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Research Article

On some new and poorly-known Chrysillini from arid western South Africa (Araneae, Salticidae)

Charles Richard Haddad[1], Wanda Wesołowska[2]

1 *Department of Zoology & Entomology, University of the Free State, Nelson Mandela Drive, Bloemfontein 9300, South Africa*
2 *Department of Biodiversity and Evolutionary Taxonomy, University of Wrocław, Przybyszewskiego 65, 51-148 Wrocław, Poland*
Corresponding author: Charles Richard Haddad (haddadcr@ufs.ac.za)

Abstract

Following a rapid biodiversity assessment of spiders in the arid western interior of South Africa, we report on the occurrence of some poorly known and new species of chrysilline jumping spiders. *Helafricanus patellaris* (Simon, 1901), *Heliocapensis capensis* (Wesołowska, 1986), *H. mirabilis* (Wesołowska, 1986) and *Menemerus lesserti* Lawrence, 1927 are recorded from the Northern Cape Province for the first time, and *Heliocapensis maluti* (Wesołowska & Haddad, 2014) (Lesotho) and *Heliophanus deformis* Wesołowska, 1986 (Angola) are recorded from South Africa for the first time, both also from the Northern Cape. The hitherto unknown females of *Heliocapensis mirabilis* (Wesołowska, 1986) and *Icius pulchellus* Haddad & Wesołowska, 2011 and the male of *M. lesserti* are described for the first time. Three new species are described: *Icius jacksoni* **sp. nov.** (♂), *Menemerus foordi* **sp. nov.** (♂) and *Natta triguttata* **sp. nov.** (♂♀). One new combination, *Afraflacilla matabelensis* (Wesołowska, 2011), **comb. nov.** (ex *Pseudicius* Simon, 1885), is proposed. We present the first comprehensive molecular analysis of South Africa Chrysillini jumping spiders, based on the cytochrome oxidase I (COI) gene, which supports the monophyly of all but two genera (*Helafricanus* Wesołowska, 1986 and *Heliophanus* C.L. Koch, 1833), which we briefly discuss.

Key words: Cytochrome oxidase subunit I, desert, jumping spiders, Salticinae, Salticoida, succulent karoo

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Introduction

South Africa includes three global biodiversity hotspots (Myers et al. 2000), of which the Succulent Karoo hotspot in the west, which includes most of the extent of the Succulent Karoo Biome (SKB), is shared with southern Namibia. The SKB is globally recognised for its exceptional richness and endemism of dwarf succulents, but the invertebrate fauna remains poorly known for most orders (e.g. Janion-Scheepers et al. 2016). Coupled with the SKB, large parts of arid western South Africa and southern Namibia are characterised by Nama Karoo vegetation and, to a lesser extent, Desert Biome (DB) surrounding the lower section of the Orange River and pockets of Fynbos further south (Mucina and Rutherford 2006).

The arid western parts of South Africa remain the most unexplored concerning spider biodiversity, with the majority of quarter-degree cells being either severely undersampled or never having been sampled at all (Foord et al. 2011,

2020; Janion-Scheepers et al. 2016; Dippenaar-Schoeman et al. 2023). This has been primarily influenced by the distribution of arachnologists in the eastern and southern parts of the country, perceived logistical challenges associated with the rural west and the expected lower species richness of arid versus mesic biotopes, which would be expected to yield lower species richness and abundance for the sampling effort. The majority of spiders recorded from this region were described by Purcell (1908) and Simon (1910), with specific details of the original localities provided in Haddad and Marusik (2019).

To help address this, the first author and colleagues collected in five historically poorly sampled degree squares along a north–south transect in the arid western interior of the country during 2021 and 2022, including the DB of the Richtersveld National Park and four sites to the south in the SKB (Fig. 1). Here, we present data on some new and poorly-known jumping spiders of the tribe Chrysillini that were collected during this study, supplemented by specimens from the area sourced from natural history collections, to improve knowledge of this group in the arid zone of South Africa. Three new species are described, two unknown sexes are described for the first time and new distribution data are provided for several poorly-known species.

Material and methods

Morphology

All of the material examined in this study is preserved in 70% ethanol and deposited in the National Collection of Arachnida, ARC – Plant Health and Protection, Pretoria (**NCA**), National Museum, Bloemfontein (**NMBA**) and KwaZulu-Natal Museum, Pietermaritzburg (**NMSA**). Digital microscope photographs of the habitus and genitalic morphology were taken by the second author with a Nikon Coolpix 8400 mounted on a Nikon SMZ 1500 and Zeiss Stemi 2000 stereomicroscope, with a series of extended focal range images taken and stacked using Helicon Focus software to increase the depth of field. For *Icius insolidus* (Wesołowska, 1999) (♂♀) and *Menemerus transvaalicus* Wesołowska, 1999 (♀), specimens were photographed with a Nikon D5-L3 camera system attached to a Nikon SMZ800 stereomicroscope, with the series of images stacked using the CombineZM imaging software (http://www.hadleyweb.pwp.blueyonder.co.uk) to increase the depth of field.

Genitalic structures were illustrated with the aid of a reticular eyepiece on a binocular microscope (Nikon and MBS-10). Detailed examination of the male pedipalps and female epigynes were done following dissection, with the epigynes cleared in 5% hot potassium hydroxide (KOH) solution for a few minutes, dehydrated with 100% ethanol, cleared in xylene and drawn in temporary eugenol mounts. All genitalia were placed in microvials containing 70% ethanol together with the specimens from which they were dissected.

All measurements are provided in millimetres and were determined with an eyepiece micrometer on a binocular microscope (Nikon and MBS-10). The carapace length was measured along the mid-line of the carapace from the base of the anterior median eyes (i.e. excluding the lenses) to the posterior margin of the carapace medially. The abdomen length was measured from the anterior margin of the abdomen to the anal tubercle, i.e. excluding the petiole and spinnerets.

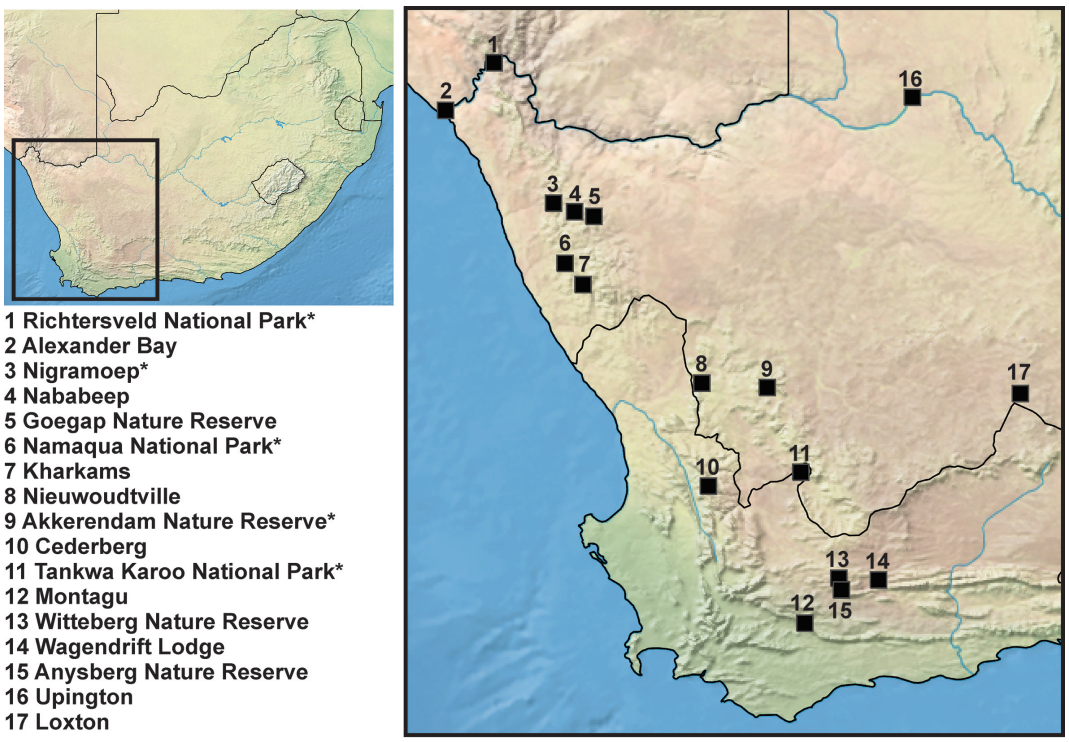

Figure 1. Map of South Africa, with enlargement indicating the 17 localities from which the Chrysillini examined in this study originated. Localities marked with * were sampled during the transect study.

Molecular analysis

As part of the deliverables for the transect project, leg tissues of representative specimens of all species collected in each of the five degree-squares were prepared for DNA barcoding (cytochrome oxidase subunit I, COI) by the Canadian Centre for DNA Barcoding, which conducted the extraction and sequencing following their standard protocols for arthropods (CCDB 2019). All the sequence data have been uploaded to the SPIZA (Spiders of South Africa) project on the Barcode of Life Data System (BOLD, www.boldsystems.org; Ratnasingham and Hebert 2007, 2013).

To assess the conspecificity of males and females of the species treated herein and support their taxonomic distinctness, we performed a phylogenetic analysis of COI sequences on the complete set of South African Chrysillini species on SPIZA, using *Massagris honesta* Wesołowska, 1993 (Hisponinae) to root the tree. All relevant data related to the specimens included in the phylogenetic analysis are presented in Appendix 1 (species, sex and process IDs of specimens, locality, depository number and sequence length), with the full collecting details of the specimens from western South Africa provided in the main text. To avoid excessively large clades in the tree, we only included a single male and female (wherever possible) for all described South African Chrysillini species not specifically treated in this paper. All individuals assigned to the species treated in this paper that were sequenced (marked with * in Appendix 1) were included, together with all their sequenced conspecifics from other localities in the country, to confirm their conspecificity. For all terminals, the species name, SPIZA sample ID, institutional depository and sampling location are provided in the tree (Fig. 2).

We used the "Sequence analysis" tool in BOLD to analyse the selected sequences (68 terminals in total), selecting the Kimura 2 Parameter distance model, Neigh-

bour-joining algorithm, aligning the sequences using Muscle (Edgar 2004) and a minimum overall overlap of 200 bp between sequences. To optimise the results, we only included sequences more than 500 bp in length, preferably those with the optimal length of 658 bp. The tree produced was further modified in Corel Draw X7.

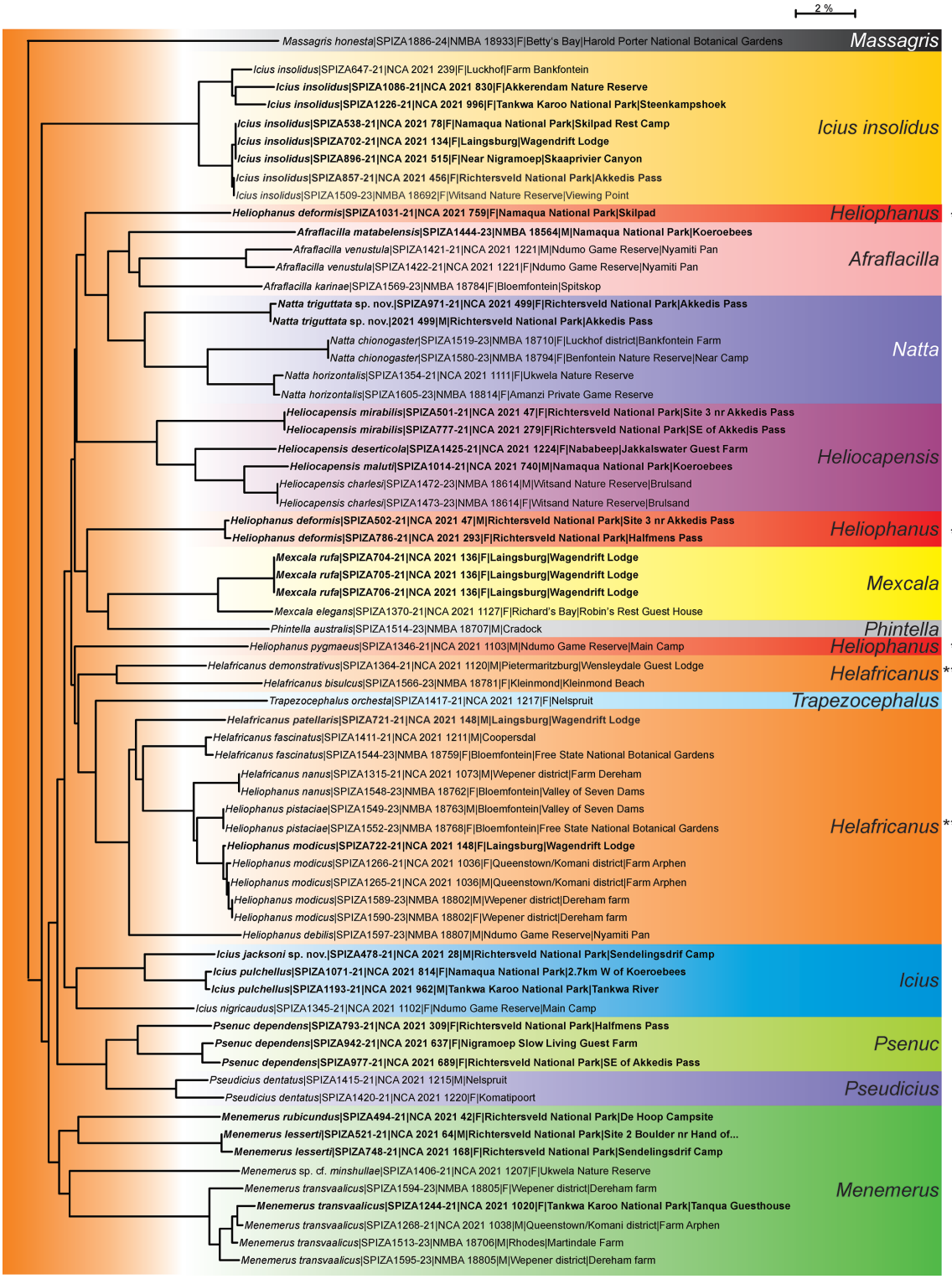

Figure 2. Phylogenetic tree of South African Chrysillini, based on cytochrome c oxidase subunit 1 (COI) sequences, with genera indicated in different colours. *Massagris honesta* (Hisponinae) was used as the outgroup to root the tree. Specimens in bold are treated in this paper. * - genus with possible contaminated sequence(s); ** possibly paraphyletic genus.

Phylogenetics

The analysis, based on the COI gene, found all of the genera of South African Chrysillini monophyletic based on the terminals included, with two exceptions (Fig. 2). *Heliophanus* C.L. Koch, 1833 *sensu stricto* (indicated by * in the tree), represented by two species (*H. deformis* Wesołowska, 1986 and *H. pygmaeus* Wesołowska & Russell-Smith, 2000) was polyphyletic, with two *H. deformis* forming a clade sister to *Mexcala* G. W. Peckham & E. G. Peckham, 1902 and one specimen as sister to a clade including *Afraflacilla* Berland & Millot, 1941 and *H. pygmaeus* as sister to a clade containing *Helafricanus* and *Trapezocephalus* Berland & Millot, 1941. Considering the disparate placement of the specimen from Namaqua National Park (SPIZA1031-21), it is plausible that this sequence may have been contaminated.

Helafricanus itself (indicated by ** in the tree) was represented by two clades, separated by *T. orchesta* (Simon, 1886); this result is not entirely surprising, as the first clade is represented by *H. bisulcus* (Wesołowska, 1986) and *H. demonstrativus* (Wesołowska, 1986), two species that are considerably larger than most other *Helafricanus* and with a modified embolus and epigyne structure, similar to other members of the *marshalli* species group (Wesołowska 1986). It is quite plausible that these two species and other close relatives may represent another genus, but any decisions on their systematics and that of *Heliophanus sensu stricto* should be based on a more comprehensive molecular dataset.

Our results also support the placement of *Pseudicius matabelensis* Wesołowska, 2011 in a clade containing two *Afraflacilla* Berland & Millot, 1941 species, *A. karinae* (Haddad & Wesołowska, 2011) and *A. venustula* (Wesołowska & Haddad, 2009). As such, we propose the transfer of this species below. When Prószyński (2017) partially revised *Pseudicius* Simon, 1885, he transferred numerous African species to *Afraflacilla* and *Psenuc* Prószyński, 2017, but a considerable proportion of species remaining unresolved and were retained in *Pseudicius*. As such, this proposed transfer here is only one step in resolving the placement of many of these untreated species.

Our tree also supports the placement of the three new species described in this paper in their respective genera, i.e. *Icius jacksoni* sp. nov., *Menemerus foordi* sp. nov. and *Natta triguttata* sp. nov. (Fig. 2). As such, we show that even a single gene (COI) can provide valuable information regarding the monophyly of genera and the placement of new species described therein.

Taxonomy

Family Salticidae Blackwall, 1841

***Afraflacilla matabelensis* (Wesołowska, 2011), comb. nov.**

Pseudicius matabelensis Wesołowska, 2011: 338, figs 73–78.

