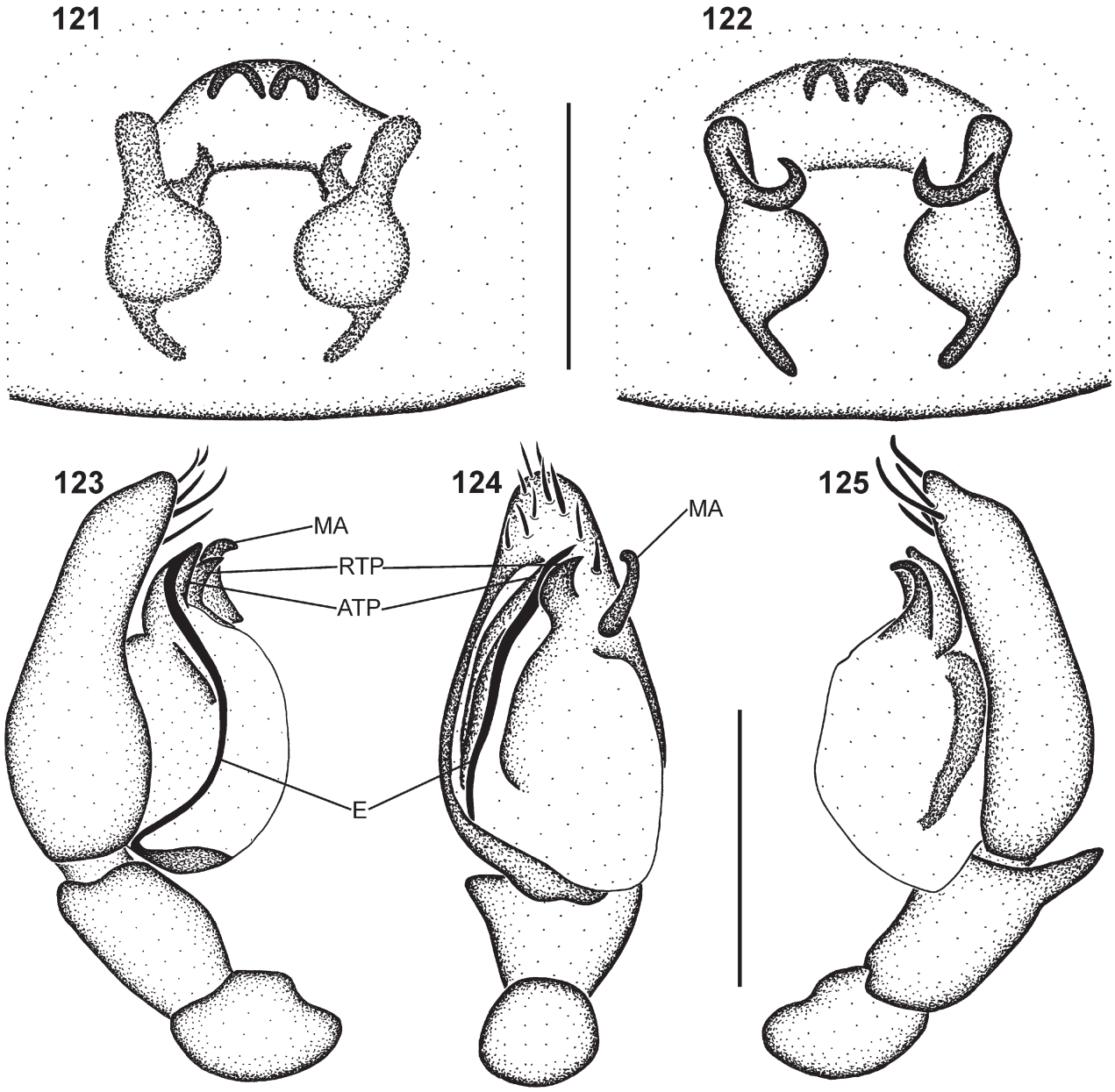
***Leptopilos butleri* sp. nov.**
Figs 87, 88, 121–126

Type material. Holotype ♀: **BOTSWANA:** *Ngamiland*: Okavango Delta, Shakawe, 18°21.960'S, 21°50.829'E, 28.XI.2006, leg. C. Haddad (leaf litter, dry savanna) (NCA 2007/1030).

Paratypes: **SOUTH AFRICA:** *Free State*: Amanzi Private Game Reserve, 28°35.980'S, 26°24.935'E, 1–30.IX.2012, leg. V. Butler (pitfall traps, *Digitaria eriantha* grazing), 7♂ 1♀ (NCA 2013/3295); Same locality, 28°35.506'S, 26°25.340'E, 1–30.IX.2012, leg. V. Butler (pitfall traps, *Searsia burchellii* woodland), 8♂ 4♀ (NCA 2013/3163).



FIGURES 114–120. Scanning electron micrographs of *Leptopilos digitus* **sp. nov.** female (114) and male (115–121): 114. Epigyne, ventral view, indicating plug (P); 115. Right palp, prolateral view; 116. Left palp, ventro-retrolateral view; 117. Right palpal patella, retrolateral view, arrowhead indicating lyriform organ; 118. Left palpal tibia, ventral view; 119. Distal end of palpal tegulum, ventro-retrolateral view; 120. Same, enlargement of anterior tegular process and embolus. Abbreviations: ATP—anterior tegular process; E—embolus; MA—median apophysis; P—plug; PTA—prolateral tibial apophysis; RTA—retrolateral tibial apophysis; RTP—retrolateral tegular process.



FIGURES 121–125. *Leptopilos butleri* **sp. nov.**, female epigyne in ventral (121) and dorsal (122) views, and male palp in prolateral (123), ventral (124) and retrolateral (125) views. Abbreviations: ATP—anterior tegular process; E—embolus; MA—median apophysis; RTP—retrolateral tegular process. Scale bars: 0.25 mm.

