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A survey of *Diphya* Nicolet, 1849 (Araneae: Tetragnathidae) from South Africa

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Abstract

In this paper, five species of *Diphya* Nicolet, 1849 are recognized in the fauna of South Africa. Four of these species are new: *D. foordi* **sp. nov.** (♂♀), *D. leroyorum* **sp. nov.** (♂), *D. vanderwaltae* **sp. nov.** (♀) and *D. wesolowskae* **sp. nov.** (♂♀). The male of *D. simoni* Kauri, 1950 is described for the first time. *Diphya tanikawai* Marusik, 2017 **syn. nov.** was found to be a junior synonym of *D. simoni*. Descriptions with illustrations, photographs and SEM images are provided for all species. The relationship between the South African and the Neotropical *Diphya* species is briefly discussed.

Key words: Aranei, spider, Metainae, Diphyaeni, new species, new synonym

Introduction

Diphya Nicolet, 1849 is an average-sized genus of spiders belonging to its own tribe, Diphyaini of the family Tetragnathidae. So far, 15 named species are known in the Neotropical and Afrotropical Realms, as well as in the southeastern Palaearctic (central and northeast China, Korea, Japan, and in the Maritime Province of Russia) (WSC 2020).

The genus was revised globally by Tanikawa (1995), where almost all species were properly described, with figures to allow for easy species recognition. The genus has the lowest diversity in the Afrotropical Region. So far, three described species are known from the continent, two from South Africa and one from Madagascar (Marusik 2017; WSC 2020). All of the species occurring in the continent are known only from females. The male of *D. pumila* Simon, 1889 from Madagascar has only sketchy illustrations.

Recently, the authors had an opportunity to study *Diphya* specimens stored in the National Collection of Arachnida (Non-Acari) in South Africa, which included adult male and female specimens. This paper is the result of the review of this material. The goal of this paper is to provide detailed descriptions of unknown species and redescriptions of two species only known from female types, as well as to discuss the status of African *Diphya*.

Material and methods

Specimens were examined and photographed at the Zoological Museum of the University of Turku, Finland, using an Olympus Camedia E-520 camera attached to an Olympus SZX16 stereomicroscope or to the eyepiece of an Olympus BH2 transmission microscope. Scanning electron microscope (S.E.M.) micrographs were taken on a

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JEOL JSM-5200 SEM. Digital images were stacked using Helicon Focus 7.5.8 and/or Zerene Stacker version 1.04 image stacking software. Illustrations of the endogyne were done once cleared in a 10% KOH aqueous solution. Lengths of leg segments were measured on the dorsal side. All measurements are given in millimeters.

The depositories of the studied material are Zoological Museum of the Moscow University, Moscow, Russia (ZMMU) and the National Collection of Arachnida, Agricultural Research Council—Plant Health and Protection, Pretoria, South Africa (NCA).

Abbreviations: ALE—anterior lateral eye; AME—anterior median eye; CL—carapace length; *Co*—conductor; *Cp*—cymbium peak; CW—carapace width; *Do*—dorsal; *Dp*—dorsal process; *Eb*—embolus base; *El*—embolus loop; *Em*—embolus; Fe—femur; *Lp*—lateral pockets; *Mr*—meso-prolateral ridge; Mt—metatarsus; *Pc*—paracymbium; pl—prolateral; PLE—posterior lateral eye; PME—posterior median eye; *Re*—receptacle; rl—retrolateral; *Sb*—septum base; Se—septum median plate; *Ss*—septal stem; *St*—subtelugum; *Te*—tegulum; Ti—tibia; TL—total length; v—ventral.

Taxonomy

Family Tetragnathidae Menge, 1866

Subfamily Diphyainae Simon, 1894

Genus *Diphya* Nicolet, 1849

Diphya Nicolet, 1849: 406; Simon 1894: 744; Tanikawa 1995: 102; Álvarez-Padilla & Hormiga 2011: 756; Marusik & Omelko 2017: 2.

Type species. *Diphya macrophthalma* Nicolet, 1849.

Diagnosis for the Afrotropical species. *Diphya* differ from other tetragnathid genera occurring in the Afrotropical Realm by having the posterior and anterior lateral eyes twice as large as the anterior medians (Figs 3A–I *vs*. eyes subequal in diameter), widely spaced lateral eyes (Figs 3A–I *vs*. eyes almost touching each other), and the presence of a row of stiff prolateral setae on legs I–II (Figs 4H, 5A–D), which are lacking in other genera. In addition, males have modified ventral spines on metatarsi I (Fig. 6) that are lacking in males of other genera.