Material examined. South Africa • Northern Cape Province; 2♂; Upington, Duine-in-die-Weg Guest Farm; -28.57, 21.77; 840 m a.s.l.; 24 Oct 2017; H. Badenhorst leg.; hand collecting; NCA 2020/18 • 1♀; same collection data as for preceding; -28.58, 21.78, 875 m a.s.l.; NCA 2020/21 • 1♂; Namaqua National Park,

Koeroebees; -30.1447, 17.7029; 240 m a.s.l.; 27 Mar 2022, C. Haddad et al. leg.; beating shrubs, dry river bed; NMBA 18564.

Distribution. A species described from Zimbabwe (Wesołowska 2011) and recently recorded from the KwaZulu-Natal and Northern Cape provinces of South Africa (Dippenaar-Schoeman et al. 2023). Recorded from two additional localities in the latter province here, indicating a broad distribution in southern Africa.

Helafricanus modicus (G. W. Peckham & E. G. Peckham, 1903)

Heliophanus modicus Peckham & Peckham, 1903: 193, pl. 20, fig. 2; Wesołowska 1986: 25, figs 215–225.
Helafricanus modicus Wesołowska 2024: 82.

Material examined. South Africa • Western Cape Province; 1♀, together with 1♂ *H. patellaris*; Laingsburg District, Wagendrift Lodge; 33°22.782'S, 20°56.566'E; 510 m a.s.l.; 22 Jan 2021; C. Haddad et al. leg.; hand collecting, in garden; NCA 2021/148.

Distribution. A species previously known from Madagascar (Wesołowska 1986), Lesotho (Wesołowska and Haddad 2014) and the Eastern Cape, Free State and Western Cape provinces of South Africa (Dippenaar-Schoeman et al. 2023; World Spider Catalog 2024).

Helafricanus patellaris (Simon, 1901)

Heliophanus patellaris Simon, 1901a: 541, fig. 667; Simon 1901b: 58, fig. 11; Wesołowska 1986: 22, figs 163–175; Wesołowska and Haddad 2014: 242, figs 30, 31, 49–55.
Helafricanus patellaris Wesołowska 2024: 81, fig. 1A–H.

Material examined. South Africa • Northern Cape Province; 1♂; Alexander Bay; 28°35'S, 16°29'E; 1 Nov 1970; M. Meyer leg.; hand collection; NCA 78/1688 • Western Cape Province • 1♂, together with 1♀ *H. modicus*; Laingsburg District, Wagendrift Lodge; 33°22.782'S, 20°56.566'E; 510 m a.s.l.; 22 Jan 2021; C. Haddad et al. leg.; hand collecting, in garden; NCA 2021/148.

Distribution. A species previously known from Lesotho (Wesołowska and Haddad 2014) and all the South African provinces, excluding Limpopo and North West (Dippenaar-Schoeman et al. 2023).

Heliocapensis capensis (Wesołowska, 1986)

Heliophanus capensis Wesołowska, 1986: 12, figs 12–17.
Heliocapensis capensis Wesołowska 2024: 84.

Material examined. South Africa • Northern Cape Province; 2♀; Nieuwoudtville, Farm Papkuilsfontein; 31°22'S, 19°06'E; 26 Aug 2008; A. Russell-Smith leg.; under shrubs; NCA 2016/28.

Distribution. A species previously known from several localities in the Northern and Western Cape in South Africa (Dippenaar-Schoeman et al. 2023).

Heliocapensis deserticola (Simon, 1901)

Heliophanus deserticola Simon, 1901b: 59, fig. 13; Wesołowska 1986: 12, figs 4–9; Prószyński 2017: 31, fig. 13H.
Heliocapensis deserticola Wesołowska 2024: 84.

Material examined. South Africa • Northern Cape Province; 1♀; Goegap Nature Reserve, Reception Office; 29°39.905'S, 17°59.827'E; 16 Jul 2017; R. Booysen leg.; beating; NCA 2017/1284 • 1♀; Namaqua National Park, Near Skilpad Rest Camp; -30.1661, 17.7685; 610 m a.s.l.; 28 Mar 2023; C. Haddad et al. leg.; leaf litter, north-facing hillside; NMBA 18551 • 1♀; Near Nababeep, Jakkalswater Guest Farm; 29°37'S, 17°48'E; 910 m a.s.l.; 22 Aug 2020; P. Webb leg.; hand collecting; NCA 2021/1224.

Distribution. Previously recorded from the Eastern Cape, Northern Cape and Mpumalanga provinces of South Africa (Dippenaar-Schoeman et al. 2023).

Heliocapensis maluti (Wesołowska & Haddad, 2014)

Fig. 3A, D

Heliophanus maluti Wesołowska & Haddad, 2014: 241, figs 28, 29, 41–47.
Heliocapensis maluti Wesołowska 2024: 84.

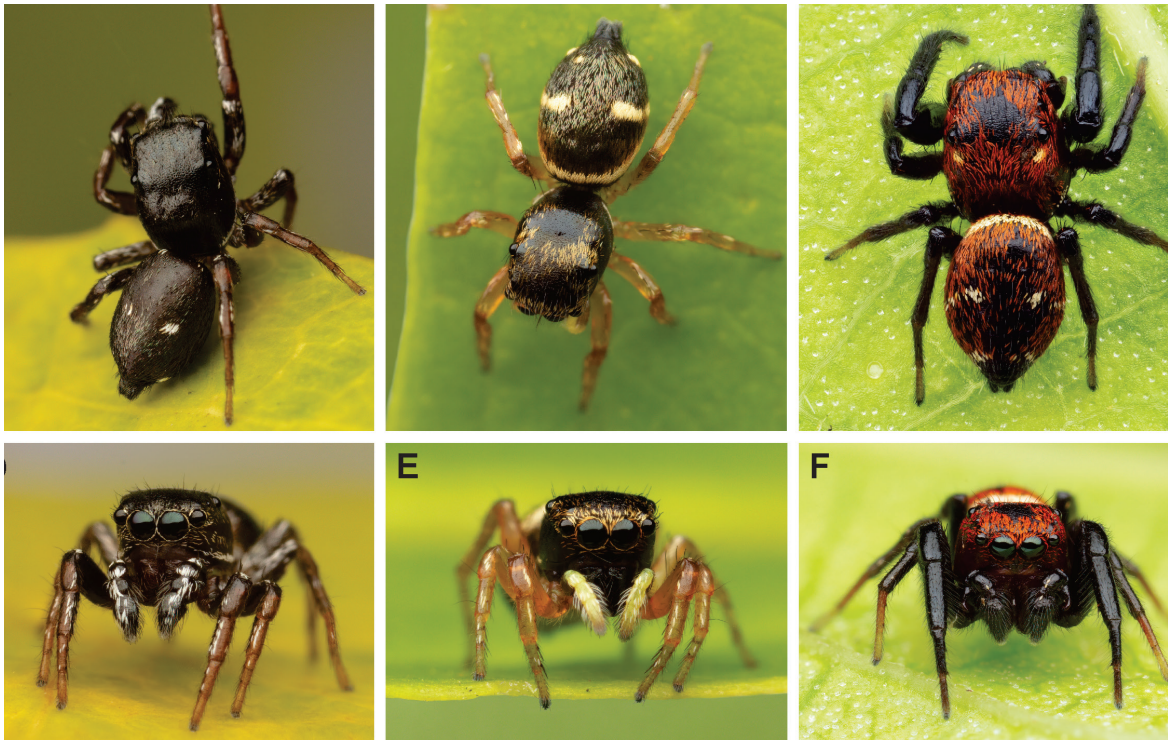

Figure 3. Dorsal habitus (**A–C**) and anterior view (**D–F**) of living *Heliocapensis maluti* Wesołowska & Haddad, 2014 male (**A, D**), *H. mirabilis* (Wesołowska, 1986) female (**B, E**) and *Heliophanus deformis* Wesołowska, 1986 male (**C, F**).

Material examined. South Africa • Northern Cape Province; 1♂; Namaqua National Park, Koeroebees; 30°08.683'S, 17°42.177'E; 240 m a.s.l.; 14 Jan 2021; C. Haddad et al. leg.; beating short shrubs, dry river bed; NCA 2021/740 • 1♂; same collection data as for preceding; NMBA 19849.

Description. See Wesołowska and Haddad (2014) for a description of both sexes. General appearance of live male as in Fig. 3A, D.

Distribution. A species previously known only from the montane enclave of Lesotho, recorded from South Africa for the first time (Wesołowska and Haddad 2014; Dippenaar-Schoeman et al. 2023).

***Heliocapensis mirabilis* (Wesołowska, 1986)**
Figs 3B, E, 4, 5

Heliophanus mirabilis Wesołowska, 1986: 14, figs 50–53; Haddad and Wesołowska 2013: 480, figs 44–47, 53.
Heliocapensis mirabilis Wesołowska 2024: 85.

Material examined. South Africa • Northern Cape Province; 1♂ 5♀; Richtersveld National Park, Halfmens Pass; 28°07.789'S, 16°57.667'E; 235 m a.s.l.; 8 Jan 2021; C. Haddad et al. leg.; leaf litter, open plain; NCA 2021/292 • 2♀; same collection data as for preceding; NCA 2021/304 • 2♂ 3♀; same locality; 10 Jul 2021; C. Haddad et al. leg.; beating short shrubs, open plain; NCA 2021/414 • 4♀; Richtersveld National Park, near Akkedis Pass; 28°07.884'S, 16°59.700'E; 330 m a.s.l.; 6 Jan 2021; C. Haddad et al. leg.; beating, karooid bushes; NCA 2024/17 • 1♀; Richtersveld National Park, Near Hand of God; 28°05.874'S, 16°58.736'E; 35 m a.s.l.; 6 Jan 2021; C. Haddad et al. leg.; hand collecting, under rocks; NCA 2021/66 • 3♂ 3♀ Richtersveld National Park, SE of Akkedis Pass; 28°11.123'S, 17°02.543'E; 535 m a.s.l.; 7 Jul 2021; C. Haddad et al. leg.; leaf litter, dry river bed; NCA 2021/354 • 1♂ 1♀; same collection data as for preceding; NCA 2021/389 • 7♀; same collection data as for preceding; 7 Jan 2021; NCA 2021/279 • 1♀; same collection data as for preceding; NCA 2021/267 • 4♂; same collection data as for preceding; NCA 2021/280 • 5♀ (together with 1♂ *Heliophanus deformis*); Richtersveld National Park, Site 3 near Akkedis Pass; 28°07.882'S, 16°59.700'E; 330 m a.s.l.; 6 Jan 2021; C. Haddad et al. leg.; beating, karooid bushes; NCA 2021/471 • 1♀; Richtersveld National Park, Sendelingsdrif Camp, 28°07.496'S, 16°53.445'E; 40 m a.s.l.; 8 Jan 2021; C. Haddad & R. Booysen leg.; hand collecting at night; NCA 2021/34.

Diagnosis of female. The female can be distinguished from its congeners by the course of the seminal ducts, which initially run anteriorly from the epigynal depressions (Fig. 5E), while posteriorly in other species.

Description. For description of the male, see Haddad and Wesołowska (2013). General appearance of male in alcohol as in Fig. 4A, B; palpal organ in Figs 4C–E, 5A–C.

Female: Measurements: Cephalothorax length 1.6–1.8, width 1.1–1.2, height 0.5–0.6. Abdomen length 1.6–2.5, width 1.1–1.7. Eye field length 0.6, anterior width 1.0, posterior width 1.1. General appearance of live female as in Fig. 3B, E, of female in alcohol in Fig. 4F. Carapace dark brown, clothed in yellowish-grey scale-like hairs, eye field black, amongst scales some long brown bristles. Mouthparts and sternum dark brown. Abdomen black, covered with

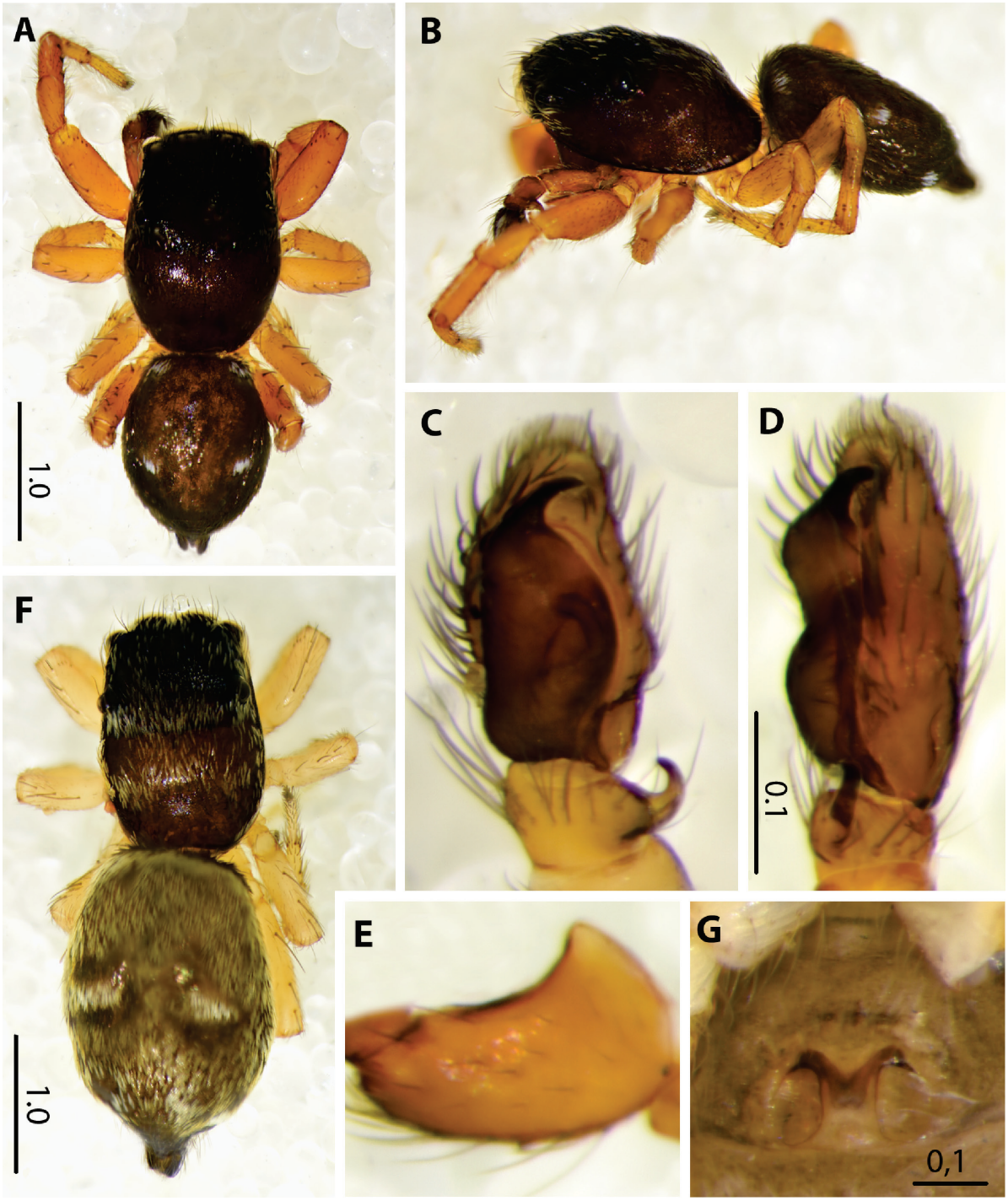

Figure 4. *Heliocapensis mirabilis* (Wesołowska, 1986), male (**A–E**) and female (**F, G**): **A, F** general appearance, dorsal view **B** same, lateral view **C** palpal organ, ventral view **D** same, retrolateral view **E** palpal femur **G** epigyne, ventral view.

greyish scales, pair of diagonal or rounded white spots at mid-point, some specimens also with single pair of small spots posteriorly. Venter dark grey, spinnerets black. Legs yellow. Epigyne with pair of large, rounded depressions (Figs 4G, 5D). Internal structure as in Fig. 5E.

Distribution. Species previously known from the Western Cape in South Africa (Dippenaar-Schoeman et al. 2023), recorded from the Northern Cape for the first time.

Remark. The female of this species is described here for the first time.