Etymology. The species is named for Vivian Butler, who collected most of the known material during a year-long pitfall study in grassland biotopes (Haddad & Butler 2018).

Diagnosis. The females of *L. butleri* **sp. nov.** can be easily recognized by the broad hemispherical anterior hood that is as wide as the lateral margins of the spermathecae (only as broad as the inner margins of the spermathecae in the type species, *L. tenerrimus* (O. Pickard-Cambridge, 1872); see Levy 2009: fig. 18), with a pair of dark n-shaped markings at their anterior margin (Fig. 121). It differs from *L. vasivulva* **sp. nov.**, which has a vase-shaped atrium and a single median curved marking on the anterior hood (compare Figs 121 and 131). Males of *L. butleri* **sp. nov.** have shorter apical and retrolateral tegular processes than *L. vasivulva* **sp. nov.**, with the retrolateral tibial apophysis of the latter species also constricted at its distal end (compare Figs 124 and 125 with Figs 134 and 135).

Description. Female (holotype, Shakawe, NCA 2007/1030). Colouration (Fig. 87): carapace and chelicerae yellow; endites creamy-yellow, labium slightly darker; sternum creamy-yellow, margins brown at coxae; femora creamy-yellow, remaining segments yellow; abdomen cream dorsally and ventrally.

Measurements: CL 1.16, CW 0.90, AL 1.79, AW 1.11, TL 2.98. Eye diameters and interdistances: AME 0.11, ALE 0.09, PME 0.10, PLE 0.08, AME–AME 0.06, AME–ALE 0.01, PME–PME 0.05, PME–PLE 0.04, ALE–PLE 0.01. Leg measurements: I 0.91, 0.38, 0.67, 0.62, 0.46 = 3.04; II 0.81, 0.38, 0.61, 0.59, 0.43 = 2.82; III 0.71, 0.35, 0.52, 0.51, 0.31 = 2.40; IV 1.27, 0.46, 0.92, 1.05, 0.33 = 4.03.

Leg spination: femora: I do 2, II do 2, III pl 1 do 3 rl 1, IV pl 1 do 3 rl 1; patellae spineless; tibiae: I plv 1 rlv 1, II rlv 1, III pl 2 rl 2 plv 1, IV pl 2 rl 2 plv 1 vt 2; metatarsi: I plv 1 rlv 1, II plv 1 rlv 1, III pl 2 rl 1 plv 1 vt 3, IV pl 3 rl 2 plv 1 vt 3; palp: femur pl 1 do 2, patella spineless, tibia pl 1 plv 1, tarsus pl 1 rl 1 plv 3 rlv 3.

Epigyne with broad hemispherical hood anteriorly, with paired n-shaped markings on either side of midline (Fig. 121); copulatory openings small, beneath posterior margin of hood, separated by distance equal to spermatheca width; copulatory ducts narrow, U-shaped initially, curving laterally, then looping anteriorly before entering almost globose spermathecae along their anterior margin (Fig. 122); fertilization ducts on posterior margin of spermathecae, directed posteriomedially.

Male (paratype, Amanzi, NCA 2013/3163). Colouration (Fig. 88): similar to female, carapace slightly paler, abdomen slightly darker.

Measurements: CL 0.92, CW 0.72, AL 1.06, AW 0.76, TL 2.08. Eye diameters and interdistances: AME 0.10, ALE 0.07, PME 0.08, PLE 0.07, AME–AME 0.06, AME–ALE 0.01, PME–PME 0.03, PME–PLE 0.03, ALE–PLE 0.01. Leg measurements: I 0.81, 0.32, 0.60, 0.53, 0.41 = 2.67; II 0.71, 0.30, 0.54, 0.46, 0.38 = 2.39; III 0.62, 0.27, 0.42, 0.41, 0.28 = 2.00; IV 1.04, 0.37, 0.76, 0.87, 0.30 = 3.34.

Leg spination: femora: I do 1, II do 1, III do 3 rl 1, IV pl 1 do 3 rl 1; patellae spineless; tibiae: I and II spineless, III pl 2 rl 1 plv 1, IV pl 2 rl 2 plv 1 vt 2; metatarsi: I spineless, II rlv 0-1, III pl 2 rl 1 plv 1 vt 3, IV pl 3 rl 2 plv 1 vt 3; palp: femur pl 1 do 2, patella spineless, tibia rlv 2, tarsus plv 1 with several modified distal setae ventrally.

Palpal tibia slightly longer than broad, with single triangular retrolateral apophysis (Fig. 125); tegulum ovoid, with slender straight median apophysis with curved tip (Fig. 124); embolus very slender, originating proximally and entering groove in subtegulum, continuing along prolateral margin in S-shaped groove (Fig. 123), before entering groove in apical tegular process, partly hidden behind retrolateral tegular apophysis.