Description for species occurring in South Africa. Small spiders, males TL 2.41–2.88, CL 1.34–1.61, females TL 3.17–3.75, CL 1.25–1.71. Carapace with distinct and variable pattern or almost uniformly dark colored, covered with fine embedded setae, each seta originates from fine papilla. Fovea indistinct. ALE and posterior eyes more than twice larger than AME, posterior eyes separated by one or less than one diameter; lateral eyes spaced by more than one diameter; clypeus smaller than ALE diameter. Sternum with pattern composed of dark median band or spot and dark margins, or just dark margins, and can be uniformly dark colored. Chelicerae with 3 promarginal and 3 or 4 retromarginal teeth; some species have distinct mesoprolateral ridge (*Mr*). Legs uniformly colored or with annulations. Legs I and II with prolateral row of stiff inflexible setae. Spines distinct. Male with modified (short and thick) unpaired ventral spines on metatarsi I. Femur I covered with setae as on carapace, with small hemispherical bases (Fig. 10C); tibia I with long ventral setae; tarsi I in *D. simoni* with 2 rows of modified ventral setae (Fig. 10I); tarsal claws I uniseriate, prolateral claw with prolateral row of teeth in proximal part, bent into retrolateral side anteriorly; retrolateral claw with straight row of prolateral teeth (Fig. 10J–K).

Abdomen with distinct and similar basic pattern (exception *D.vanderwaltae* **sp. nov.**), although it can vary within the same species.

Male palp. Femur short, shorter than cymbium; patella unmodified; tibia as long as wide or slightly longer than wide, widening distally. Cymbium oval or subsquare-shaped, with strong dorsal process; paracymbium small and short, wide basally, with clavate head, lacking setae. Subtegulum large; visible part of tegulum (*Te*) small, stripe-like, most of it hidden by subtegulum and broad and large conductor. Conductor with fold wrapping terminal part of long embolus; embolus with broad base, forming loop (*El*) over 360º.

Epigyne. Wider than long, with transverse septum, lacking fovea, with distinct copulatory openings. Septum with stem and wide base; stem with lateral hoods (pockets) or without, central part of septum can be protruding

over epigynal plate; receptacles globular or oval, converging anteriorly, almost touching or spaced by less than one radius; copulatory ducts indistinct.

Species-specific characters. Species can be separated by their own pattern, presence or absence of annulation of legs, spination, number of cheliceral teeth, shape of cymbium, shape and size of dorsal cymbial process, shape of conductor, relative length of embolus (and its loop), shape of septum, relative width of septal stem, and the presence or absence of lateral hoods of the stem. Males also differ by the relative size of ventral metatarsal spines.

Composition. So far, five species are recognized in South Africa: *D. foordi* **sp. nov.** (♂♀), *D. leroyorum* **sp. nov.** (♂), *D. simoni* (♂♀), *D. vanderwaltae* **sp. nov.** (♀) and *D. wesolowskae* **sp. nov.** (♂♀).

Distribution. Distribution records of all species found in South Africa are shown in Fig. 14. *Diphya simoni* has the widest range and known from the Cape Peninsula in the southwest to the Kruger National Park in the northeast, followed by *D. foordi* **sp. nov.** with the second widest range. *Diphya wesolowskae* **sp. nov.** is restricted to the eastern part of the country and two remaining species are known from single localities.

Relationships. All South African species seem related to each other and have similar copulatory organs, but differ significantly from the generotype *D. macrophthalma* Nicolet, 1849 (see Marusik & Omelko 2017) and other species occurring in southern South America. The male palps of African species lack a tibial apophysis, which is present in the American species (unique character within the family); have a short hairless paracymbium (*vs*. long and bilobate, longer than tibia and bearing several setae); and the fold of the conductor hides the terminal part of the embolus (*vs*. embolus not hidden). Epigynes also differ significantly between African and American species: African species have a septum, which is lacking in the Neotropical species. Further, the latter lack a median plate and fovea (atrium) and have a single copulatory opening, while in African *Diphya* a fovea is absent, and the copulatory openings are located on different sides of the septum. In addition, African *Diphya* have no distinct copulatory ducts and have simple receptacles, while epigynes of Neotropical species have copulatory ducts and the receptacles are bilobate (at least in the generotype). This suggests that the African species should be placed in a separate genus.