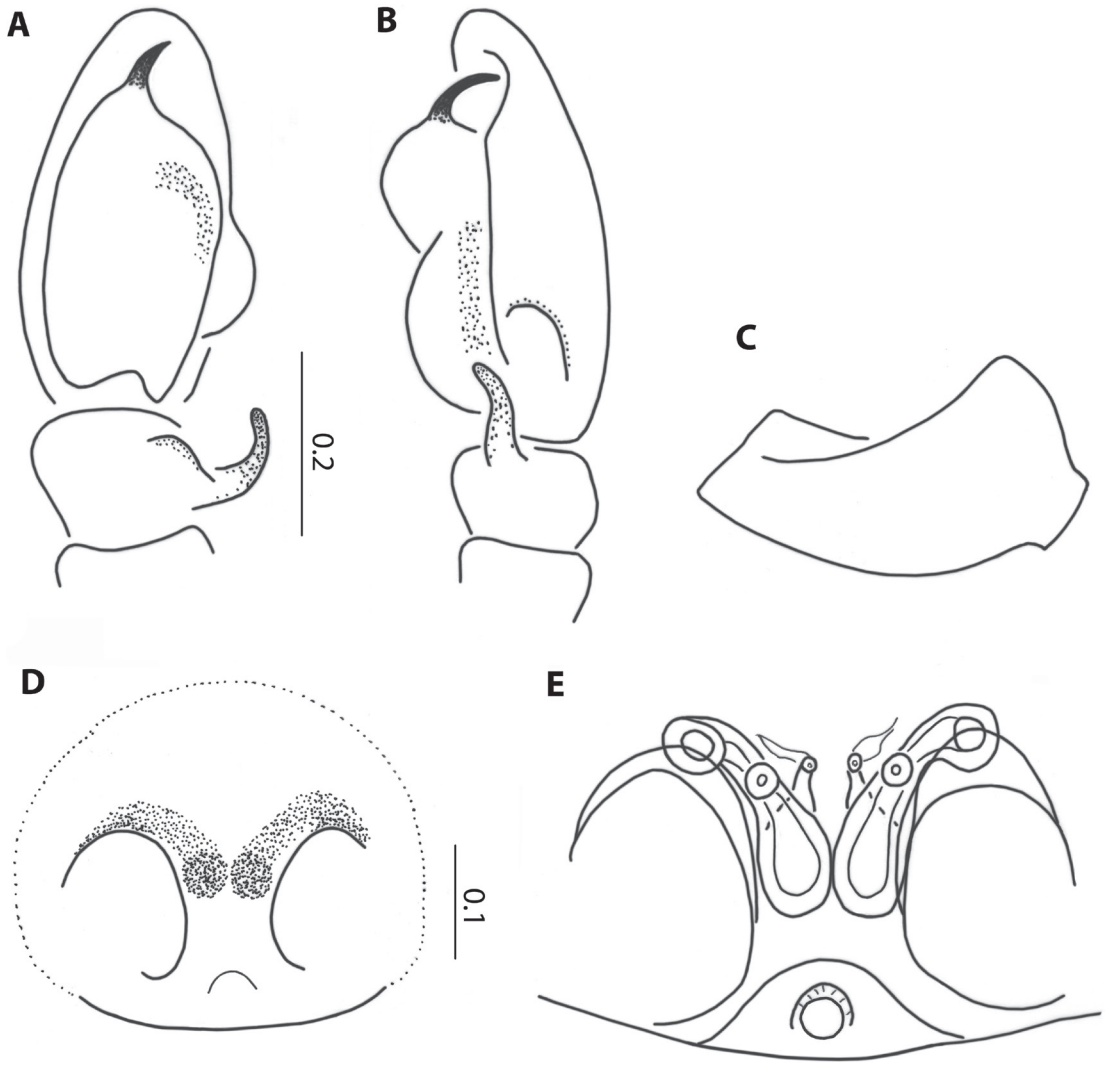

Figure 5. *Heliocapensis mirabilis* (Wesołowska, 1986), male (**A–C**) and female (**D, E**): **A** palpal organ, ventral view **B** same, retrolateral view **C** palpal femur **D** epigyne, ventral view **E** internal structure of epigyne.

***Heliocapensis redimitus* (Simon, 1910)**
Fig. 6

Heliophanus redimitus Simon, 1910: 216; Wesołowska 1986: 12, figs 10, 11.
Heliocapensis redimitus Wesołowska 2024: 85.

Material examined. South Africa • Northern Cape Province; 1♀; Goegap Nature Reserve; 29°41'18"S, 17°57'57"E; 16 Jul 2017; R. Booysen leg.; beating shrubs; NCA 2017/1284.

Re-description. Female: Measurements: Cephalothorax length 1.7, width 1.2, height 0.6. Abdomen length 2.2, width 1.5. Eye field length 0.7, anterior width 1.1, posterior width 1.2. General appearance in alcohol as in Fig. 6A. Carapace dark brown, clothed in whitish hairs and brown bristles, thin white line along lateral edges of carapace, eye field black, reticulate punctured, anterior eyes rounded by white scales. Sternum and mouthparts brown. Abdomen brown, covered with dark hairs, with thin white streak along anterior edge, pair of round white stains in middle of abdomen. Venter brownish, spinnerets black.

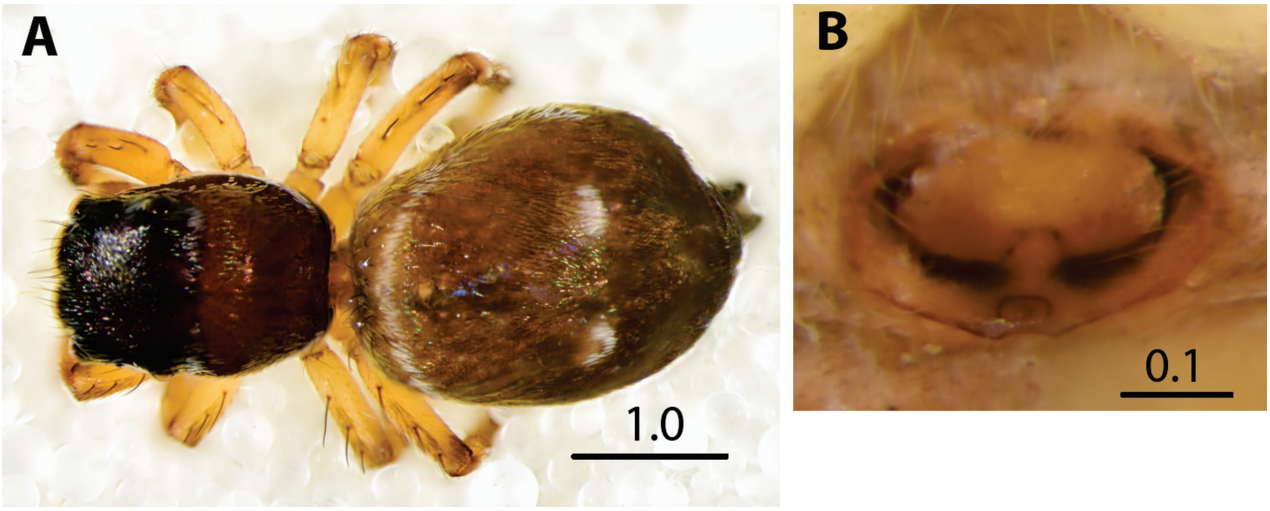

Figure 6. *Heliocapensis redimitus* (Simon, 1910), female: **A** general appearance of female, dorsal view **B** epigyne, ventral view.

Legs dark yellow, spines and hairs brown. Epigyne oval, wide and short, with large central depression (Fig. 6B). Copulatory openings placed laterally, at borders of depression, internal structure simple (see fig. 11 in Wesołowska 1986).

Distribution. This species was previously known from the type locality, Komaggas (Wesołowska 1986; Haddad and Marusik 2019), approximately 45 km west of this recently collected specimen. This is only the second record of the species.

***Heliophanus deformis* Wesołowska, 1986**
Figs 3C, F, 7, 8

Heliophanus deformis Wesołowska, 1986: 226, figs 819–824.

Material examined. South Africa • Northern Cape Province; 1♀; Namaqua National Park, Skilpad; 30°09.868'S, 17°47.282'E; 730 m a.s.l.; 13 Jan 2021; C. Haddad et al. leg.; beating shrubs; NCA 2021/759 • 1♂ 3♀; Richtersveld National Park, Halfmens Pass; 28°07.789'S, 16°57.667'E; 235 m a.s.l.; 8 Jan 2021, C. Haddad et al. leg.; open area; NCA 2021/305 • 1♂ 1♀; same collection data as for preceding; NCA 2021/293 • 5♂ 1♀; same collection data as for preceding; 10 Jul 2021; NCA 2021/423 • 2♂; Richtersveld National Park, SE of Akkedis Pass; 28°11.123'S, 17°02.543'E; 535 m a.s.l.; 7 Jan 2021; C. Haddad et al. leg.; beating short shrubs; NCA 2021/283 • 1♂ same collection data as for preceding; 7 Jul 2021; NCA 2021/501 • 1♂ (together with 5♀ *Heliocapensis mirabilis*); Richtersveld National Park, Site 3 near Akkedis Pass; 28°07.882'S, 16°59.700'E; 330 m a.s.l.; 6 Jan 2021; C. Haddad et al. leg.; beating, karooid bushes; NCA 2021/47.

Re-description. Male: Cephalothorax length 1.5, width 1.3, height 0.8. Abdomen length 1.6, width 1.3. Eye field length 0.7, anterior and posterior width 1.0. General appearance of live male as in Fig. 3C, F, of male in alcohol Fig. 7A, B. Carapace brown, covered with dense reddish-orange scale-like hairs, white scales on lateral slopes and behind eye field, with long brown bristles near anterior eyes. Mouthparts and sternum brown. Abdomen also clothed in dense

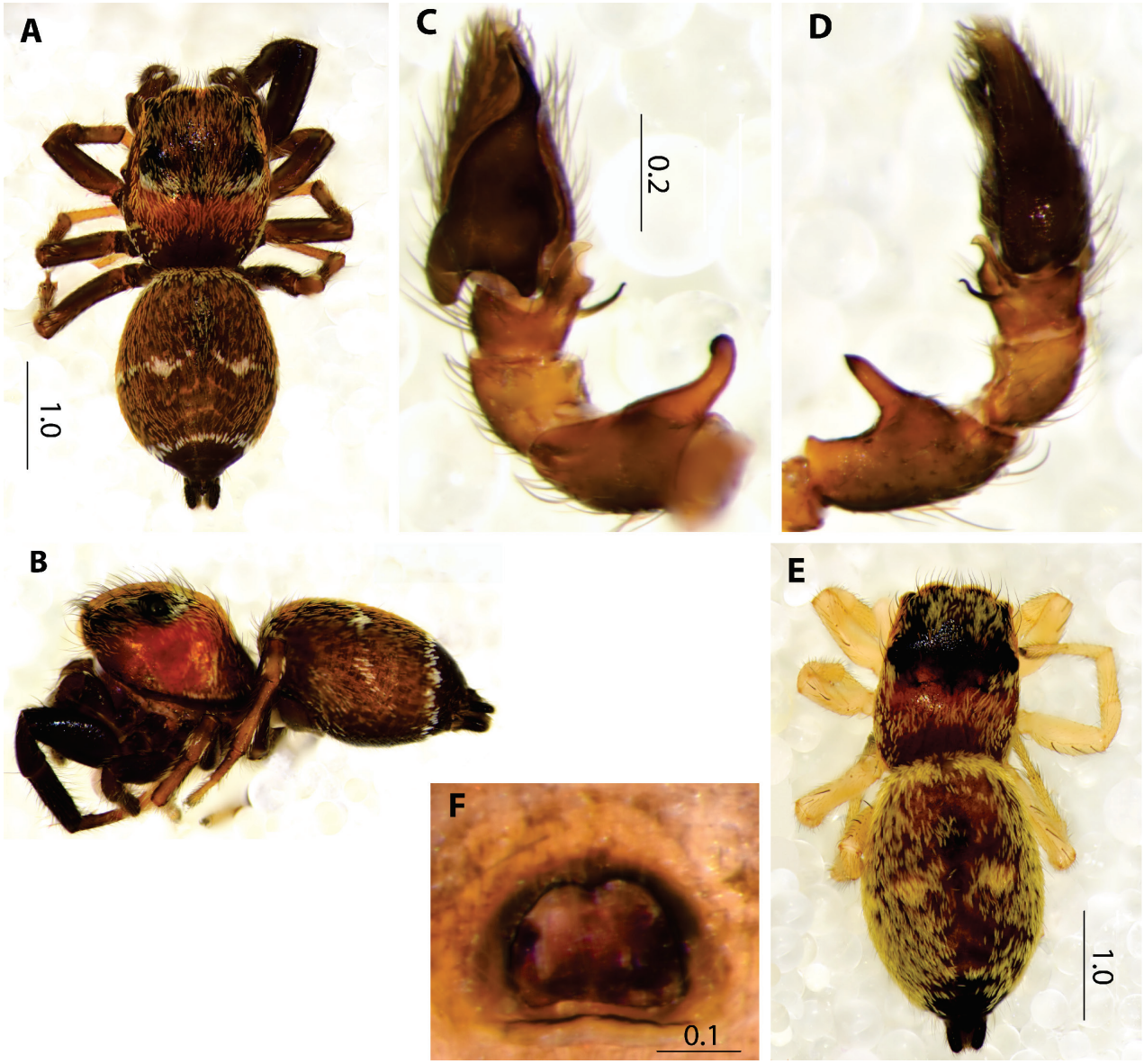

Figure 7. *Heliophanus deformis* Wesołowska, 1986, male (**A–D**) and female (**E, F**): **A, E** general appearance, dorsal view **B** same, lateral view **C** palpal organ, ventral view **D** same, retrolateral view **F** epigyne, ventral view.

reddish scales, with three narrow white streaks; first along anterior edge, second at middle and last near abdominal end. Posterior part of abdomen dark brown, without hairs, spinnerets black. Venter of abdomen brown. First pair of legs black, others brown with darker femora. Palps brown, some white scales on cymbium. Palpal organ as in Figs 7C, D, 8A–C, femur with large apophysis. Tibia with two apophyses, one of them very thin (Figs 7C, 8A).

Female: Cephalothorax length 1.5, width 1.3, height 0.6. Abdomen length 2.0, width 1.5. Eye field length 0.7, anterior and posterior width 1.0. General appearance as in Fig. 7E. Colouration similar to male, body clothed in dense golden orange scale-like hairs. No white scales on dorsum, but present on ventral surface of abdomen. Legs yellow. Epigyne with deep large heart-shaped depression (Figs 7F, 8D). Internal structure simple, as in Fig. 8E.

Distribution. A species previously only known from Angola (Wesołowska 1986); recorded from South Africa for the first time.

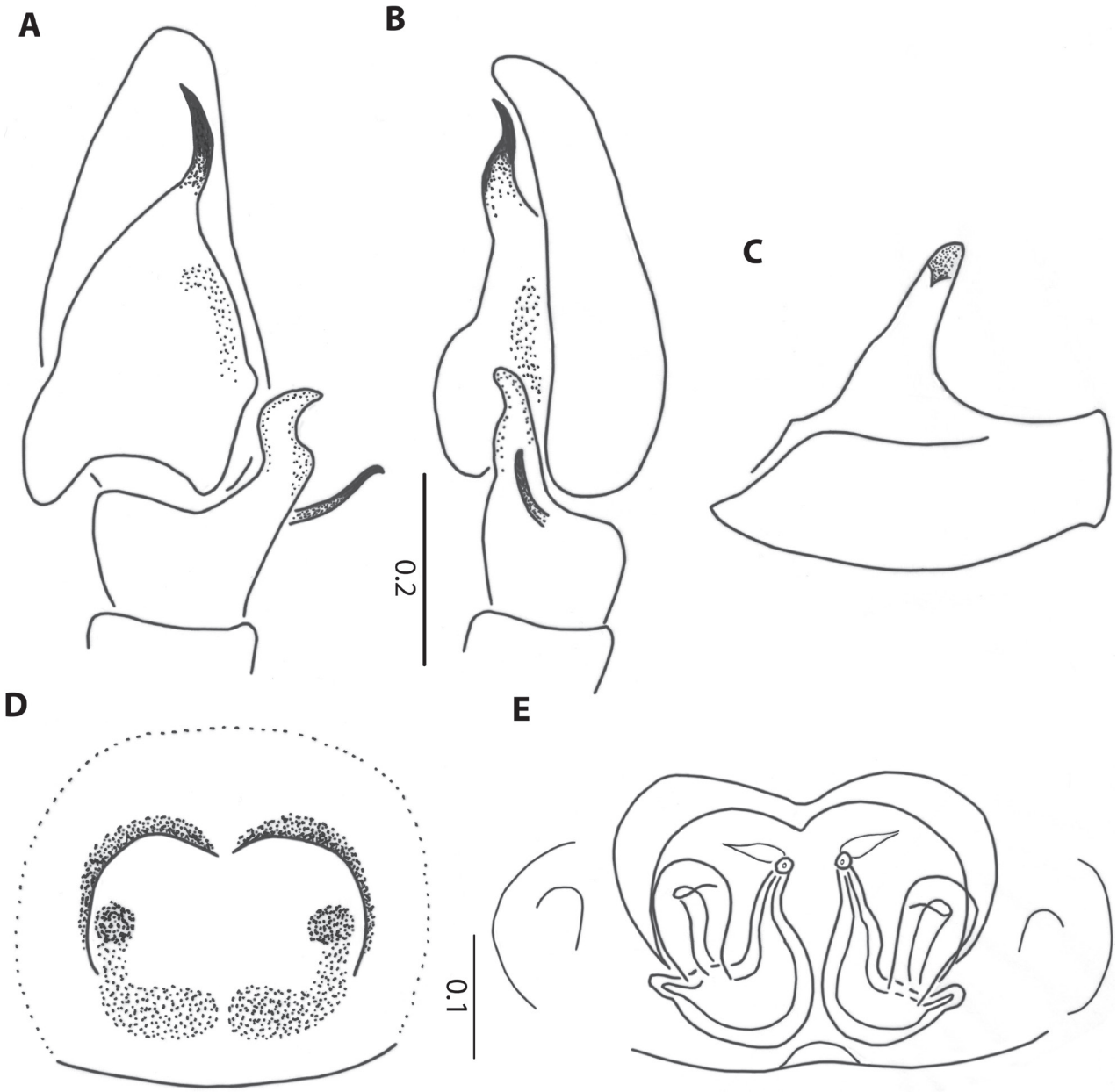

Figure 8. *Heliophanus deformis* Wesołowska, 1986, male (**A–C**) and female (**D, E**): **A** palpal organ, ventral view **B** same, lateral view **C** palpal femur **D** epigyne, ventral view **E** internal structure of epigyne.