Additional material examined. SOUTH AFRICA: *Free State*: Amanzi Private Game Reserve, 28°35.805’S, 26°25.190’E, 1–30.IX.2012, leg. V. Butler (pitfall traps, *Digitaria eriantha* grazing), 8♂ 2♀ (NCA 2013/3310); Same locality, 28°35.765’S, 26°25.455’E, 1–30.IX.2012, leg. V. Butler (pitfall traps, mesa, plateau), 1♂ (NCA 2013/3236); Same data but 1–31.X.2012, 1♀ (NCA 2014/1541); Same locality, 28°35.565’S, 26°25.550’E, 1–31.X.2012, leg. V. Butler (pitfall traps, mesa, plateau), 18♂ 4♀ (NCA 2014/1562); Same locality, 28°35.506’S, 26°25.340’E, 1–30.IX.2012, leg. V. Butler (pitfall traps, *Searsia burchellii* woodland), 1♀ (NCA 2013/3162); Same data but 1–30.IV.2013, 1♀ (NCA 2013/3581); Same locality, 28°35.975’S, 26°25.435’E, 1–30.IX.2012, leg. V. Butler (pitfall traps, *Tarchonanthus camphoratus* woodland), 1♂ (NCA 2013/3321); Same locality, 28°35.785’S, 26°26.335’E, 1–30.IX.2012, leg. V. Butler (pitfall traps, *Vachellia karroo* woodland), 1♂ 1♀ (NCA 2013/3380). *Gauteng*: Bronkhortspruit, Ezemvelo Nature Reserve, Farm Elandsfontein, 25°42’20.7’’S, 28°56’27.0’’E, 1403 m a.s.l., 8.III.2005, leg. R. Koko (pitfalls, koppie crest), 1♀ (NCA 2016/3183); Wonderboom, Tswaing Nature Reserve, Farm Tswaing, 25°24’15.1’’S, 28°03’34.9’’E, 1116 m a.s.l., 9.XI.2004, leg. R. Koko (baited pitfall, open woodland), 1♀ (NCA 2014/3235), 1♀ (NCA 2014/3252). *KwaZulu-Natal*: Tembe Elephant Park, Viewing Tower, Open woodland/sand, 27°02.225’S, 32°24.905’E, 115 m a.s.l., 3.XII.2015, leg. C. Haddad, R. Booysen, V. & N. Butler (hand collecting), 1♀ (NCA 2016/2045). *Limpopo*: Vyeboom, 23°18.534’S, 30°24.486’E, 24.I.2015, leg. E. Mauda (pitfalls), 1♂ (NCA 2016/245); Vhembi Biosphere Reserve, Mara Research Station, 23°02’S, 29°39’E, 7.XI.2012, leg. C. Schoeman (pitfalls, Makhado sweet bushveld), 1♂ (NCA 2015/1172). *Northern Cape*: Prieska district, Green Valley Nuts, 29°34.924’S, 22°54.376’E, 28.I.2009, leg. C. Haddad (base of grass tussocks), 1♂ (NCA 2009/1474). **ZIMBABWE:** Bulawayo, Hillside, 20°10’S, 28°35’E, III–IV.1999, leg. M. FitzPatrick (pitfall traps), 2♀ (NMZ/A14034); Mtshelele Dam, 20°35’S, 28°36’E, 1–3.XII.2004, leg. M. FitzPatrick, 1♀ (NMZ/A15180); Pomongwe, 20°32’S, 28°30’E, XII.2004, leg. M. FitzPatrick, 1♂ (NMZ/A15250); Rowallan Park, 20°25’S, 28°31’E, VII.2005, leg. M. FitzPatrick, 1♀ (NMZ/A15864).

Variation. Total length: females 2.15–3.08 (average 2.51, n = 13); males 1.77–2.23 (average 2.03, n = 21).

Habitat and biology. The extent of epigyne plugging was not quantified for this species. It occupies Nama Karoo, grassland and savanna habitats, and was predominantly sampled from the ground by pitfalls, litter sifting, beneath rocks or from grass tussocks, and only rarely from woody vegetation by beating. It represented 1.11% of the ground-dwelling spider fauna in a pitfall survey in the grassland biome, but was almost exclusively sampled

there from *Searsia burchellii* closed evergreen shrubland and cultivated *Digitaria eriantha* pastures (Haddad & Butler 2018).

Distribution. Widely distributed in South Africa, Zimbabwe and Botswana (Fig. 136).

***Leptopilos digitus* sp. nov.**
Figures 89, 90, 93–120, 126–130

Type material. Holotype ♀: **SOUTH AFRICA:** *Northern Cape*: Namaqua National Park, Koeroebees, 30°08.683'S, 17°42.177'E, 240 m a.s.l., 27.III.2022, leg. C. Haddad & R. Booysen (leaf litter, dry river bed) (NMBA 18534).

Paratypes: **SOUTH AFRICA:** *Free State*: Erfenis Dam Nature Reserve, 28°30.134'S, 26°48.427'E, 22.XI–23.XII.2005, leg. C. Haddad (pitfalls, burnt site 2), 1♂ (NMBA 13573). *Northern Cape*: Namaqua National Park, Koeroebees, 30°08.683'S, 17°42.177'E, 240 m a.s.l., 27.III.2022, leg. C. Haddad, R. Booysen, L. Malope & S. Sibisi (leaf litter, dry river bed), 2♂ 3♀ (NMBA 18533); Prieska district, Green Valley Nuts, 29°34'S, 22°55'E, 950 m a.s.l., 15.I.2001, leg. C. Haddad (canopy fogging, pistachio orchard), 1♂ (NCA 2004/196). *Western Cape*: Tankwa Karoo National Park, Tanqua Guesthouse, 32°23.911'S, 19°50.713'E, 355 m a.s.l., 19.I.2021, leg. C. Haddad & R. Booysen (hand collecting, at night around houses), 1♀ (NCA 2021/1016).

Etymology. The species name is Latin for finger or toe (digit), referring to the shape of the apical tegular sclerite.

Diagnosis. This species is very distinct in the genus by the short finger-like apical tegular process (Fig. 129) and the short, slender dorsal tibial apophysis (Figs 120, 130) of the male palp. Females can be distinguished from congeners by the paired, weakly sclerotized recurved ridges anteriorly in the epigyne, as opposed to a single median hood, and the paired longitudinal ridges forming the lateral margins of the atrium (Fig. 126).

Description. Female (holotype, Namaqua, NMBA 18534). Colouration (Fig. 89): carapace and chelicerae creamy-white; endites and labium pale yellow-brown; sternum creamy-white, margins brown at coxae; femora creamy-white, remaining segments creamy-yellow, metatarsi and tarsi slightly darker; abdomen white dorsally and ventrally.