Diphya foordi sp. nov.

Figures 1H–I, 2B–C, 3B,I, 4E,G, 5C, 6B, 7B,E, 8A, 11B, 13E–G

Etymology. The specific name is a patronym in honour of the prominent South African arachnologist, Stefan Foord (University of Venda, Limpopo), for his significant contribution to the study of African spiders.

Diagnosis. *Diphya foordi* **sp. nov.** can be separated from other congeners occurring in South Africa by the pattern and shape of the copulatory organs. Males differ from those of *D. simoni* by lacking a complex pattern on the carapace, and from two other species known by males by the same dark coloration of the frontal part of carapace and chelicera (*D. leroyorum* **sp. nov.** and *D. wesolowskae* **sp. nov.** have chelicerae darker than the ocular area and clypeus). Females of the new species can be recognized by having a dark sternum lacking a pattern, light-coloured femora of all legs and well-developed abdominal pattern. *Diphya vanderwaltae* **sp. nov.** is similar and has no abdominal pattern and has dark brown femora. Males differs from congeners by the palp with longest embolus and roundly bent and gradually tapering conductor. The most similar species is *D. simoni*, which has a straight conductor (in retrolateral view), a much shorter embolus and a shorter cymbial process (cf. Figs 7E, 8A, and 7H, 8C). The epigyne of *D. foordi* **sp. nov.** is most similar to those in *D. wesolowskae* **sp. nov.** and differs from it by thinner septal stem, ca. 1/5 of the septal base width *vs*. 1/3 of the septum base width (Figs 11B and 11D).

Description. ***Male*** **(Holotype).** TL 2.41, CL 1.34, CW 0.99. Carapace brown or dark brown with more or less distinct yellow-brown longitudinal band. Ocular area dark black; clypeus dark brown, somewhat higher than AME diameter. Chelicerae with 3 promarginal and 3 retromarginal teeth. Sternum dark brown with indistinct longitudinal stripe. Femora of all legs light brown; patellae light-brown, III-IV with grayish lateral sides; tibiae, metatarsi and tarsi of all legs uniformly light brown. Abdomen dorsally brown with 4 pairs of irregularly shaped spots (frontal pair of spots largest), surrounded by line consisting of white guanine spots. Lateral sides blackish, with yellow spots and stripes. Ventrally blackish, surrounded by yellow spaces.

Palp (Figs 7B, E, 8A): femur relatively short, slightly longer than cymbium; cymbial process long, 2.25 shorter than cymbium, gradually tapering; conductor weakly sclerotized, long, almost as long as cymbium, gradually tapering, anterior margin roundly bent; tip of embolus extends past conductor, visible in retrolateral view; embolus very long, ca. 1.6 shorter than length of cymbium, with its dorsal process in anterior view (Fig. 7E).