***Icius insolidus* (Wesołowska, 1999)**
Fig. 9

Menemerus insolidus Wesołowska, 1999: 299, figs 158–161.
Icius insolidus Wesołowska 2006: 234, figs 43–52; Haddad and Wesołowska 2011: 75, figs 45–46, 55–56.

Material examined. South Africa • Northern Cape Province; 1♀; Calvinia, Akkerendam Nature Reserve; 31°24.896'S, 19°46.728'E; 1095 m a.s.l.; 16 Jan 2021; C. Haddad et al. leg.; leaf litter, dry river bed; NCA 2021/830 • 1♂; Same locality; 31°24.643'S, 19°46.077'E; 1235 m a.s.l.; 17 Jan 2021; C. Haddad et

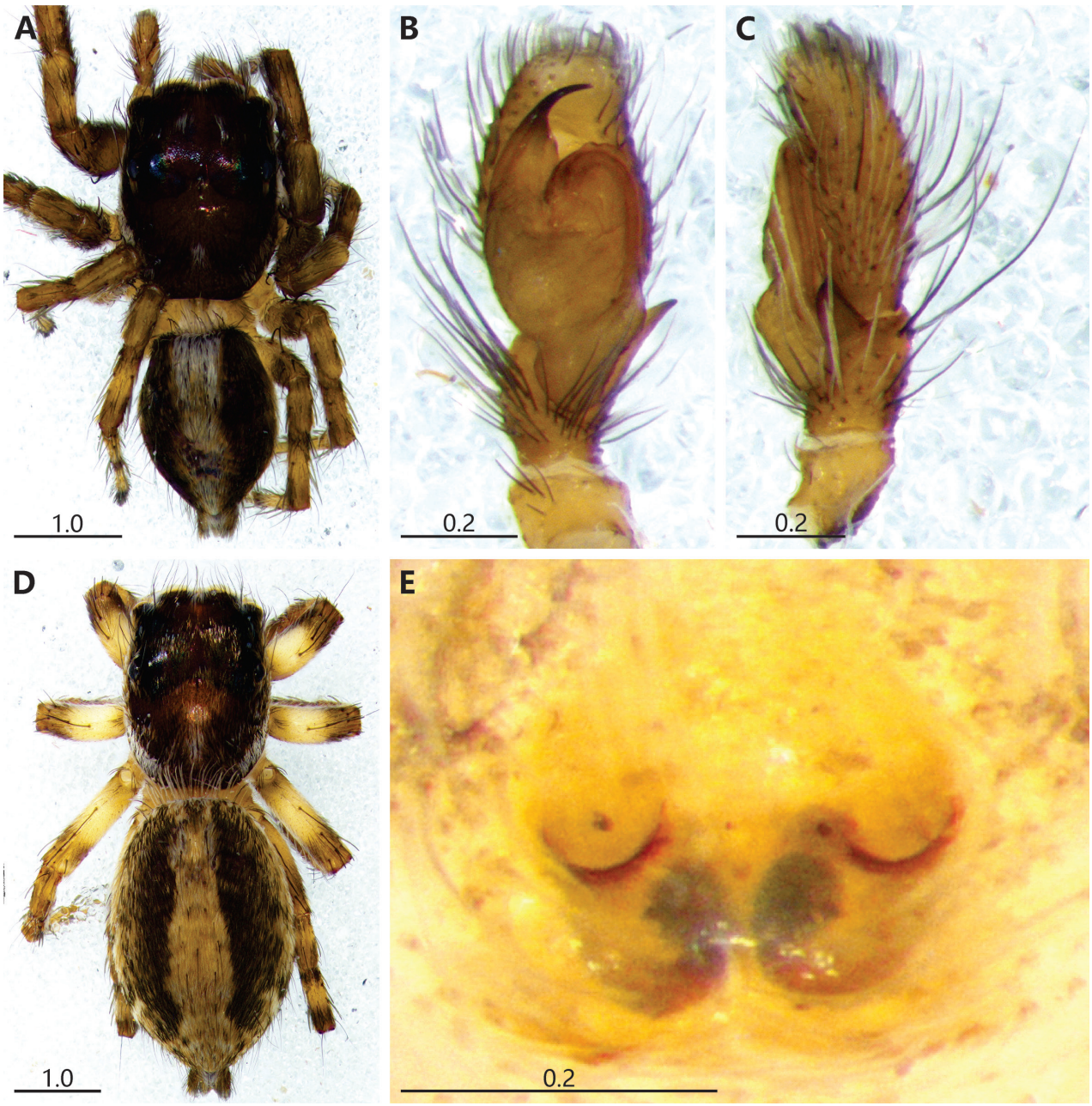

Figure 9. *Icius insolidus* (Wesołowska, 1999), male (**A–C**) and female (**D, E**): **A, D** general appearance, dorsal view **B** palpal organ, ventral view **C** same, retrolateral view **E** epigyne, ventral view.

al. leg.; beating shrubs, east-facing slope; NCA 2021/896 • 1♀; Kharkams, Kharkams High School; 30°21.665'S, 17°53.201'E; 735 m a.s.l. ; 5 Jul 2021; C. Haddad leg.; hand collecting, under rocks; NMBA 19882 • 1♀; Namaqua National Park, 1.7 km WSW of Skilpad Rest Camp; 30°10.044'S, 17°45.674'E; 575 m a.s.l.; 13 Jan 2021; C. Haddad et al. leg.; beating short shrubs, east-facing slope; NCA 2021/795 • 1♂; Namaqua National Park, Koeroebees; 30°08.683'S, 17°42.177'E; 240 m a.s.l.; Apr 2022; C. Haddad & R. Booysen leg.; hand collecting; NMBA 19921 • 1♀; Namaqua National Park, Skilpad Rest Camp; 30°09.802'S, 17°46.671'E; 725 m a.s.l.; 14 Jan 2021; C. Haddad & R. Booysen leg.; hand collecting, at night around houses; NCA 2021/78 • 1♀;

near Nigramoep, Skaaprivier Canyon; 29°33.130'S, 17°39.135'E; 690 m a.s.l.; 10 Jan 2021; C. Haddad et al. leg.; beating shrubs, river bed; NCA 2021/515 • 1♀; Nigramoep Slow Living Guest Farm; 29°31.869'S, 17°35.150'E; 745 m a.s.l.; 9 Jan 2021; C. Haddad et al. leg.; leaf litter, open plain; NCA 2021/532 • 1♀; Richtersveld National Park, Akkedis Pass; 28°10.772'S, 17°02.173'E; 600 m a.s.l.; 8 Jan 2021; C. Haddad et al. leg.; under rocks, west-facing slope; NCA 2021/342 • 1♀; Richtersveld National Park, Akkedis Pass; 28°10.673'S, 17°01.863'E; 540 m a.s.l.; 8 Jul 2021; C. Haddad et al. leg.; beating short shrubs, east-facing slope; NCA 2021/456 • 1♀; Richtersveld National Park, Akkedis Pass; 28°10.577'S, 17°02.069'E; 645 m a.s.l.; 9 Jul 2021; C. Haddad et al. leg.; under rocks, west-facing slope; NCA 2021/489 • 1♀; Tankwa Karoo National Park, Steenkampshoek; 32°16.737'S, 20°09.622'E; 860 m a.s.l.; 19 Jan 2021; C. Haddad et al. leg.; leaf litter, east-facing slope; NCA 2021/996 • 1♂ 1♀; 12 miles W of Upington; 28°27'S, 21°15'E; 12 Apr 1970; B. Lamoral leg.; NMSA 26500 • Western Cape Province; 1♂; Laingsburg District, Wagendrift Lodge; 33°22.446'S, 20°54.247'E; 580 m a.s.l.; 6 Oct 2015; Z. Mbo leg.; hand collecting, under rocks; NCA 2016/2692 • 1♀; Same locality; 33°22.943'S, 20°54.711'E; 530 m a.s.l.; 5 Oct 2015; Z. Mbo leg.; hand collecting, under rocks; NCA 2016/2703 • 3♀; Same locality; 33°22.861'S, 20°56.910'E; 520 m a.s.l.; 22 Jan 2021; C. Haddad et al. leg.; hand collecting, under rocks in veld; NCA 2021/134.

Description. For description of male, see Wesołowska (2006); for female, see Wesołowska (1999). General appearance of male in alcohol in Fig. 9A, palp in ventral and retrolateral views in Fig. 9B, C, respectively; general habitus of female in Fig. 9D, ventral epigyne in Fig. 9E.

Distribution. A common species widespread in South Africa, having been recorded from all the provinces except the Western Cape (Dippenaar-Schoeman et al. 2023), from which it is recorded here for the first time.

***Icius jacksoni* sp. nov.**

https://zoobank.org/89040F85-2AC6-48BA-9B1D-265D0E26BE93

Figs 10, 11

Material examined. ***Holotype:*** South Africa • ♂; Northern Cape Province; Richtersveld National Park, Sendelingsdrift camp; 28°07.494'S, 16°35.454'E; 40 m a.s.l.; 8 Jan 2021; C. Haddad & R. Booysen leg.; hand collecting; NCA 2021/28.

Diagnosis. This species has a male palp similar to that of *Icius hamatus* (C.L. Koch, 1846), but differs in the absence of the anterior lobe of the bulb at the base of the embolus (present in *I. hamatus*), as well as the notch between the two branches of the apophysis, which is V-shaped in *I. jacksoni* sp. nov., while U-shaped in *I. hamatus* (cf. Fig. 10B with fig. 2 in Andreeva et al. 1984). *Icius jacksoni* (Fig. 10B) also differs by the shape of the tibial apophysis from *I. pulchellus* Haddad & Wesołowska, 2011 (fig. 61 in Haddad and Wesołowska 2011) and *I. minimus* Wesołowska & Tomasiewicz, 2008 from Ethiopia (fig. 73 in Wesołowska and Tomasiewicz 2008). *Icius jacksoni* sp. nov. is one of the smallest species in the genus.

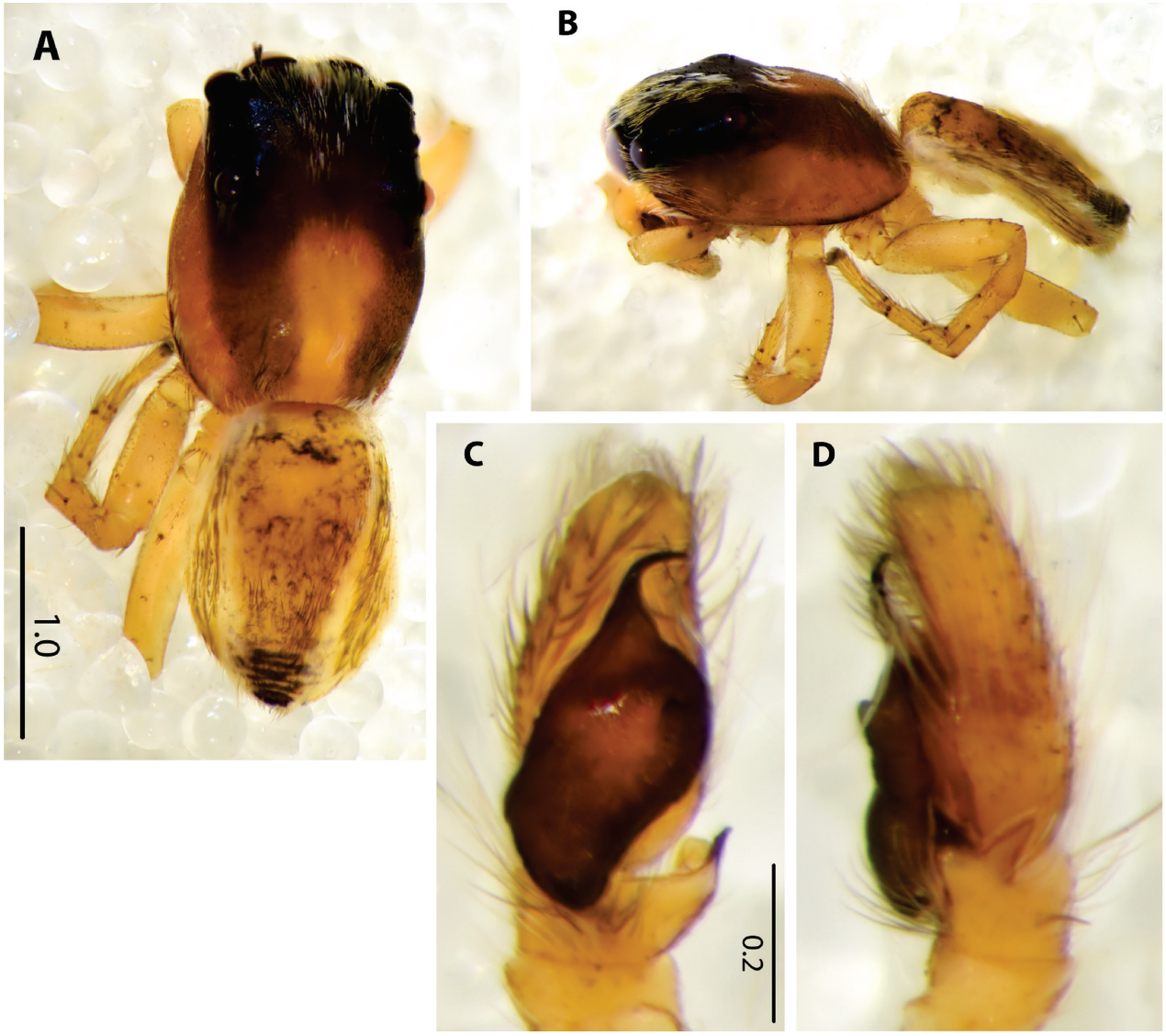

Figure 10. *Icius jacksoni* sp. nov., male, holotype: **A** general appearance, dorsal view **B** same, lateral view **C** palpal organ, ventral view **D** same, retrolateral view.

Description. Male: Measurements: Cephalothorax length 1.7, width 1.3, height 0.6. Abdomen length 1.3, width 1.1. Eye field length 0.8, anterior width 1.1, posterior width 1.2. General appearance in alcohol as in Fig. 10A, B, diminutive spider. Carapace light brown with two darker streaks on thoracic part, eye field black, clothed in white hairs. Anterior median eyes surrounded by white hairs from bottom, clypeus also with white hairs. Mouthparts light brown, sternum yellow. Abdomen oval, brownish, with two thin white strips laterally, sides brownish with light marks, end of abdomen blackish, venter and spinnerets light yellow. Legs yellow. Palpal organ as in Figs 10C, D, 11A, B, bulb oval, embolus short, tibial apophysis wide, with deep V-shaped notch.

Female: Unknown.

Etymology. This species is named for Robert Jackson, in recognition of his unparalleled contribution to our understanding of jumping spider biology over a career spanning five decades.

Distribution. Only known from the type locality.

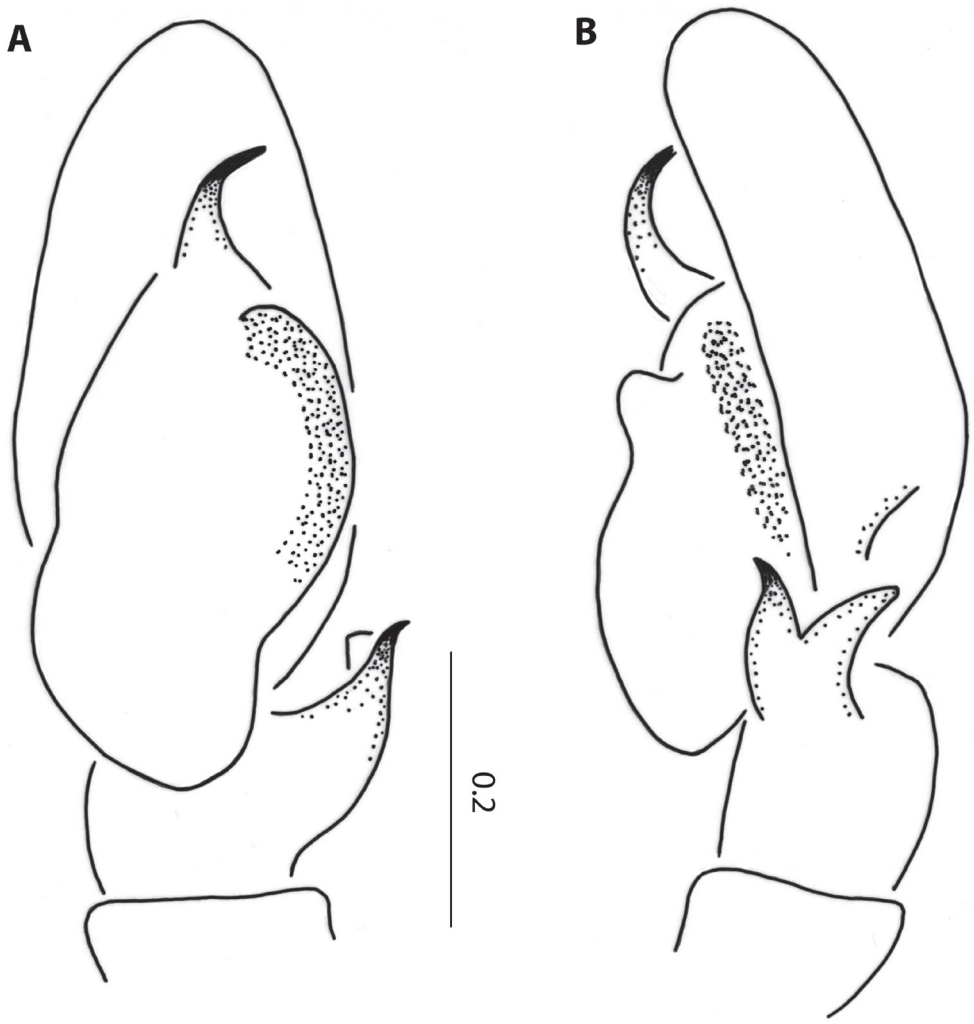

Figure 11. *Icius jacksoni* sp. nov., male, holotype: **A** palpal organ, ventral view **B** same, lateral view.