Measurements: CL 1.06, CW 0.87, AL 1.71, AW 1.25, TL 2.80. Eye diameters and interdistances: AME 0.10, ALE 0.07, PME 0.08, PLE 0.07, AME–AME 0.05, AME–ALE 0.01, PME–PME 0.06, PME–PLE 0.04, ALE–PLE 0.01. Leg measurements: I 0.86, 0.40, 0.67, 0.57, 0.44 = 2.94; II 0.81, 0.37, 0.62, 0.56, 0.43 = 2.79; III 0.67, 0.35, 0.49, 0.48, 0.30 = 2.29; IV 1.05, 0.40, 0.84, 0.97, 0.30 = 3.56.

Leg spination: femora: I do 1, II do 1, III do 1, IV do 2 rl 1; patellae spineless; tibiae: I plv 1, II spineless, III pl 2 rl 2 plv 1, IV pl 2 rl 2 plv 1 vt 2; metatarsi: I plv 1 rlv 1, II plv 1 rlv 1, III pl 2 rl 1 plv 1 rlv 1 vt 3, IV pl 3 rl 2 plv 2 vt 3; palp: femur do 1, patella pl 1 do 1, tibia plv 1, tarsus pl 1 rl 1 plv 3 rlv 2.

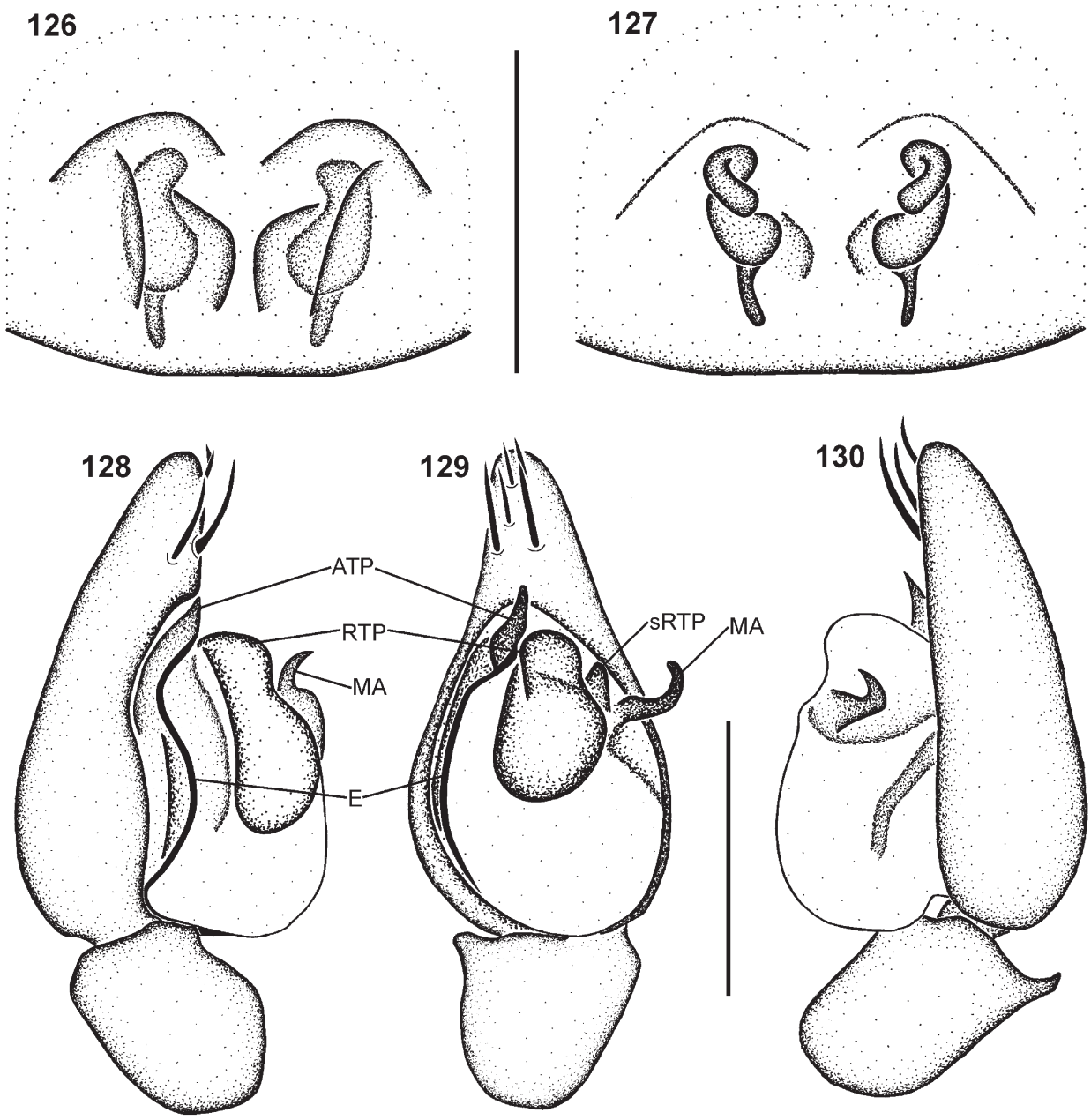
Epigyne with paired, recurved, weakly sclerotized ridges anteriorly, longitudinal ridges laterally forming margins of atrium, with further funnel-shaped ridges medially (Fig. 126); copulatory openings small, beneath anterolateral corners of funnel-shaped ridges; copulatory ducts short, looping laterally, then anteriorly and posteriorly, entering teardrop-shaped spermathecae along their anterior margin (Fig. 127); fertilization ducts on posterior margin of spermathecae, directed posteriorly.