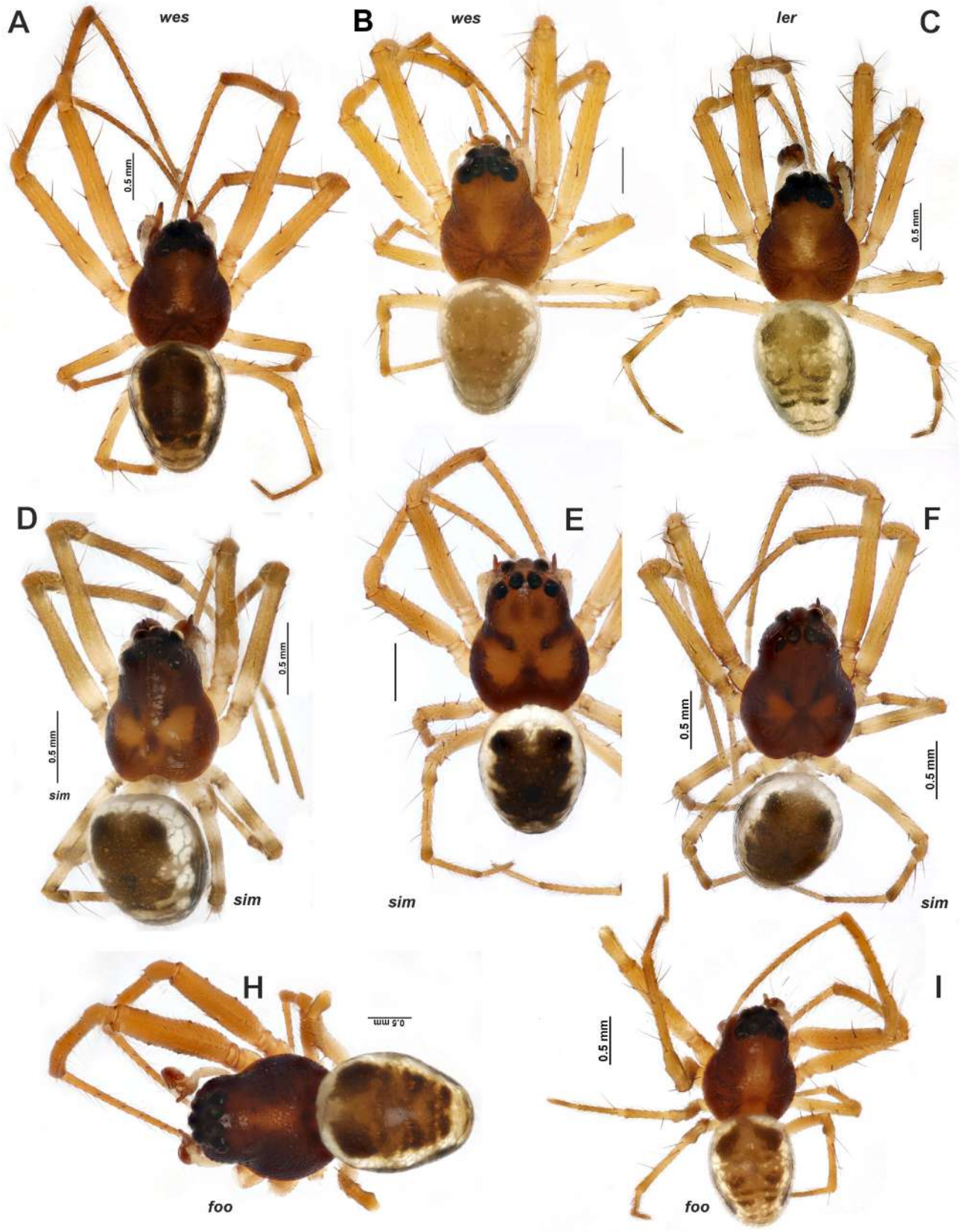

FIGURE 1. Male habitus of *Diphya wesolowskae* **sp. nov.** (A–B), *D. leroyorum* **sp. nov.** (C), *D. simoni* Kauri, 1950 (D–F) and *D. foordi* **sp. nov.** (H–I). Scales = 0.5 mm.

Palp and leg segment lengths

	Fe	Pa	Ti	Mt	Ta	Total
palp	0.36	0.07	0.13	-	0.34	0.90
I	1.56	0.50	1.36	1.50	0.77	5.68
II	1.41	0.49	1.21	1.29	0.60	5.00
III	0.80	0.27	0.51	0.60	0.31	2.50
IV	1.01	0.27	0.76	0.86	0.41	3.31

Spination of legs I–II

	Fe	Pa	Ti	Mt
I	2p2r	1d	2d3p1r	1d
II	1d2p2r	1d	2d1p1r	-

Female **(Paratype, NCA 2009/203).** TL 3.85, CL 1.71, CW 1.49. Carapace dark brown with yellow, indistinct median band. Ocular area black. Clypeus brown more than AME diameter. Chelicerae and mouthparts brown. Chelicerae with 3 promarginal and 3 or 4 retromarginal teeth. Retromarginal teeth somewhat smaller than promarginal ones. Sternum dark brown with black edge, without stripe. All legs uniformly brown without spots and rings. Abdomen light-brown dorsally with number of guanine spots and couple of large black spots and several pairs of stripes. Lateral sides dark gray with yellow spots and stripes. Ventrally grayish.