***Icius pulchellus* Haddad & Wesołowska, 2011**
Figs 12A, B, D, E, 13, 14

Icius pulchellus Haddad & Wesołowska, 2011: 76, figs 47 and 57–62.

Material examined. South Africa • Northern Cape Province; 2♀; Namaqua National Park, 2.7 km W of Koeroebees; 30°08.683'S, 17°42.177'E; 345 m a.s.l.; 14 Jan 2021; C. Haddad et al. leg.; beating short shrubs; NCA 2021/814 • 3♂ 8♀; Tankwa Karoo National Park, Paulshoek; 32°16.556'S, 20°06.626'E; 500 m a.s.l.; 20 Jan 2021; C. Haddad et al. leg.; beating shrubs, open plain; NCA 2021/976 • 2♂ 3♀; Tankwa Karoo National Park, Tankwa River; 32°24.598'S, 20°20.215'E; 375 m a.s.l.; 20 Jan 2021; C. Haddad et al. leg.; beating shrubs, river bed; NCA 2021/962.

Diagnosis of female. The female of this species has an epigyne somewhat similar to that in *Icius minimus* but has the spermathecae placed parallel to the posterior edge of the epigyne, while in *I. minimus* they lie obliquely (compare Fig. 14B with fig. 81 in Wesołowska and Tomasiewicz 2008). These species also differ in carapace colour: in *I. minimus*, white hairs create a cross pattern in the eye field (fig. 78 in Wesołowska and Tomasiewicz 2008), while *I. pulchellus* has a dark eye field (Fig. 13D–G).

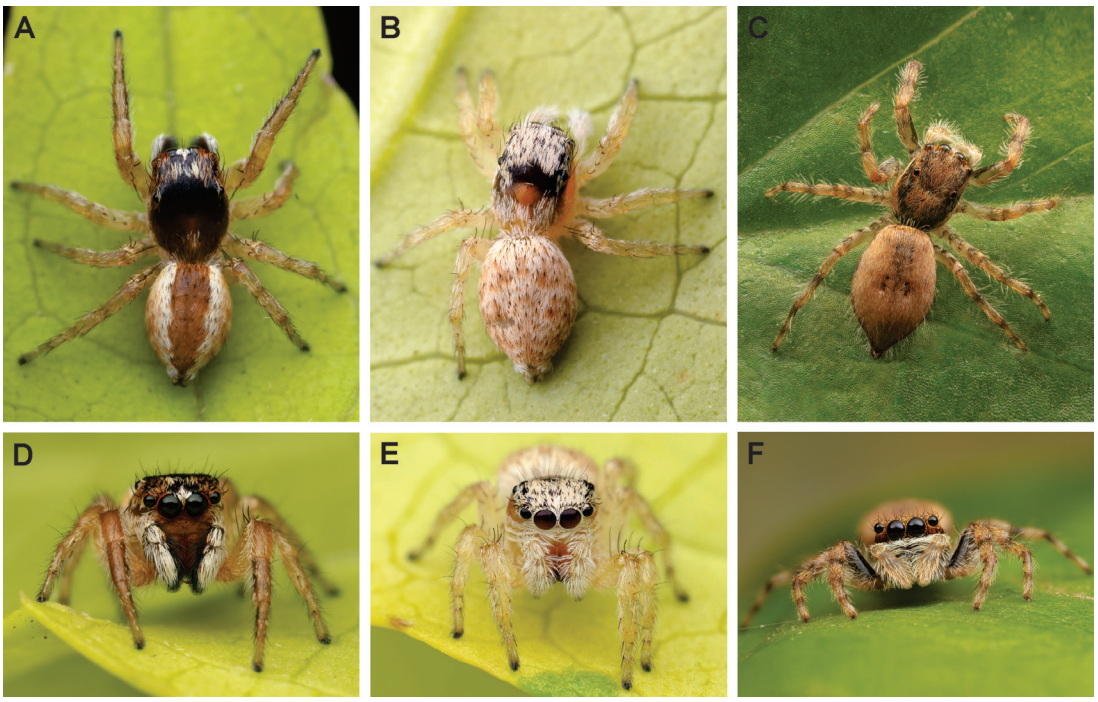

Figure 12. Dorsal habitus (**A–C**) and anterior view (**D–F**) of living *Icius pulchellus* Haddad & Wesołowska, 2013 female (**A, D**) and male (**B, E**) and *Menemerus foordi* sp. nov. subadult male (**C, F**).

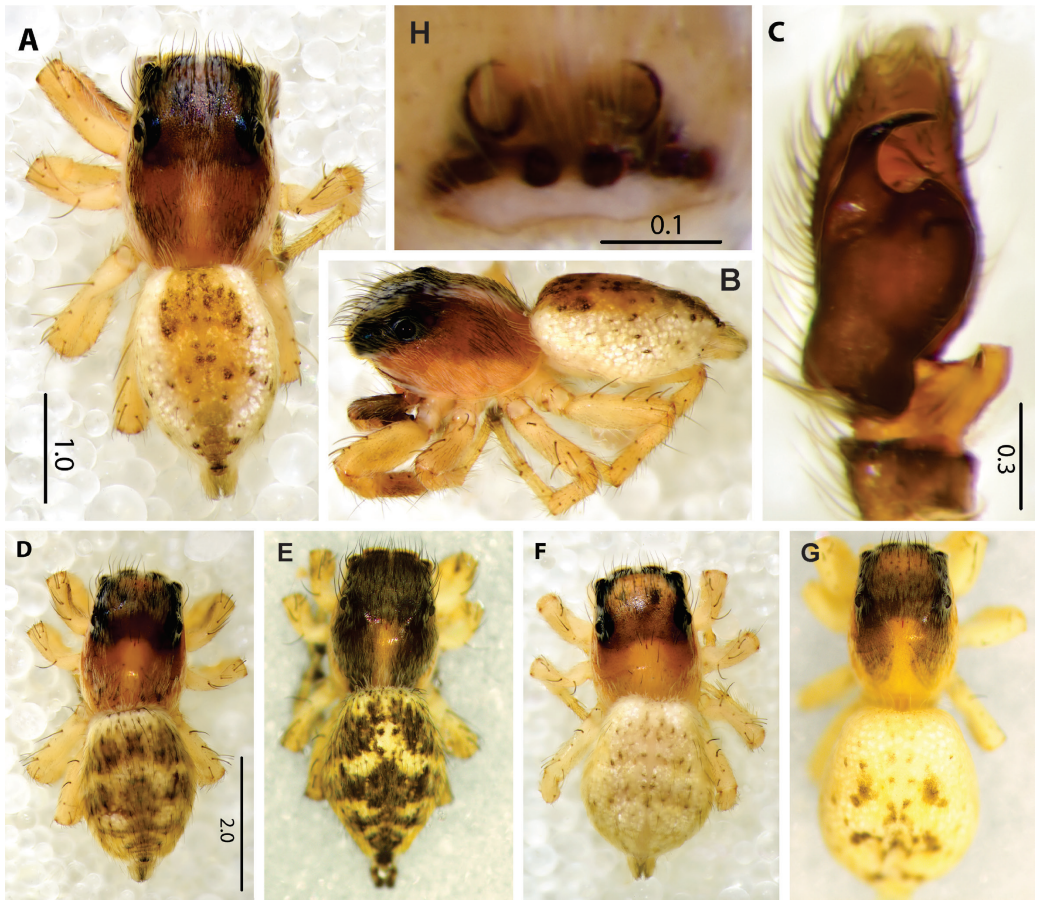

Figure 13. *Icius pulchellus* Haddad & Wesołowska, 2011, male (**A–C**) and female (**D–H**): **A, D–G** general appearance, dorsal view **B** same, lateral view **C** palpal organ, ventral view **H** epigyne, ventral view **D, E** are dark variants of the female and **F, G** are pale variants.

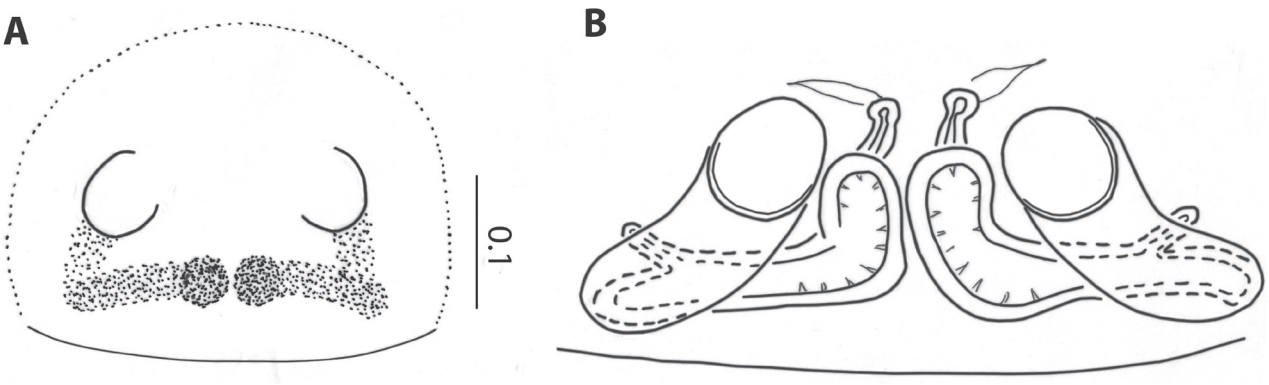

Figure 14. *Icius pulchellus* Haddad & Wesołowska, 2011, female: **A** epigyne, ventral view **B** internal structure of epigyne.

Description. Male: See Haddad and Wesołowska (2011). General appearance of living male as in Fig. 12A, D, in alcohol as in Fig. 13A, B; palpal organ as in Fig. 13C.

Female: Measurements: Cephalothorax length 2.0–2.4, width 1.4–1.7, height 0.8–0.9. Abdomen length 2.3–2.7, width 1.6–1.9. Eye field length 0.8–0.9, anterior width 1.1–1.2, posterior width 1.3–1.4. General appearance of living female as in Fig. 12B, E, in alcohol as in Fig. 13D–G. Carapace brown, with lighter median streak on thoracic part, lateral sides dark yellow, eye field black. Dense light grey hairs on carapace, amongst them long brown bristles, more numerous on eye field. Chelicerae unidentati, light brown. Sternum, labium and endites yellow. Abdomen ovoid, yellow, with leaf-shaped brownish pattern (Fig. 13D, E). In some specimens, abdomen light, creamy-yellow (Fig. 13F), sometimes with brownish marks (Fig. 13G). Venter covered with silver spots (translucent guanine). Spinnerets light. Legs yellow, their hairs faint, spines long, brown. Epigyne short and wide (Figs 13H, 14A). Copulatory openings large, widely separated. Internal structure simple (Fig. 14B), seminal ducts tubuliform, spermathecae elongated, accessory glands present.

Distribution. Species previously known only from the Free State Province, recorded from the Northern Cape for the first time based on this material (Dippenaar-Schoeman et al. 2023).

Remark. The female of this species is described here for the first time.

***Menemerus foordi* sp. nov.**

https://zoobank.org/F94D1325-B96D-41DC-8D4E-9D51E8AA8622

Figs 12C, F, 15, 16

Material examined. ***Holotype:*** South Africa • ♂; Northern Cape Province; Richtersveld National Park, Kokerboomkloof; 28°18.434'S, 17°17.476'E; 15 Sep 1994; A. Leroy leg.; on grass; NCA 2007/2503.

Other material. South Africa • Northern Cape Province; 1 subadult ♂; Richtersveld National Park, Akkedis Pass; 28°10.577'S, 17°02.069'E; 645 m a.s.l.; 9 Jul 2021; C. Haddad et al. leg.; under rocks, west-facing slope; NMBA 19095.

Diagnosis. The palpal organ of this species is similar to that of *Menemerus lesnei* Lessert, 1936 but differs by the presence of a ventral apophysis (absent in *M. lesnei*), narrower retrolateral apophysis and the shape of the embolus (with small membranous conductor in *M. foordi* sp. nov., while with a distal lamella in *M. lesnei*). Compare Fig. 16A with fig. 162 in Wesołowska (1999).

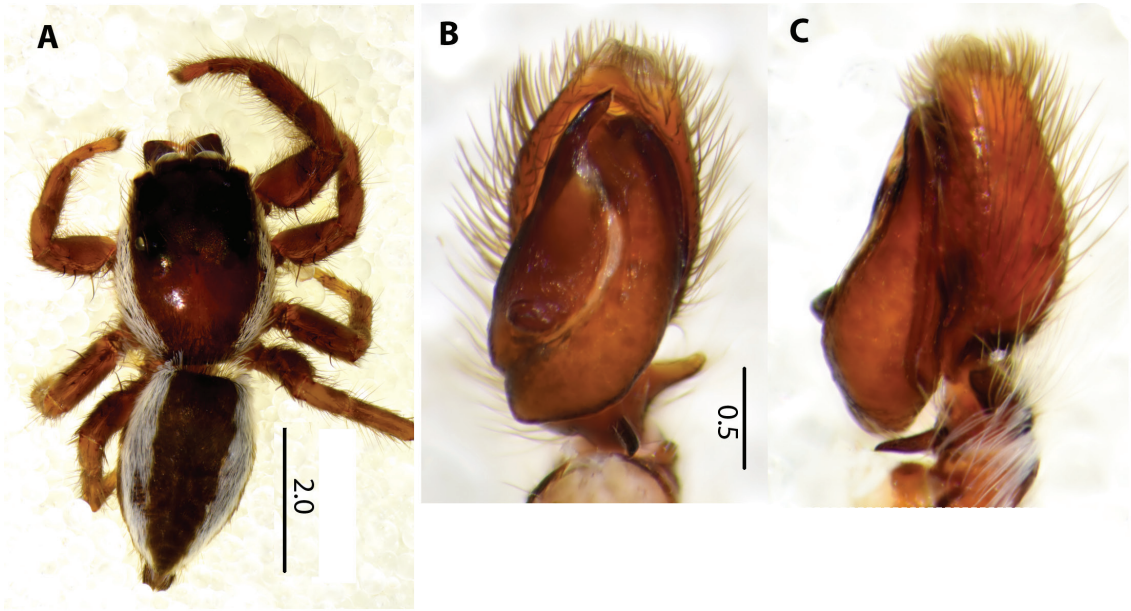

Figure 15. *Menemerus foordi* sp. nov., male, holotype: **A** general appearance of male **B** palpal organ, ventral view **C** same, retrolateral view.

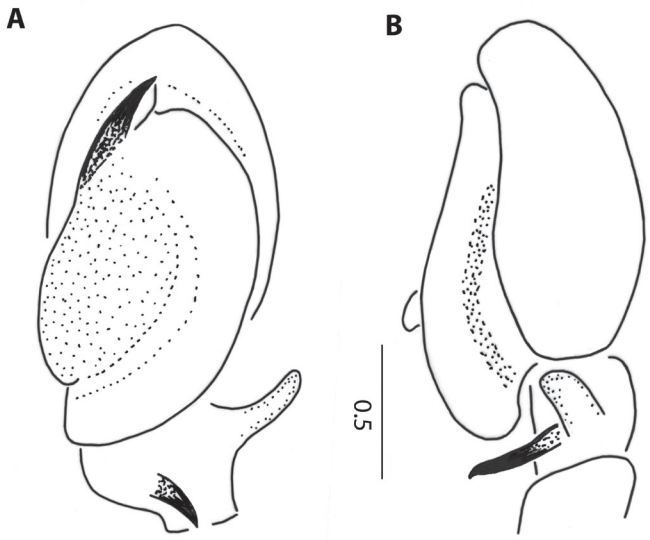

Figure 16. *Menemerus foordi* sp. nov., male, holotype: **A** palpal organ, ventral view **B** same, retrolateral view.