Male (paratype, Prieska, NCA 2004/196). Colouration (Fig. 90): carapace and chelicerae light yellow; endites and labium creamy-yellow; sternum creamy-yellow, margins brown at coxae; femora to tibiae creamy-yellow, metatarsi and tarsi slightly darker; abdomen creamy-white dorsally and ventrally.

Measurements: CL 1.05, CW 0.79, AL 1.81, AW 1.02, TL 2.98. Eye diameters and interdistances: AME 0.11, ALE 0.08, PME 0.09, PLE 0.08, AME–AME 0.06, AME–ALE 0.01, PME–PME 0.05, PME–PLE 0.04, ALE–PLE 0.01. Leg measurements: I 0.87, 0.38, 0.67, 0.57, 0.51 = 3.00; II 0.83, 0.37, 0.62, 0.56, 0.48 = 2.86; III 0.65, 0.32, 0.48, 0.46, 0.33 = 2.24; IV 1.06, 0.41, 0.83, 0.95, 0.33 = 3.58.

Leg spination: femora: I do 1, II do 1, III do 1 rl 1, IV pl 1 do 2 rl 1; tibiae: I plv 1 rlv 1, II spineless, III pl 2 rl 1 plv 1, IV pl 2 rl 2 plv 1 vt 2; metatarsi: I rlv 1, II rlv 1, III pl 2 rl 1 plv 1 vt 3, IV pl 2 rl 2 plv 1 vt 3; palp: femur do 1, patella and tibia spineless, tarsus plv 1 rlv 1.

Palpal tibia very slightly longer than broad, with small spike-like dorso-retrolateral apophysis (Figs 115, 116, 130); tegulum oval, with narrow finger-like prolateral apical tegular process, lobate mesal retrolateral tegular process with additional smaller subtriangular lobe, and slender strongly curved median apophysis (Fig. 129); embolus very slender, originating proximally and entering S-shaped groove in prolateral subtegulum, continuing along prolateral margin distally (Fig. 128), before entering groove in apical tegular process.



FIGURES 126–130. *Leptopilos digitus* **sp. nov.**, female epigyne in ventral (126) and dorsal (127) views, and male palp in prolateral (128), ventral (129) and retrolateral (130) views. Abbreviations: ATP—anterior tegular process; E—embolus; MA—median apophysis; RTP—retrolateral tegular process; sRTP—secondary lobe of RTP. Scale bars: 0.25 mm.

Additional material examined. SOUTH AFRICA: *Northern Cape*: Namaqua National Park, Koeroebees, 30°08.683'S, 17°42.177'E, 240 m a.s.l., 14.I.2021, leg. C. Haddad, R. Booysen, R. Christiaan & A. Stander (leaf litter, dry river bed), 1♀ (NCA 2021/726; epigyne lost in preparation); Same locality, 27.III.2022, leg. C. Haddad, R. Booysen, L. Malope & S. Sibisi (leaf litter, dry river bed), 2♂ 2♀ (S.E.M. preparations).

Variation. Total length: females 2.78–3.32 (average 2.98, n = 7); males 2.05–2.98 (average 2.36, n = 4).

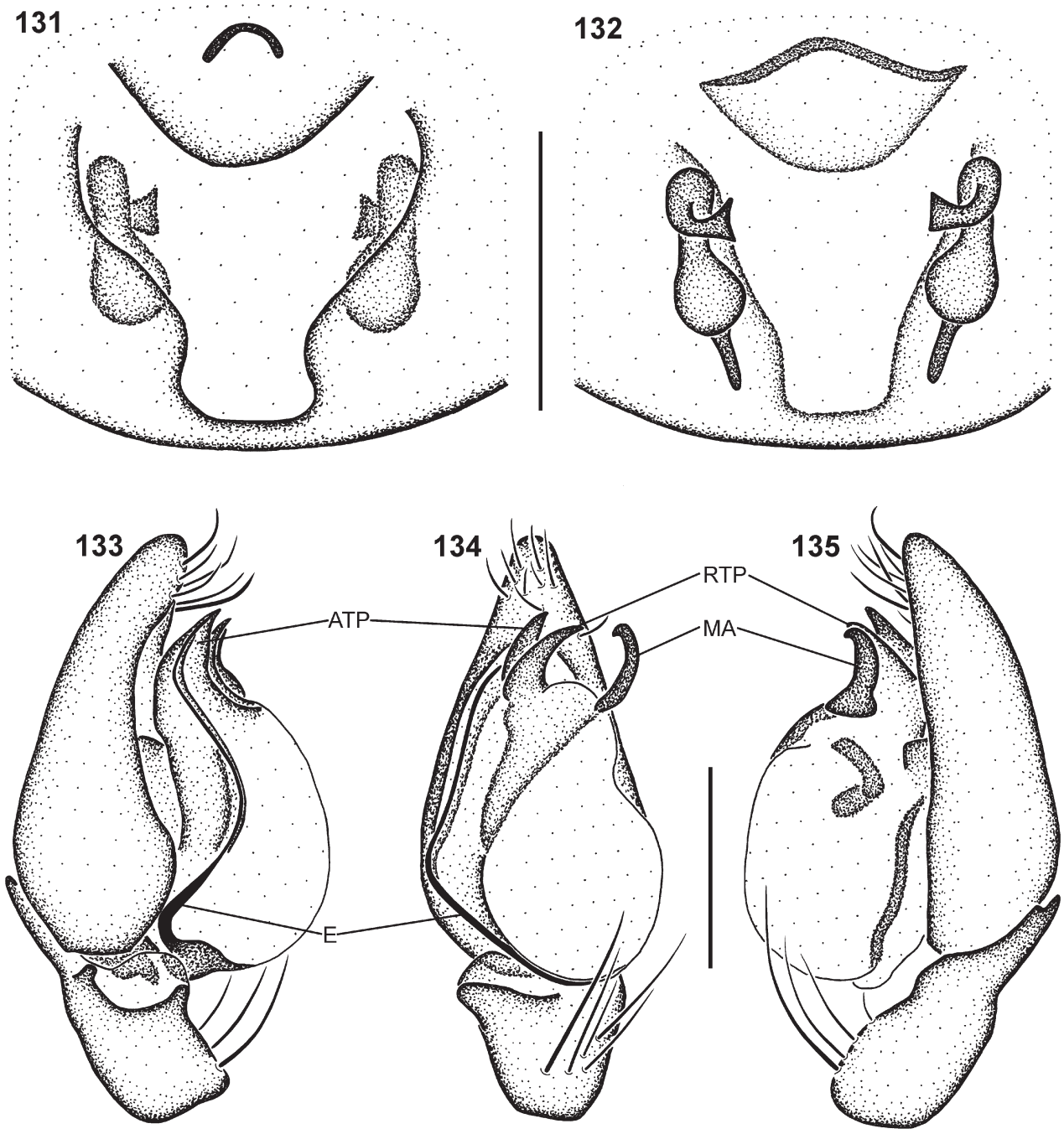
Habitat and biology. All of the females collected had the epigyne plugged (Fig. 114). Recorded from the Succulent Karoo, Nama Karoo and Grassland biomes. At the type locality, it was a common species collected in the litter of short shrubs in a dry river bed, with adults far more common in autumn (March) than midsummer (January) or winter (July).