Palp and leg segment lengths

	Fe	Pa	Ti	Mt	Ta	Total
palp	0.47	0.21	0.40	-	0.56	1.64
I	1.80	0.67	1.67	1.79	0.84	6.77
II	1.70	0.66	1.49	1.57	0.71	6.13
III	1.14	0.41	0.73	0.89	0.50	3.67
IV	1.46	0.44	1.14	1.21	0.57	4.83

Spination of legs I–II

	Fe	Pa	Ti	Mt
I	1p	1d	2d3p1r	1d
II	1p	1d	2d1p1r	-

Epigyne as in Figs 11B, 13E–G; epigynal plate about 2.5 times wider than long, with transverse septal base and very short stem, septal base almost 5 times wider than long; stem as wide as septal base long and twice shorter that septal length. Receptacles inverted droplet shaped, about 2 times longer than wide, converging, space by slightly over than 1 radius; copulatory ducts indistinct.

Type material. Holotype ♂: **SOUTH AFRICA:** *Limpopo*: Lekgalameetse Nature Reserve, Farm Malta, 24°10.2’S, 30°15’E, leg. S. Foord, 17.I.2009 (riverine bush, litter sifting) (NCA 2013/1025).

Paratypes: **SOUTH AFRICA:** *Eastern Cape*: Addo National Park, Woody Cape, 33°45.6’S, 26°24.0’E, leg. L. Wiese, 1.XI.2015 (active search), 1♀ (NCA 2016/3633); Same locality and collector, XII.2009, 1♀ (NCA 2014/90); King William’s Town State Forest, 32°52.8’S, 27°23.4’E, 450 m, leg. J. Neethling, 29.XI.2013 (forest, litter sifting), 1♂ (NCA 2013/4385). *Limpopo*: Lajuma Mountain Retreat, Soutpansberg, 23°02.280’S, 29°26.520’E, 1312 m a.s.l., R. Jocqué, 6.II.2008 (grassland), 1♂ 3♀ (NCA 2012/2548); Same locality, 23°02.4’S, 29°26’E, leg. D. de Bakker, 4.II.2008 (branch beating), 1♀ (NCA 2012/2468); Same locality, 23°01.8’S, 29°27’E, leg. R. Jocqué, 8.II.2008 (near waterfall, hand), 1♀ (NCA 2012/4281); Schoemansdal, Happy Rest Nature Reserve, 23°00’35.7’’S, 29°43’32’’E, leg. Y.M. Marusik, 25.I.2020, 1♂ 2♀ (ZMMU); Tshulu, 22°34.8’S, 30°48.6’E, leg. S. Foord, 20.II.2008 (bushland, litter sifting), 1♀ (NCA 2009/203); Same locality, leg. A. Honiball, 6.II.2008, 2♀ (NCA 2010/4852). *Mpumalanga*: Mariepskop, 24°34.8’S, 30°52.2’E, leg. J. Horn, 1.III.2005 (forest), 1♀ (NCA 2010/3939). *Western Cape*: Goukamma Nature Reserve, 34°02.4’S, 22°51.6’E, leg. R. Jocqué, 30.I.2014 (fynbos litter), 1♀ (NCA 2016/1819).

Distribution. Widespread in southern and eastern South Africa (Fig. 14).