Description. Male: Measurements: Cephalothorax length 2.8, width 2.2, height 1.0. Abdomen length 2.8, width 1.7. Eye field length 1.2, anterior width 1.6, posterior width 1.8. General appearance of live subadult male as in Fig. 12C, F, of adult male in alcohol as in Fig. 15A. Carapace dark brown, eye field black, with wide streaks composed of white hairs along lateral margins. Clypeus with white hairs. Mouthparts dark brown, only tips of endites pale. Sternum dark brown. Abdomen black, with broad white streaks laterally, venter dark brown, spinnerets black. Legs brown, hairy. Palps dark brown, femur and tibia clothed in white hairs. Palpal tibia with two long apophyses; retrolateral blunt and ventral sharpened (Figs 15B, C, 16A, B). Bulb oval, tegular furrow wide, embolus short, with small membranous functional conductor (Figs 15B, 16A).

Female: Unknown.

Etymology. The new species is a patronym in honour of the late Stefan Hendrik Foord, in recognition of his distinguished career and contributions to the development of arachnology in Africa.

Distribution. Only known from the type locality.

***Menemerus lesserti* Lawrence, 1927**

Figs 17A, B, D, E, 18, 19

Menemerus lesserti Lawrence, 1927: 60, pl. 2, fig. 45; Wesołowska 1999: 302, figs 171–176.

Material examined. South Africa • Northern Cape Province; 1♂; Richtersveld National Park, near Hand of God; 28°05.874'S, 16°58.736'E; 35 m a.s.l.; 6 Jan 2021; C. Haddad et al. leg.; hand collecting, under rocks; NCA 2021/64 • 2♀; Richtersveld National Park, Research Accommodation; 28°07.122'S, 16°53.480'E; 9 Jul 2021; C. Haddad & R. Booysen leg.; on rocky outcrop, hand collection; NCA 2021/190 • 1♀; same collection data as for preceding; NCA 2021/168 • 1♀; same collection data as for preceding; NMBA 19844 • 1♂; same collection data as for preceding; NMBA 19845.

Diagnosis of male. The palpal organ of this species is similar to that of *Menemerus meridionalis* Wesołowska, 1999, as both share a similar shape of the tibia, but it can be distinguished by a more robust ventral apophysis, clearly longer embolus and the shape of retrolateral apophysis, which is triangular in *M. lesserti* while rounded in *M. meridionalis* (cf. Fig. 19A, B with fig. 188 in Wesołowska 1999).

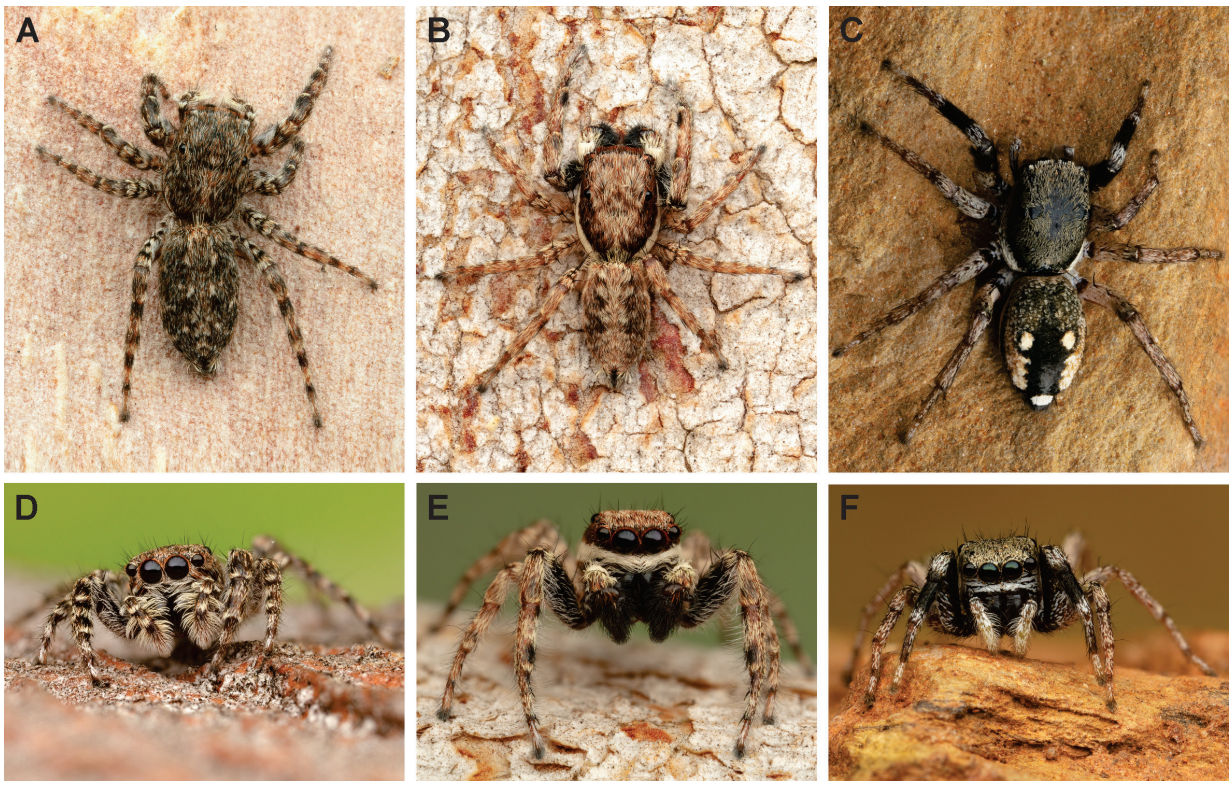

Figure 17. Dorsal habitus (**A–C**) and anterior view (**D–F**) of living *Menemerus lesserti* Lawrence, 1927 female (**A, D**) and male (**B, E**) and *Natta triguttata* sp. nov. female (**C, F**).

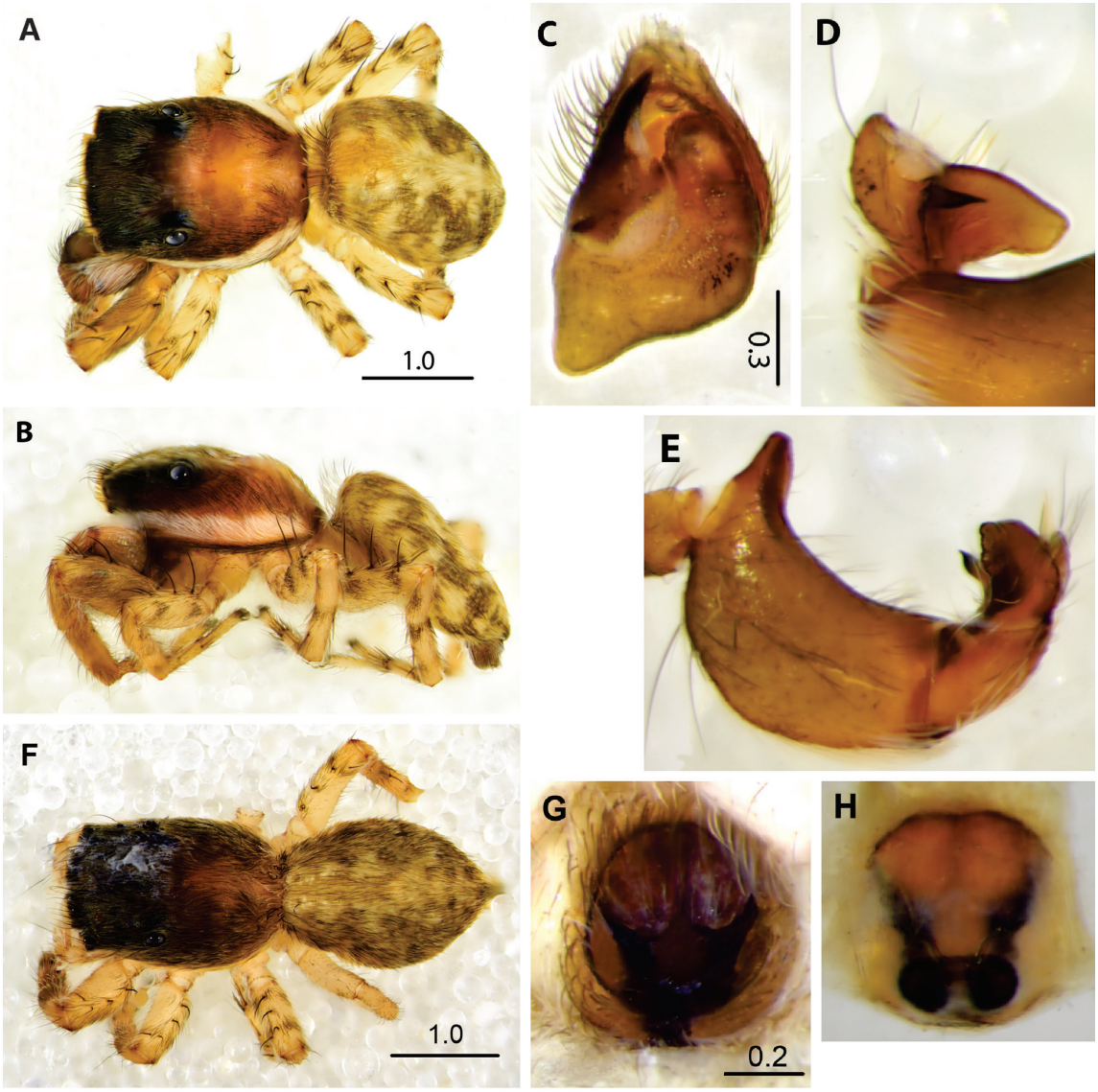

Figure 18. *Menemerus lesserti* Lawrence, 1927, male (**A–E**) and female (**D–H**): **A, F** general appearance, dorsal view **B** same, lateral view **C** palpal organ, ventral view of bulb **D** palpal tibia, ventral view **E** palpal tibia, patella and femur, retrolateral view **G** epigyne, ventral view **H** same, dorsal view.

Description. See Wesołowska (1999) for description of female. Live habitus of female in Fig. 17A, D, of female in alcohol in Fig. 18F, epigyne in Fig. 18G, H.

Male: Measurements: Cephalothorax length 2.1, width 1.6, height 0.6. Abdomen length 2.0, width 1.5. Eye field length 0.9, anterior and posterior width 1.3. General appearance of live male as in Fig. 17B, E, of male in alcohol in Fig. 18A, B, body flattened. Carapace brown, with black eye field. Dense whitish hairs on eye field, amongst them long brown bristles. White hairs form broad streak along lateral margins of carapace (Fig. 18A, B). Clypeus low, with white hairs. Mouthparts dark brown, endites with whitish tips. Sternum yellow. Abdomen oval, light, greyish, with broad median whitish-yellow serrated streak and light patches laterally. White and brown hairs on abdomen. Venter light, spinnerets grey. Legs yellow, with brownish marks formed by brown hairs. Other leg hairs white, spines brown. Palps brown, femur clothed in white hairs. Tibia with large lobate retrolateral apophysis and spiked ventral apophysis (Figs 18D, E, 19B–D). Embolus straight, accompanied by membranous functional conductor (Figs 18C, 19A).

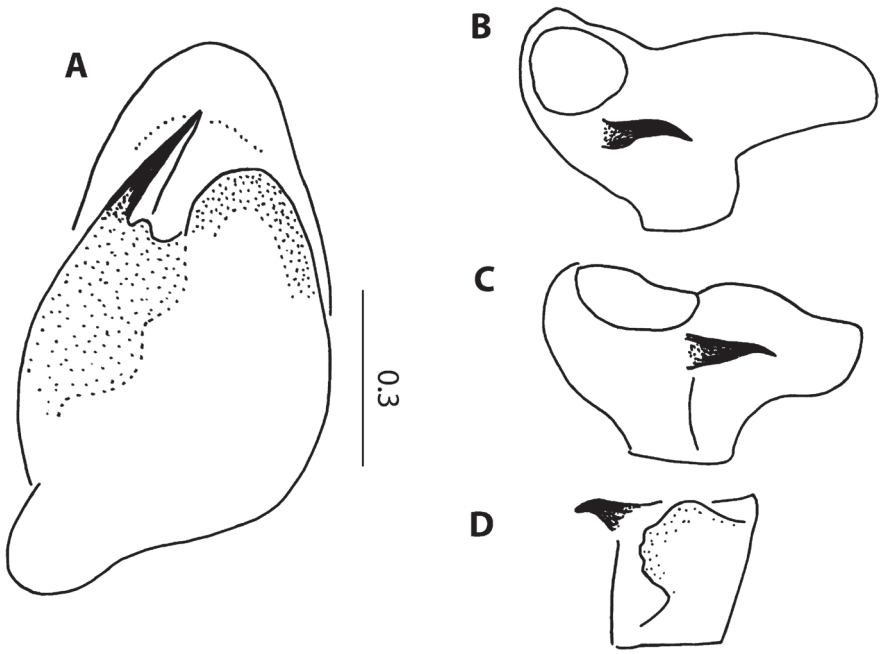

Figure 19. *Menemerus lesserti* Lawrence, 1928, male: **A** palpal organ, ventral view of bulb **B, C** palpal tibia, ventral view **D** same, retrolateral view.

Distribution. A species known from Namibia, Zimbabwe and South Africa (Limpopo and Northern Cape) (Wesołowska 1999; Dippenaar-Schoeman et al. 2023).

Remarks. The male of this species is described here for the first time. It was matched to the female of *M. lesserti*, based on DNA barcodes of the specimens sequenced (Fig. 2).

Menemerus rubicundus **Lawrence, 1928**

Fig. 20

Menemerus rubicundus Lawrence, 1928: 259, pl. 22, fig. 41; Wesołowska 1999: 329, figs 252–255; Wesołowska and Haddad 2018: 896, figs 65, 96 and 102–106.

Material examined. South Africa • Northern Cape Province; 1♀; Alexander Bay; 28°35'S, 16°29'E; 4 Apr 1988; A. Leroy leg.; hand collection; NCA 88/861.

Figure 20. *Menemerus rubicundus* Lawrence, 1928, female: **A** general appearance, dorsal view **B** epigyne, ventral view.

Description. For male, see in Wesołowska and Haddad (2018); for female, see Wesołowska (1999). General appearance of female in alcohol as in Fig. 20A, epigyne in Fig. 20B.

Distribution. A species known from Namibia and South Africa (Free State and Northern Cape) (Wesołowska 1999; Wesołowska and Haddad 2018).

Menemerus transvaalicus Wesołowska, 1999

Fig. 21

Menemerus transvaalicus Wesołowska, 1999: 339, figs 284–296; Haddad and Wesołowska 2011: 86, figs 71, 72; Wesołowska and Haddad 2014: 253.

Material examined. South Africa • Western Cape Province; 1♀; Tankwa Karoo National Park, Tanqua Guesthouse; 32°23.911'S, 19°50.713'E; 355 m a.s.l.; 19 Jan 2021; C. Haddad & R. Booysen leg.; hand collecting, at night around houses; NCA 2021/1020.

Description. See Wesołowska (1999) for a description of both sexes. General appearance of female in alcohol as in Fig. 21A, epigyne in Fig. 21B.

Distribution. A species widespread in South Africa, also recorded from Lesotho (Wesołowska and Haddad 2014; Dippenaar-Schoeman et al. 2023).

Mexcala rufa G. Peckham & E. Peckham, 1902

Mexcala rufa G. Peckham & E. Peckham, 1902: 333; G. Peckham & E. Peckham 1903: 247, pl. 29, fig. 1; Prószyński 1984: figs on p. 83; Wesołowska 2009: 176, figs 95–99.

Material examined. South Africa • Northern Cape Province; 2 imm. 1♂; near Nababeep, Jakkalswater Guest Farm; 29°37'S, 17°48'E; 895 m a.s.l.; 23 Aug 2020; P. Webb leg.; NCA 2020/208 • 1♂; Richtersveld National Park, Kokerboomkloof;

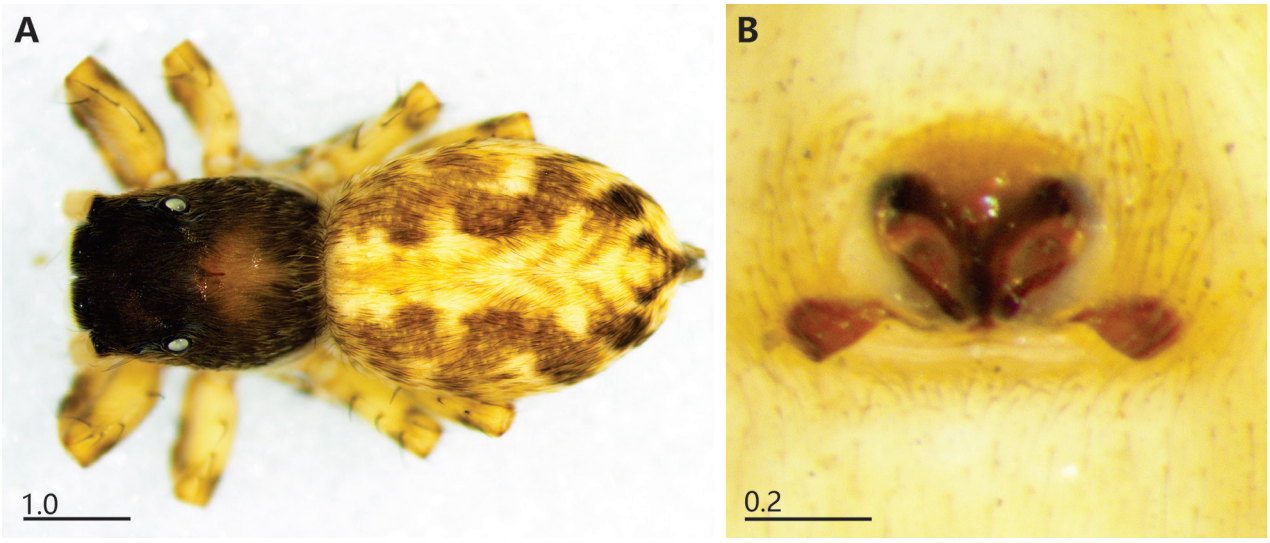

Figure 21. *Menemerus transvaalicus* Wesołowska, 1999, female: **A** general appearance, dorsal view **B** epigyne, ventral view.