Distribution. Widespread in the western half of South Africa (Fig. 136).

***Leptopilos vasivulva* sp. nov.**
Figures 91, 92, 131–135

Type material. Holotype ♀: **BOTSWANA:** *North-East*: Near Francistown, Selkirk Mine, 21°19.494'S, 27°45.030'E, 30.XI–6.XII.2007, leg. D.H. Jacobs (pitfalls) (NCA 2010/1835).

Paratypes: Together with holotype, 2♂ 3♀ (NCA 2010/1835); Same data as holotype, 1♂ 1♀ (NCA 2009/3027); Same data as holotype but 30.X–6.XI.2007, 3♀ (NCA 2010/642). **SOUTH AFRICA:** *Limpopo*: Blouberg Nature Reserve, 22°59.332'S, 29°06.397'E, leg. S. Foord & E. Stam (pitfalls, *Sclerocarrea birrea*), no date, 1♀ (NCA 2009/1779); Vhembe Biosphere Reserve, Baries Farm, 22°28.672'S, 29°24.316'E, 6.XII.2012, leg. C. Schoeman (pitfalls, Musina mopane bushveld), 1♀ (NCA 2015/1240).



FIGURES 131–135. *Leptopilos vasivulva* **sp. nov.**, female epigyne in ventral (131) and dorsal (132) views, and male palp in prolateral (133), ventral (134) and retrolateral (135) views. Abbreviations: ATP—anterior tegular process; E—embolus; MA—median apophysis; RTP—retrolateral tegular process. Scale bars: 0.25 mm.