28°18.434'S, 17°17.476'E; 15 Sep 2007; A. Leroy leg.; on grass; NCA 2007/25 • Western Cape Province • 2 imm. 1♂; Anysberg Nature Reserve, Road between Vrede and Allemorgens; 33°28.627'S, 20°31.499'E; 23 Sep 2007; C. Haddad leg.; under rocks; NCA 2007/3970 • 2 imm. 2♂; Same locality, Landsekloof; 33°29.493'S, 20°34.078'E; 24 Sep 2007, C. Haddad & R. Lyle leg.; under rocks; NCA 2007/3772 • 1♂ 1♀; Cederberg Tourist Park, Kromrivier, 72 km SSE of Clanwilliam, 32°32'S, 19°17'E; 3100 ft a.s.l.; 1–7 Nov 1985; C. Griswold et al. leg.; with *Camponotus* ant; NMSA 26403 • 4♀; Laingsburg District, Wagendrift Lodge; 33°22.861'S, 20°56.910'E; 520 m a.s.l.; 22 Jan 2021; C. Haddad et al. leg.; hand collecting, under rocks in veld; NCA 2021/136 • 1♂; Montagu, Les Hauts de Montagu; 33°48.915'S, 20°09.076'E; 360 m a.s.l.; Jul–Dec 2016; W. Jubber leg.; hand collecting; NCA 2017/545 • 1♂; Witteberg Nature Reserve; 33°21.462'S, 20°29.929'E; 905 m a.s.l.; 20 Oct 2015; Z. Mbo leg.; hand collecting, under rocks; NCA 2016/2613.

Distribution. A rare species known from Namibia and South Africa (Free State, Limpopo, Northern Cape and Western Cape) (Wesołowska 2009; Haddad 2021; Dippenaar-Schoeman et al. 2023).

Natta chionogastra (Simon, 1901)

Cyllobelus chionogaster Simon, 1901a: 541, 549, fig. 665; Simon 1901c: 151; G. Peckham & E. Peckham 1903: 195, pl. 21, fig. 1.

Cyllobelus australis G. Peckham & E. Peckham, 1902: 334; G. Peckham & E. Peckham 1903: 194, pl. 21, fig. 2.

Natta chionogastra Prószyński 1984: figs on pp. 87–88; Prószyński 1985: 80, figs 39–41, 45, 47; Wesołowska 1993: 19, figs 1–16; Haddad and Wesołowska 2011: 89, figs 74, 75.

Material examined. South Africa • Northern Cape Province; 1♂; Loxton; 31°28'23"S, 22°21'07"E; 15 Mar 2001; C. Stuart leg.; hand collection; NCA 2010/713 • Western Cape • 2♂ 1♀; Cederberg Mountains, 17 km SE of Algeria; 32°25'S, 19°10'E; 3000 ft a.s.l.; 1 Nov 1985; C. Griswold et al. leg.; fynbos; NMSA 26466.

Distribution. Species widely distributed in Africa. Recorded from all the South African provinces (Dippenaar-Schoeman et al. 2023).

Natta triguttata sp. nov.

https://zoobank.org/C8C35C71-FE03-41A2-B5A7-78C1CE8FB4CB

Figs 17C, F, 22, 23

Material examined. ***Holotype:*** South Africa • ♂; Northern Cape; Richtersveld National Park, Akkedis Pass; 28°10.577'S, 17°02.069'E; 645 m a.s.l.; 9 Jul 2021, C. Haddad et al. leg.; leaf litter, dry river bed; NCA 2021/499.

Paratype: South Africa • 1♀; together with holotype.

Diagnosis. The new species differs from congeners in colouration: the presence of a pair of round white spots near the middle of the abdominal dorsum and a single white spot above the spinnerets differs from the other species, which have many orange or yellow spots. The palpal organ is similar to that in *Natta horizontalis* Karsch, 1979, but can be recognised by the thin, pointed tibial

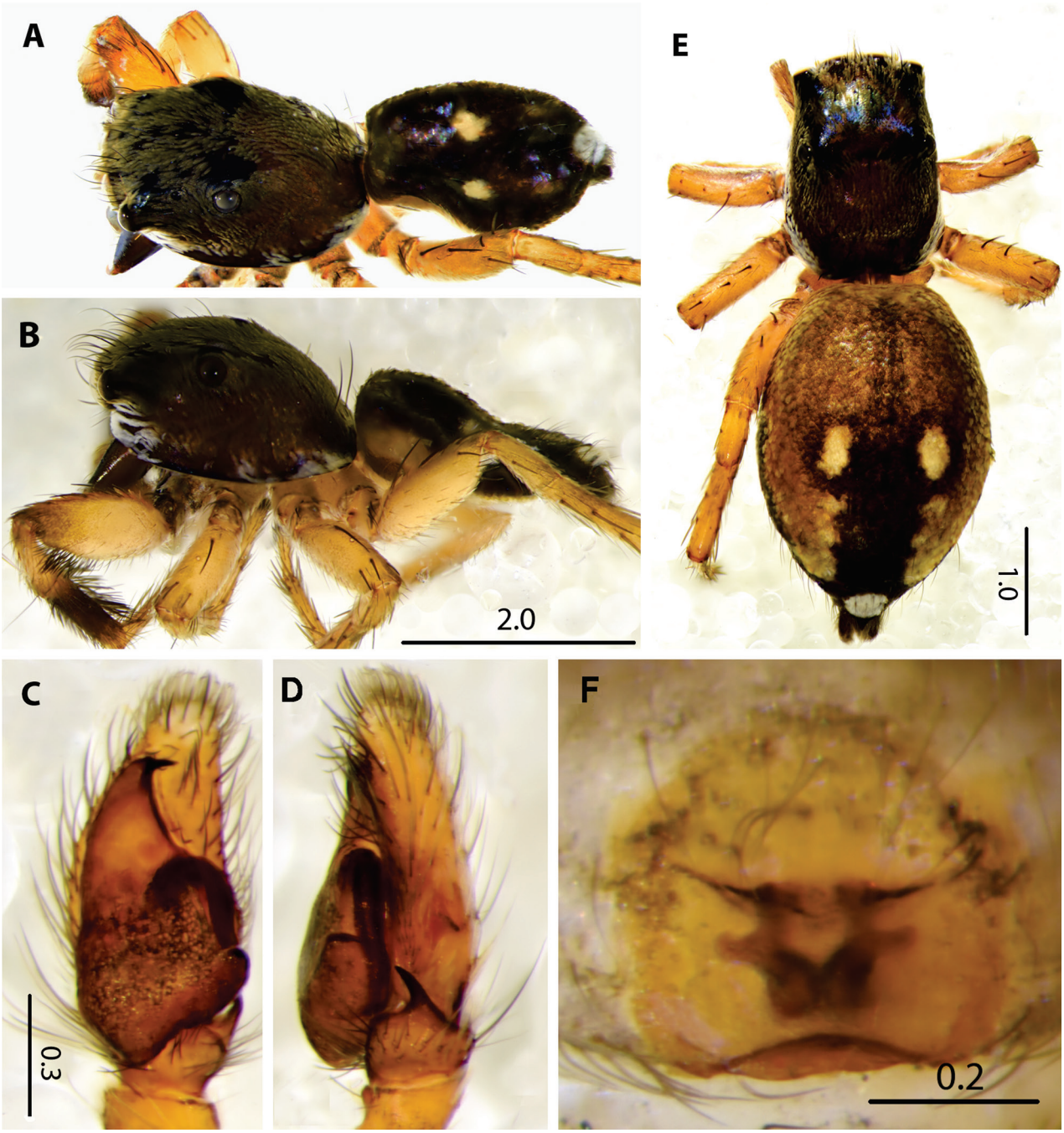

Figure 22. *Natta triguttata* sp. nov., holotype male (**A–D**) and paratype female (**E, F**): **A, E** general appearance, dorsolateral view **B** same, lateral view **C** palpal organ, ventral view **D** same, lateral view **F** epigyne, ventral view.

apophysis (Figs 22C, D, 23A, B), whereas it is shorter, wide and truncated in the latter species (Wesołowska 1993: figs 23, 28, 33). The female differs from congeners by the absence of an epigynal depression (Figs 22F, 23C).

Description. Male: Measurements: Cephalothorax length 2.1, width 1.5, height 0.8. Abdomen length 2.0, width 1.5. Eye field length 1.0, anterior width 1.2, posterior width 1.3. General appearance in alcohol as in Fig. 22A, B. Carapace black, clothed in dense greyish scales, amongst them some long brown bristles. Some white scales on lateral slopes, same scales form two lines below anterior lateral eyes (Fig. 22B). Chelicerae unidentati. Mouthparts and sternum blackish. Abdomen black, with pair of white round spots near mid-point and single white spot

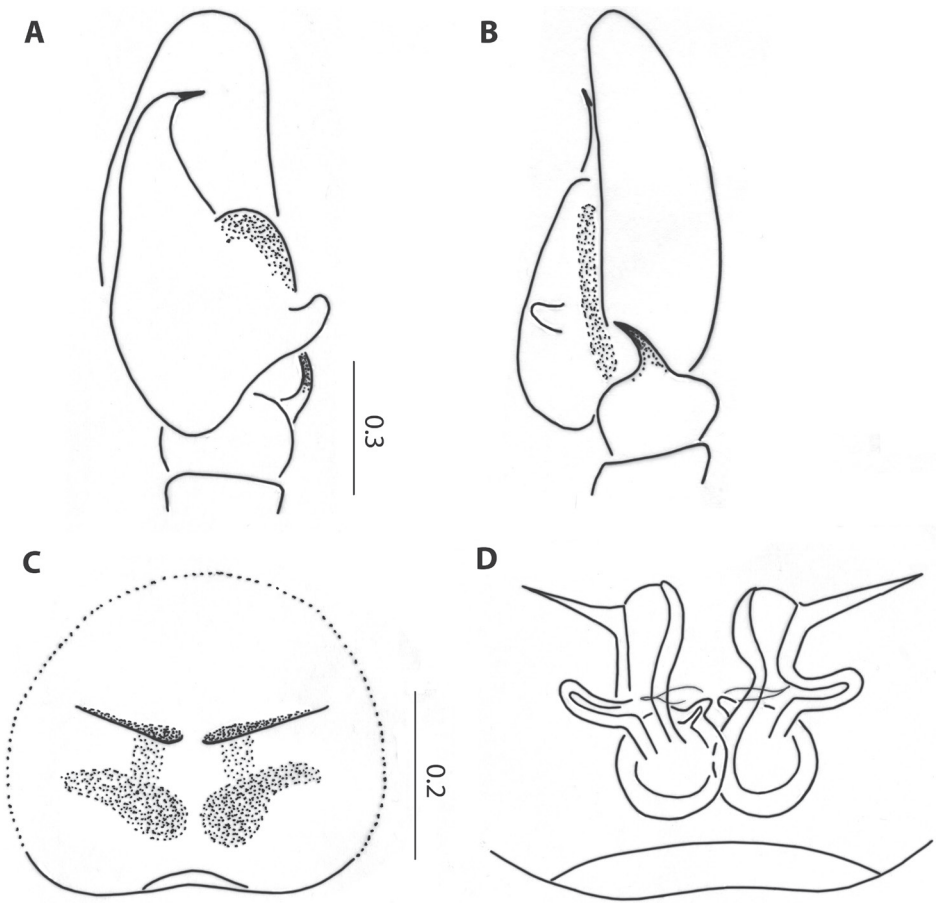

Figure 23. *Natta triguttata* sp. nov., holotype male (**A, B**) and paratype female (**C, D**): **A** palpal organ, ventral view **B** same, lateral view **C** epigyne, ventral view **D** internal structure of epigyne.

at end of abdomen above spinnerets, spinnerets black. Venter black, shining. Legs dark yellow, hairs and spines brown, long sharp bristles on ventral surface of femur I. Palpal organ as in Figs 22C, D, 23A, B, bulb triangular, embolus very short, tip orientated transversely towards retrolateral side, tibial apophysis thin.

Female: Measurements: Cephalothorax length 2.2, width 1.5, height 0.9. Abdomen length 3.1, width 2.3. Eye field length 1.0, anterior width 1.2, posterior width 1.3. General appearance of live female as in Fig. 17C, F, in alcohol as in Fig. 22E. Larger than male, similarly coloured. White streak composed of scales along lateral margins of carapace. Abdomen slightly lighter, brown with black wide median streak in posterior half, white spots as in male. Dorsum of abdomen covered with transparent scales, venter light brown. Epigyne as in Figs 22B, 23C, with wide posterior pocket, copulatory openings placed centrally, their outer edges with long sclerotised flange. Internal structure simple, large accessory glands connected to seminal ducts, spermathecae spherical (Fig. 23D).

Etymology. The species name is derived from the Latin tri- (three) and guttatus (spotted), referring to the three distinct spots on the abdomen of both sexes.

Distribution. Only known from the type locality.

Remarks. This is the first new species of *Natta* to be described in more than 120 years. The placement of the species was confirmed through the molecular results (Fig. 2), as well as the consistency in somatic morphology of the new species with *N. chionogaster* and *N. horizontalis*, particularly the presence of iridescent scales all over the body (Fig. 18C).

***Psenuc dependens* (Haddad & Wesołowska, 2011)**

Pseudicius dependens Haddad & Wesołowska, 2011: 109, figs 141, 142 and 166–170.
Psenuc dependens Prószyński 2016: 23.

Material examined. South Africa • Northern Cape Province; 2♀; Nigramoep Slow Living Guest Farm; 29°32.385'S, 17°34.746'E; 765 m a.s.l.; 9 Jan 2021; C. Haddad et al. leg.; beating short shrubs, east-facing slope; NCA 2021/637 • 1♀; Richtersveld National Park, Akkedis Pass; 28°10.673'S, 17°01.863'E; 540 m a.s.l.; 8 Jul 2021; C. Haddad et al. leg.; beating short shrubs, east-facing slope; NCA 2021/457 • 1♀; Richtersveld National Park, Halfmens Pass; 28°07.789'S, 16°57.667'E; 235 m a.s.l.; 8 Jan 2021; C. Haddad et al. leg.; beating short shrubs, open plain; NCA 2021/309 • 1♀; same collection data as for preceding; 10 Jul 2021; C. Haddad et al. leg.; NCA 2021/422 • 1♀; Richtersveld National Park, SE of Akkedis Pass; 28°11.123'S, 17°02.543'E; 535 m a.s.l.; 7 Jul 2021; C. Haddad et al. leg.; beating short shrubs, dry river bed; NCA 2021/689.

Distribution. Previously recorded from the Free State, Limpopo, Northern Cape and Western Cape Provinces (Dippenaar-Schoeman et al. 2023), but for the first time from the western parts of the Northern Cape.

Discussion

This paper presents the results of the first focused treatment of a spider group from the arid western interior of South Africa, based on freshly sampled material supplemented by numerous historical museum records. Our survey uncovered three new species and several new provincial and country records from the region, highlighting the poor state of knowledge of jumping spiders in this part of South Africa. This is not surprising, as several studies have emphasised the poor historical collecting effort in this part of the country and the need to focus resources on sampling here to improve knowledge of its fauna (Foord et al. 2011; Janion-Scheepers et al. 2016; Dippenaar-Schoeman et al. 2023).

Considering these results, it is plausible that taxonomic studies of other salticid clades will also show how poorly studied its fauna is. For example, of the eight species of Euophryini collected along the transect, only one species (*Euophrys leipoldti* G. W. Peckham & E. G. Peckham, 1903), is described. Only through a concerted taxonomic effort on Salticidae and other families can the fauna of this region be properly documented, although there is still great potential for intensive sampling in the arid zone to address the massive geographical gaps that persist.

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

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Author contributions

Charles Haddad – Field sampling, sorting and processing of material, DNA barcoding tissue preparation and data recording, microscope photography, wrote part of manuscript, edited final manuscript. Wanda Wesołowska – Descriptions, illustrations, microscope photography, preparation of figure plates.

Author ORCIDs

Charles Richard Haddad https://orcid.org/0000-0002-2317-7760
Wanda Wesołowska https://orcid.org/0000-0002-4411-1058

Data availability

All of the data that support the findings of this study are available in the main text or Supplementary Information.

References

Andreeva EM, Hęciak S, Prószyński J (1984) Remarks on *Icius* and *Pseudicius* (Araneae, Salticidae) mainly from central Asia. Annales Zoologici, Warszawa 37: 349–375.

CCDB [Canadian Centre for DNA Barcoding] (2019) CCDB Protocols. CCDB [Internet], Guelph. http://ccdb.ca/site/wp-content/uploads/2016/09/CCDB_Amplification.pdf [accessed 19 December 2023]

Dippenaar-Schoeman AS, Haddad CR, Lotz LN, Booysen R, Steenkamp RC, Foord SH (2023) Checklist of the spiders (Araneae) of South Africa. African Invertebrates 64(3): 221–281. https://doi.org/10.3897/AfrInvertebr.64.111047

Edgar RC (2004) MUSCLE: A multiple sequence alignment method with reduced time and space complexity. BMC Bioinformatics 5(1): 113. https://doi.org/10.1186/1471-2105-5-113

Foord SH, Dippenaar-Schoeman AS, Haddad CR (2011) Chapter 8 – South African spider diversity: African perspectives on the conservation of a mega-diverse group. In: Grillo O, Venora G (Eds) Changing Diversity in Changing Environment. InTech Publishing, Rijeka, Croatia, 163–182.

Foord SH, Dippenaar-Schoeman AS, Haddad CR, Lyle R, Lotz L, Sethusa T, Raimondo D (2020) The South African National Red List of spiders: Patterns, threats, and conservation. The Journal of Arachnology 48(2): 110–118. https://doi.org/10.1636/0161-8202-48.2.110

Haddad CR (2021) Undergraduate entomology field excursions are a valuable source of biodiversity data: A case for spider (Araneae) bycatches in ecological studies. Biodiversity and Conservation 30(14): 4199–4222. https://doi.org/10.1007/s10531-021-02301-9

Haddad CR, Marusik YM (2019) Clarifying the taxonomic status and distributions of the spider species collected during the Leonhard Schultze expeditions in western and central southern Africa (Arachnida: Araneae). Zootaxa 4608(3): 451–483. https://doi.org/10.11646/zootaxa.4608.3.3

Haddad CR, Wesołowska W (2013) Additions to the jumping spider fauna of South Africa (Araneae: Salticidae). Genus 24: 459–501.

Janion-Scheepers C, Measey J, Braschler B, Chown SL, Coetzee L, Colville J, Dames J, Davies AB, Davies S, Davis A, Dippenaar-Schoeman AS, Duffy G, Fourie D, Griffiths C, Haddad CR, Hamer M, Herbert D, Hugo-Coetzee LEA, Jacobs A, Jansen Van Rensburg C, Lamani S, Lotz LN, Louw Svd M, Lyle R, Malan A, Marais M, Neethling JA, Nxele T, Plisko D, Prendini L, Rink AN, Swart A, Theron P, Truter M, Ueckermann E, Uys VM, Villet MH, Willows-Munrow S, Wilson JRU (2016) Soil biota in a megadiverse country: Current knowledge and future research directions in South Africa. Pedobiologia 59(3): 129–174. https://doi.org/10.1016/j.pedobi.2016.03.004

Lawrence R (1927) Contributions to a knowledge of the fauna of South-West Africa V. Arachnida. Annals of the South African Museum 25: 1–75 [pl. 1–4].

Lawrence R (1928) Contributions to a knowledge of the fauna of South-West Africa VII. Arachnida (part 2). Annals of the South African Museum 25: 217–312 [pl. 21–24].

Mucina L, Rutherford MC (2006) The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19: 1–807.

Myers N, Mittermeier RA, Mittermeier CG, Da Fonseca GAB, Kent J (2000) Biodiversity hotspots for conservation priorities. Nature 403(6772): 853–858. https://doi.org/10.1038/35002501

Peckham GW, Peckham EG (1902) Some new genera and species of Attidae from South Africa. Psyche (Cambridge, Massachusetts) 9(312): 330–335. https://doi.org/10.1155/1902/13502

Peckham GW, Peckham EG (1903) New species of the family Attidae from South Africa, with notes on the distribution of the genera found in the Ethiopian region. Transactions of the Wisconsin Academy of Sciences, Arts and Letters 14: 173–278 [pl. 19–29].

Prószyński J (1984) Atlas rysunków diagnostycznych mniej znanych Salticidae (Araneae). Zeszyty Naukowe Wyższej Szkoły Rolniczo-Pedagogicznej, Siedlce, 177 pp.

Prószyński J (1985) On *Siler*, *Silerella*, *Cyllobelus* and *Natta* (Araneae, Salticidae). Annales Zoologici, Warszawa 39: 69–85.

Prószyński J (2016) Delimitation and description of 19 new genera, a subgenus and a species of Salticidae (Araneae) of the world. Ecologica Montenegrina 7: 4–32. https://doi.org/10.37828/em.2016.7.1

Prószyński J (2017) Pragmatic classification of the world's Salticidae (Araneae). Ecologica Montenegrina 12: 1–133. https://doi.org/10.37828/em.2017.12.1

Purcell WF (1908) Araneae (I). In: Schultze L (Ed.) Zoologische und anthropologische Ergebnisse einer Forschungsreise im westlichen und zentralen Südafrika. Erster Band: Systematik und Tiergeographie. Zweite Lieferung. Denkschriften der Medizinisch-Naturwissenschaftlichen Gesellschaft zu Jena 13: 203–246.

Ratnasingham S, Hebert PDN (2007) BOLD: The Barcode of Life Data System (www.barcodinglife.org). Molecular Ecology Notes 7(3): 355–364. https://doi.org/10.1111/j.1471-8286.2007.01678.x

Ratnasingham S, Hebert PDN (2013) A DNA-based registry for all animal species: The Barcode Index Number (BIN) system. PLoS One 8(7): e66213. https://doi.org/10.1371/journal.pone.0066213

Simon E (1901a) Histoire naturelle des araignées. Deuxième édition, tome second. Roret, Paris, 381–668. https://doi.org/10.5962/bhl.title.51973

Simon E (1901b) Etudes arachnologiques. 31e Mémoire. XLVIII. Etude sur les *Heliophanus* d'Afrique et de Madagascar. Annales de la Société Entomologique de France 70(1): 52–61. https://doi.org/10.1080/21686351.1901.12279316

Simon E (1901c) Descriptions d'arachnides nouveaux de la famille des Attidae (suite). Annales de la Société Entomologique de Belgique 45: 141–161.

Simon E (1910) Arachnoidea: Araneae (II). In: Schultze L (Ed.) Zoologische und anthropologische Ergebnisse einer Forschungsreise im westlichen und zentralen Südafrika. Vierter Band. Systematik und Tiergeographie. Denkschriften der MedizinischNaturwissenschaftlichen Gesellschaft zu Jena 16: 175–218.

Wesołowska W (1986) A revision of the genus *Heliophanus* C. L. Koch, 1833 (Aranei: Salticidae). Annales Zoologici, Warszawa 40: 1–254.

Wesołowska W (1993) Notes on the genus *Natta* Karsch, 1879 (Araneae, Salticidae). Genus 4: 17–32.

Wesołowska W (1999) A revision of the spider genus *Menemerus* in Africa (Araneae: Salticidae). Genus 10: 251–353.

Wesołowska W (2006) Jumping spiders from the Brandberg massif in Namibia (Araneae: Salticidae). African Entomology 14: 225–256.

Wesołowska W (2009) A revision of the spider genus *Mexcala* Peckham et Peckham, 1902 (Araneae: Salticidae). Genus 20: 149–186.

Wesołowska W (2011) New species and new records of jumping spiders from Botswana, Namibia and Zimbabwe (Araneae: Salticidae). Genus 22: 307–346.

Wesołowska W (2024) Taxonomic notes on the genus *Heliophanus* C.L. Koch, 1833, with description of three additional genera (Araneae: Salticidae: Chrysillini). Zootaxa 5405(1): 80–92. https://doi.org/10.11646/zootaxa.5405.1.3

Wesołowska W, Haddad CR (2014) An overview of the jumping spiders of Lesotho (Araneae: Salticidae), with descriptions of six new species. African Invertebrates 55: 229–268.

Wesołowska W, Haddad CR (2018) Further additions to the jumping spider fauna of South Africa (Araneae: Salticidae). Annales Zoologici 68(4): 879–908. https://doi.org/10.3161/00034541ANZ2018.68.4.011

Wesołowska W, Russell-Smith A (2000) Jumping spiders from Mkomazi Game Reserve in Tanzania (Araneae Salticidae). Tropical Zoology 13(1): 11–127. https://doi.org/10.1080/03946975.2000.10531126

Wesołowska W, Tomasiewicz B (2008) New species and records of Ethiopian jumping spiders (Araneae, Salticidae). Journal of Afrotropical Zoology 4: 3–59.

World Spider Catalog (2024) World Spider Catalog. Version 25.5. Natural History Museum Bern. https://doi.org/https://doi.org/10.24436/2 [accessed on 14 October 2024]

Appendix 1

Table A1. Summary of Chrysillini specimens from western South Africa for which DNA barcodes (cytochrome oxidase subunit I) have been generated (indicated with *), with additional Chrysillini from South Africa and *Massagris honesta* Wesołowska, 1993 (Hisponinae) as the outgroup used for the molecular analysis. All sequences are included in the SPIZA project on BOLD (Barcode of Life Data Systems). The *Heliocapensis mirabilis* specimen marked with a dash did not sequence successfully.

Species	Sex	BOLD Sample ID	Locality	Depository	Length
Afraflacilla karinae	♂	SPIZA1444-23	*Namaqua	NMBA 18564	657 bp
Afraflacilla venustula	♂	SPIZA1421-21	Ndumo	NCA 2021/1221	658 bp
	♀	SPIZA1422-21	Ndumo	NCA 2021/1221	658 bp
Helafricanus bisulcus	♀	SPIZA1566-23	Kleinmond	NMBA 18781	657 bp
Helafricanus debilis	♂	SPIZA1531-23	Amanzi	NMBA 18732	657 bp
Helafricanus demonstrativus	♂	SPIZA1364-21	Pietermaritzburg	NCA 2021/1120	658 bp
Helafricanus fascinatus	♂	SPIZA1411-21	Coopersdal	NCA 2021/1211	658 bp
	♀	SPIZA1544-23	Bloemfontein	NMBA 18759	657 bp
Helafricanus modicus	♀	SPIZA722-21	*Wagendrift	NCA 2021/148	658 bp
	♂	SPIZA1265-21	Queenstown	NCA 2021/1036	658 bp
Helafricanus nanus	♀	SPIZA1315-21	Wepener	NCA 2021/1073	658 bp
	♂	SPIZA1548-23	Bloemfontein	NMBA 18762	657 bp
Helafricanus patellaris	♂	SPIZA721-21	*Wagendrift	NCA 2021/148	658 bp
Helafricanus pistaciae	♂	SPIZA1549-23	Bloemfontein	NMBA 18763	657 bp
	♀	SPIZA1552-23	Bloemfontein	NMBA 18768	657 bp
Helafricanus trepidus	♀	SPIZA1267-21	Queenstown	NCA 2021/1037	658 bp
Heliocapensis charlesi	♂	SPIZA1472-23	Witsand	NMBA 18614	658 bp
	♀	SPIZA1473-23	Witsand	NMBA 18614	658 bp
Heliocapensis deserticola	♀	SPIZA1425-21	*Nababeep	NCA 2021/1224	658 bp
Heliocapensis maluti	♂	SPIZA1014-21	*Namaqua	NCA 2021/740	658 bp
Heliocapensis mirabilis	♀	SPIZA485-21	*Richtersveld	NCA 2021/34	599 bp
	♀	SPIZA501-21	*Richtersveld	NCA 2021/47	639 bp
	♀	SPIZA777-21	*Richtersveld	NCA 2021/279	658 bp
	♂	SPIZA778-21	*Richtersveld	NCA 2021/280	–
Heliophanus deformis	♀	SPIZA502-21	*Richtersveld	NCA 2021/47	658 bp
	♀	SPIZA786-21	*Richtersveld	NCA 2021/293	658 bp
	♂	SPIZA1031-21	*Namaqua	NCA 2021/759	658 bp
Heliophanus gramineus	♂	SPIZA1802-23	Jonkershoek	NMBA 18891	658 bp
	♀	SPIZA1887-23	Betty's Bay	NMBA 18934	658 bp
Heliophanus pygmaeus	♂	SPIZA1346-21	Ndumo	NCA 2021/1103	658 bp
Icius insolidus	♀	SPIZA1086-21	*Akkerendam	NCA 2021/830	658 bp
	♀	SPIZA1226-21	*Tankwa	NCA 2021/996	631 bp
	♀	SPIZA538-21	*Namaqua	NCA 2021/78	658 bp
	♀	SPIZA702-21	*Wagendrift	NCA 2021/134	658 bp
	♀	SPIZA896-21	*Nigramoep	NCA 2021/515	658 bp
	♀	SPIZA857-21	*Richtersveld	NCA 2021/456	658 bp
	♀	SPIZA702-21	*Wagendrift	NCA 2021/134	658 bp
	♀	SPIZA647-21	Bankfontein	NCA 2021/239	658 bp
Icius jacksoni sp. nov.	♂	SPIZA478-21	*Richtersveld	NCA 2021/28	658 bp
Icius nigricaudus	♀	SPIZA1345-21	Ndumo	NCA 2021/1102	658 bp
Icius pulchellus	♀	SPIZA1070-21	*Namaqua	NCA 2021/814	561 bp
	♀	SPIZA1071-21	*Namaqua	NCA 2021/814	658 bp
	♂	SPIZA1193-21	*Tankwa	NCA 2021/962	658 bp
	♀	SPIZA1194-21	*Tankwa	NCA 2021/962	598 bp

Species	Sex	BOLD Sample ID	Locality	Depository	Length
Massagris honesta	♀	SPIZA1678-21	Hermanus	NMBA 19027	657 bp
Mememerus sp. cf. *minshullae*	♀	SPIZA1406-21	Ukwela	NCA 2021/1207	658 bp
Menemerus foordi sp. nov.	s/a ♂	SPIZA2148-24	*Richtersveld	NMBA 19095	658 bp
Menemerus lesserti	♂	SPIZA521-21	*Richtersveld	NCA 2021/64	658 bp
	♀	SPIZA748-21	*Richtersveld	NCA 2021/168	632 bp
	♂	SPIZA521-21	*Richtersveld	NCA 2021/64	658 bp
Menemerus rubicundus	♀	SPIZA494-21	*Richtersveld	NCA 2021/42	658 bp
Menemerus transvaalicus	♀	SPIZA1244-21	*Tankwa	NCA 2021/1020	658 bp
	♂	SPIZA1268-21	Queenstown	NCA 2021/1038	658 bp
	♂	SPIZA1513-23	Rhodes	NMBA 18706	658 bp
	♀	SPIZA1594-23	Wepener	NMBA 18805	657 bp
	♂	SPIZA1595-23	Wepener	NMBA 18805	657 bp
Mexcala elegans	♀	SPIZA1370-21	Richard's Bay	NCA 2021/1127	658 bp
Mexcala rufa	♀	SPIZA704-21	*Wagendrift	NCA 2021/136	658 bp
	♀	SPIZA705-21	*Wagendrift	NCA 2021/136	658 bp
	♀	SPIZA706-21	*Wagendrift	NCA 2021/136	658 bp
Natta chionogaster	♀	SPIZA1519-23	Bankfontein	NMBA 18710	658 bp
	♀	SPIZA1580-23	Amanzi	NMBA 18794	657 bp
Natta horizontalis	♀	SPIZA1354-21	Ukwela	NCA 2021/1111	658 bp
	♂	SPIZA1423-21	Ndumo	NCA 2021/1222	658 bp
Natta triguttata sp. nov.	♀	SPIZA971-21	*Richtersveld	NCA 2021/499	658 bp
	♂	SPIZA972-21	*Richtersveld	NCA 2021/499	658 bp
Phintella australis	♂	SPIZA1514-23	Cradock	NMBA 18707	658 bp
Pseudicius dentatus	♂	SPIZA1415-21	Nelspruit	NCA 2021/1215	658 bp
	♀	SPIZA1420-21	Komatipoort	NCA 2021/1220	658 bp
Pseudicius matabelensis	♂	SPIZA1444-21	*Namaqua	NMBA 18564	658 bp
Psenuc dependens	♀	SPIZA793-21	*Richtersveld	NCA 2021/309	658 bp
	♀	SPIZA942-21	*Nigramoep	NCA 2021/637	658 bp
	♀	SPIZA977-21	*Richtersveld	NCA 2021/689	658 bp
Trapezocephalus orchesta	♀	SPIZA1417-21	Nelspruit	NCA 2021/1217	658 bp

Supplementary material 1

Details of collecting data of Chrysillini jumping spiders from western South Africa

Authors: Charles Richard Haddad, Wanda Wesołowska

Data type: xlsx

Explanation note: This spreadsheet contains all of the specimen data presented in the main document text.

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