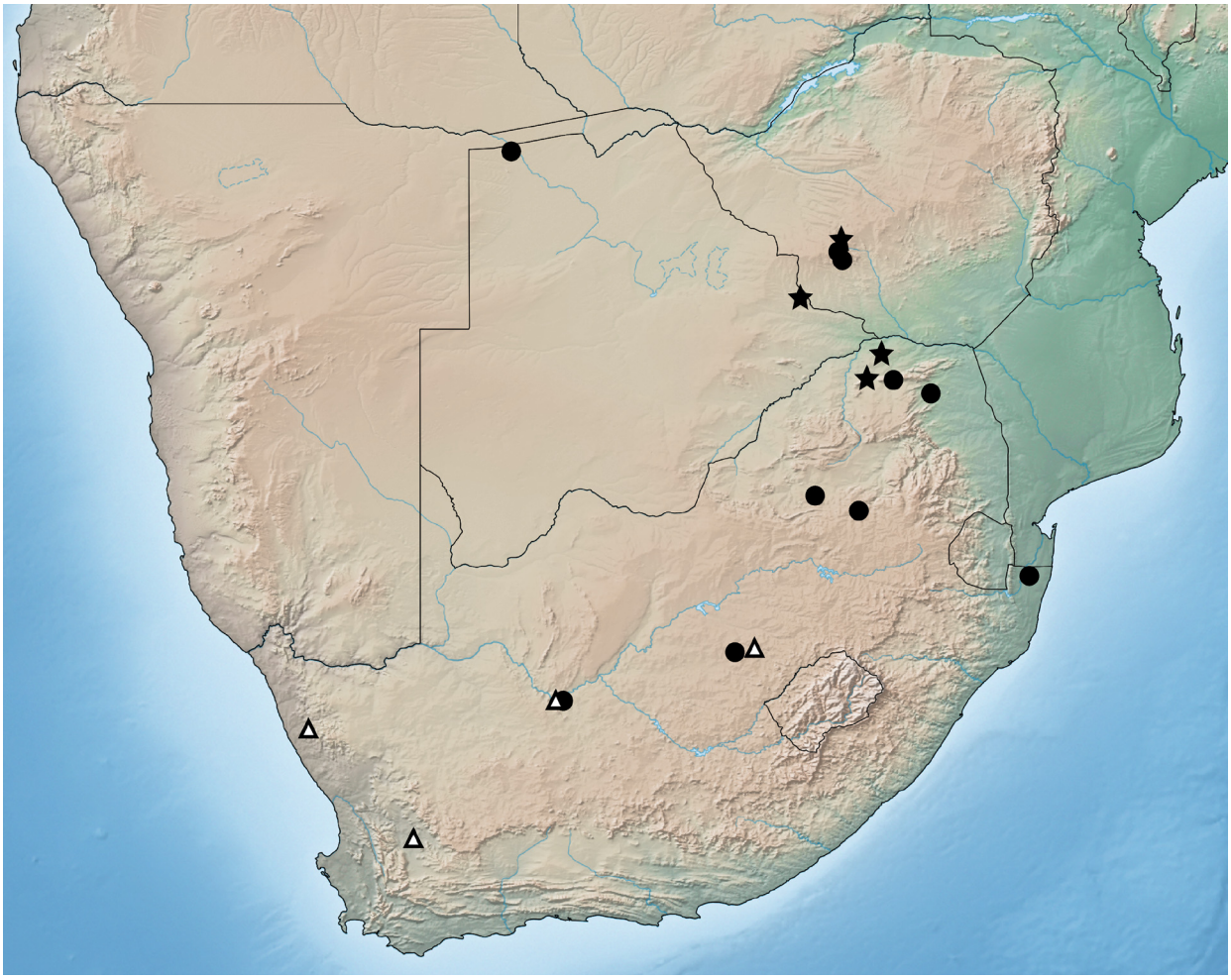


FIGURE 136. Distribution of *Leptopilos butleri* **sp. nov.** (circles), *L. digitus* **sp. nov.** (triangles) and *L. vasivulva* **sp. nov.** (stars) in southern Africa.

Etymology. The species name is a contraction of the Greek words *vasis* and *vulva*, referring to the vase-shaped margins of the female's epigynal atrium.

Diagnosis. The females of *L. vasivulva* **sp. nov.** can be distinguished from congeners by the unique vase-shaped atrium and a single median curved marking on the anterior hood (Fig. 131). Males of *L. vasivulva* **sp. nov.** are similar to *L. butleri* **sp. nov.**, but have longer apical and retrolateral tegular processes and a distally constricted retrolateral tibial apophysis (compare Figs 124 and 125 with Figs 134 and 135).

Description. Female (holotype, NCA 2010/1835). Colouration (Fig. 91): carapace and chelicerae creamy-yellow; endites and labium creamy-yellow, labium slightly darker; sternum creamy-yellow, margins yellow-brown; femora creamy-yellow, remaining segments pale yellow; abdomen creamy-grey dorsally and ventrally.

Measurements: CL 1.13, CW 0.89, AL 1.90, AW 1.21, TL 3.40. Eye diameters and interdistances: AME 0.11, ALE 0.09, PME 0.09, PLE 0.08, AME–AME 0.06, AME–ALE 0.01, PME–PME 0.06, PME–PLE 0.04, ALE–PLE 0.01. Leg measurements: I 0.92, 0.38, 0.65, 0.62, 0.48 = 3.05; II 0.78, 0.37, 0.54, 0.53, 0.40 = 2.62; III 0.67, 0.35, 0.44, 0.49, 0.32 = 2.27; IV 1.16, 0.44, 0.84, 1.00, 0.33 = 3.77.

Leg spination: femora: I do 1, II do 1, III pl 1 do 2 rl 1, IV pl 1 do 3 rl 1; patellae spineless; tibiae: I and II spineless, III pl 2 rl 2 plv 1, IV pl 2 rl 2 plv 1 vt 2; metatarsi: I and II spineless, III pl 2 rl 1 plv 1 vt 3, IV pl 3 rl 2 plv 1 vt 3; palp: femur do 2, patella spineless, tibia plv 1, tarsus plv 3 rlv 3.

Epigyne with strongly curved hemispherical anterior hood, with small recurved median marking; atrium vase-shaped, broad anteriorly and narrowed posteriorly (Fig. 131); copulatory openings anterolaterally in atrium, longitudinal; copulatory ducts short, initially directed laterally, looping anteriorly, then posteriorly, entering ovoid lateral spermathecae on their anterior margin; fertilization ducts on posterior margin of spermathecae, directed posteriorly (Fig. 132).

Male (paratype, NCA 2010/1835). Colouration (Fig. 92): similar to female, slightly darker.

Measurements: CL 1.05, CW 0.86, AL 1.43, AW 0.84, TL 2.63. Eye diameters and interdistances: AME 0.11, ALE 0.08, PME 0.10, PLE 0.08, AME–AME 0.04, AME–ALE 0.01, PME–PME 0.04, PME–PLE 0.03, ALE–PLE 0.01. Leg measurements: I 0.90, 0.40, 0.76, 0.70, 0.51 = 3.27; II 0.81, 0.37, 0.60, 0.59, 0.43 = 2.80; III 0.66, 0.32, 0.48, 0.50, 0.33 = 2.29; IV 1.16, 0.41, 0.86, 1.02, 0.35 = 3.80.

Leg spination: femora: I do 2, II do 2, III do 2 rl 1, IV pl 1 do 2 rl 1; patellae spineless; tibiae: I and II spineless, III pl 2 rl 2 plv 1, IV pl 2 rl 2 plv 1 vt 2; metatarsi: I and II spineless, III pl 2 rl 1 plv 1 vt 3; IV pl 2 rl 2 plv 1 vt 3; palp: femur pl 1 do 3, patella spineless, tibia with several long ventral setae, tarsus with several distal setae ventrally.

Palpal tibia slightly longer than broad, broadened distally, without prolateral apophysis, with single triangular retrolateral apophysis with constricted tip (Fig. 135); tegulum ovoid, with slender, gradually curved median apophysis with hooked tip (Fig. 134); embolus very slender, originating proximally and entering groove in membranous conductor, continuing along prolateral margin in S-shaped groove (Fig. 133), before entering groove in apical tegular process, partly hidden behind retrolateral tegular apophysis.

Additional material examined. ZIMBABWE: Bulawayo, Hillside, 20°10'S, 28°35'E, VI.1999, leg. M. FitzPatrick, 11♂ 14♀ (NMZ/A16735); Same locality, VIII.1999, leg. M. FitzPatrick, 6 imm. 6♂ 14♀ (NMZ/A16718); Same locality, III–IV.1999, leg. M. FitzPatrick (pitfall traps), 2 imm. 2♂ 11♀ (NMZ/A14033).

Variation. Total length: females 2.80–3.60 (average 3.23, n = 9); males 2.15–2.80 (average 2.53, n = 3).

Habitat and biology. All nine examined females (100%) from South Africa had plugged epigynes. This species was only recorded from pitfall traps in savanna habitats.

Distribution. Only known from a small area in northern Limpopo Province, South Africa, and south-western Zimbabwe, and south-eastern Botswana (Fig. 136).

Discussion

The current study extends the distribution of *Leptodrassex* southwards from Kenya (Murphy 2007) to South Africa, and of *Leptopilos* from the Mediterranean and Asia to South Africa, as well as adding a new genus to the Afrotropical Leptodrassinae fauna. It is therefore likely that the former two genera occur at least throughout East Africa, and perhaps more broadly in Central and West Africa. Although no material from Lesotho, Swaziland and Namibia was represented in the CAS, NCA, NMZ and NMBA collections, it is likely that both genera and *Afrodrassex* occur in these southern African countries too, as several species were recorded close to the borders with these countries (Figs 44, 136). Further, recent challenges in loaning specimens from other collections added to this problem, and when available, may provide additional new taxa from the region.

Considering this likely distribution, some remarks on the currently known East African morphospecies are warranted. The two Kenyan *Leptodrassex* species illustrated by Murphy (2007) may actually belong to two different genera. His *Leptodrassex* sp. 1 is probably correctly placed in this genus, but *Leptodrassex* sp. 2 probably belongs to *Leptopilos*, which was described after the publication of Murphy's book (Levy 2009). This is supported by the presence of an anterior epigynal hood, the short laterally looping copulatory ducts, the lateral spermathecae, and the male palpal structure (e.g., Chatzaki *et al.* 2002; Levy 2009; Kovblyuk & Nadolny 2010). Similarly, *Leptodrassus strandi*, described from Ethiopia, may also belong to *Leptopilos*, as Caporiacco's (1947) very simplistic illustration of the female epigyne seems to present an anterior hood and lateral spermathecae, coupled with its small size (3.25 mm) and yellowish colouration. It is therefore important that the Leptodrassinae of East Africa be revised to determine the true diversity of the group there and resolve these taxonomic issues.

The generic relationships of the Leptodrassinae are still unresolved and require further investigation. The new genus *Afrodrassex* and two of the species described here, *A. balrog* **sp. nov.** and *A. catharinae* **sp. nov.**, have very distinctive genitalic morphology amongst all known Leptodrassinae, including male palps that lack a median apophysis, and possess a large membranous conductor, greatly enlarged anterior tegular process and very long embolus, and female epigynes with very long copulatory ducts running around the periphery of the epigyne to the posteriorly positioned spermathecae.

We were also able to review some of the potential synapomorphies for Leptodrassinae in this study. Azevedo *et al.* (2018) proposed four synapomorphies for the subfamily: 1) posteriorly directed fertilization ducts, 2) absence of secondary spermathecae, 3) absence of teeth on the tarsal claws, and 4) the presence of an accessory median

apophysis on the male palp that hides the thin filiform embolus. In the three genera under study here, we found variation in character 1, with the fertilization ducts directed posteriorly in *Afrodrassex* and *Leptopilos* (e.g. Figs 35, 122), but more mesally directed in *Leptodrassex* (e.g. Figs 81, 83; Rodrigues & Rheims 2020: fig. 29B). Although the internal genitalic structure of females of the three genera were not studied with S.E.M. here, in *Leptodrassex murphyi* **sp. nov.** there are secondary spermathecae present, although they are reduced to small structures on the anterior margin of the primary spermathecae (B. Rodrigues, pers. comm.; Rodrigues & Rheims 2020: fig. 29B). Character 2 should therefore be re-evaluated when the internal epigynal morphology of representative females of the other leptodrassine genera have been studied in detail. Character 3 seems invalid for these three genera, as we found tarsal claw teeth in all of the representative species (Figs 26, 70, 113), and this requires further study in *Leptodrassus* and *Neodrassex* to test its validity. Character 4 seems consistently present in all leptodrassines, although the terminology of this structure seems variable, with "anterior tegular process" being the most widely used recently. Anterior tegular process would seem preferable to the "accessory median apophysis", as a regular "median apophysis" is present in most leptodrassines (excluding *Afrodrassex*), and using both these latter terms could cause avoidable confusion.

We did, however, discover a potentially new synapomorphy for the subfamily. The anterior lateral spinnerets of the three generic representatives studied by S.E.M. all possessed apparently dimorphic piriform gland spigots (Pi) in both sexes. Each genus has one or two typical large Pi mesally, but also two or three smaller slender Pi with elongate shafts, with two typically situated anterior to the large anterior Pi (Figs 17, 57, 102, 105), and in female *Leptodrassex murphyi* **sp. nov.** and male *Leptopilos digitus* **sp. nov.** with an additional modified Pi behind the large posterior Pi (Fig. 54). Indeed, these modified Pi are visible in the male ALS of the *Leptodrassex* sp. imaged by Rodrigues & Rheims (2020: fig. 22C), which was identified as being *Leptodrassex murphyi* **sp. nov.** (B. Rodrigues, pers. comm.; specimens in NMBA 13987 from Bloemfontein), but were not specifically identified as such in that paper. These modified Pi are quite likely unique amongst all Gnaphosidae (see examples of gnaphosid spinnerets in Ramírez 2014, Azevedo *et al.* 2018 and Rodrigues & Rheims 2000), and should be investigated in *Leptodrassus*, *Neodrassex* and other related gnaphosids to establish their occurrence and potential as a synapomorphy for Leptodrassinae.

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