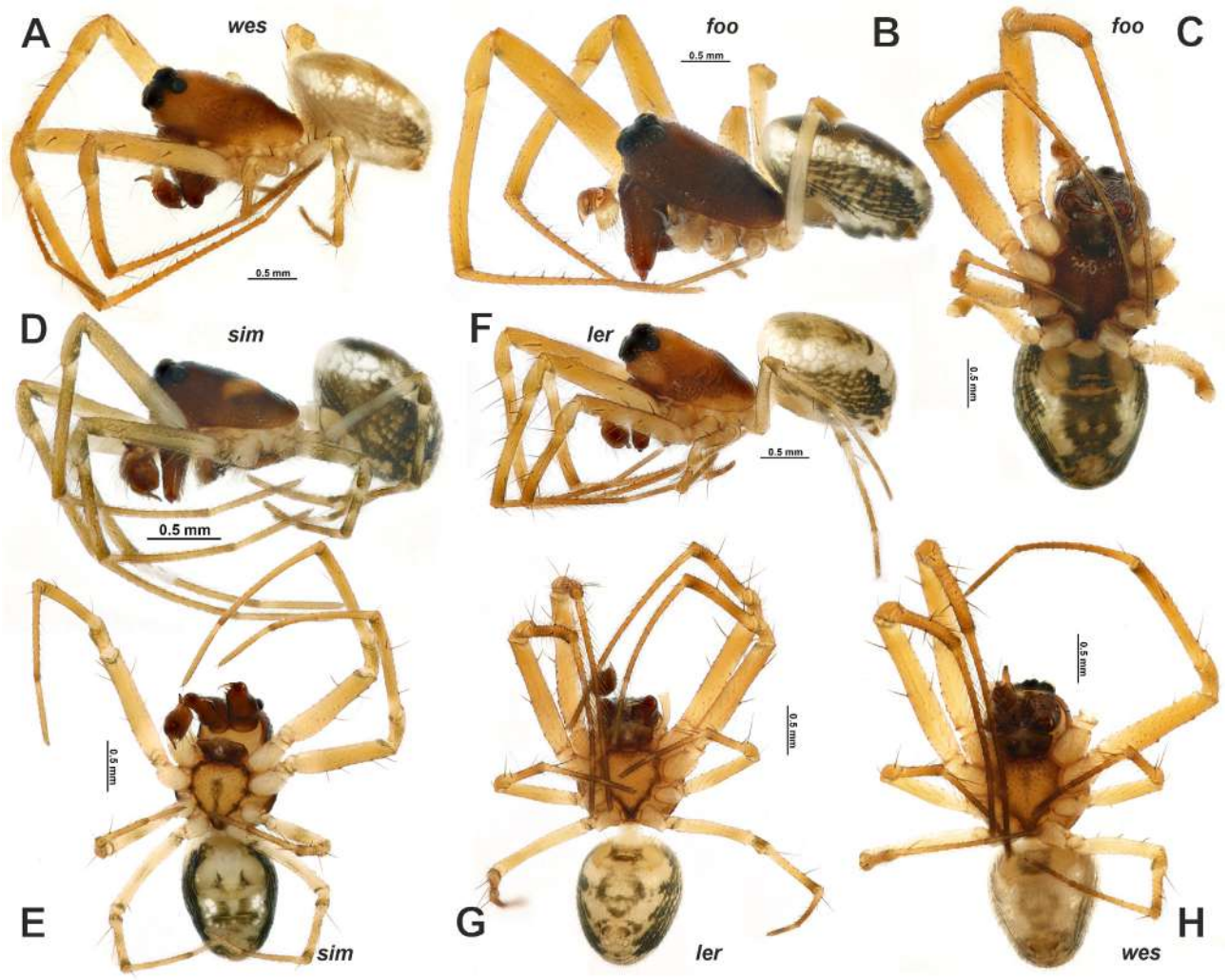

FIGURE 2. Male habitus of *Diphya wesolowskae* **sp. nov.** (A, H), *D. foordi* **sp. nov.** (B, C), *D. simoni* Kauri, 1950 (D–E) and *D. leroyorum* **sp. nov.** (F–G). A–B, D, F Lateral; C, E, G–H Ventral. Scales = 0.5 mm.

Diphya leroyorum sp. nov.

Figures 1C, 2F–G, 3G, 6C, 7F–G, 8D

Etymology. The specific name is a patronym in honour of the Leroy family. Astri and John Leroy have been key role players in the establishment of the Spider Club of Southern Africa. They have shared their passion and excitement for arachnids to many others.

Diagnosis. This species, only known from the holotype male, can be distinguished from other congeners by the palp having a well-sclerotized conductor with a tip that bends anteriorly, forming a right angle, and with a short, abrupt tip of the cymbial process. Other species, such as *D. foordi* **sp. nov.** and *D. simoni*, have either a weakly sclerotized conductor or a long, sharply pointed cymbial process and the tip of conductor bent antero-ventrally. Female unknown.

Description. ***Male*** **(Holotype).** TL 2.88. CL 1.46, CW 1.13; carapace brown or dark brown with indistinct yellow-brown longitudinal band. Ocular area dark black. Edge of carapace in its rear half with very thin yellow line. Clypeus yellowish, somewhat higher than AME diameter. Chelicerae with 3 promarginal and 4 retromarginal teeth. Sternum brown with blackish edges, without longitudinal stripe. Femora and patellae light-brown; III-IV lighter than I-II. Tibiae light brown, grayish dorsally (except for III, which are uniformly colored). Metatarsi and tarsi of all legs light brown. Abdomen dorsally light brown, with 4 pairs of irregularly shaped spots (frontal pair of spots biggest), surrounded by line consisting of white guanine spots. Lateral sides blackish, with yellow spots and stripes. Ventrally yellow with blackish spots.

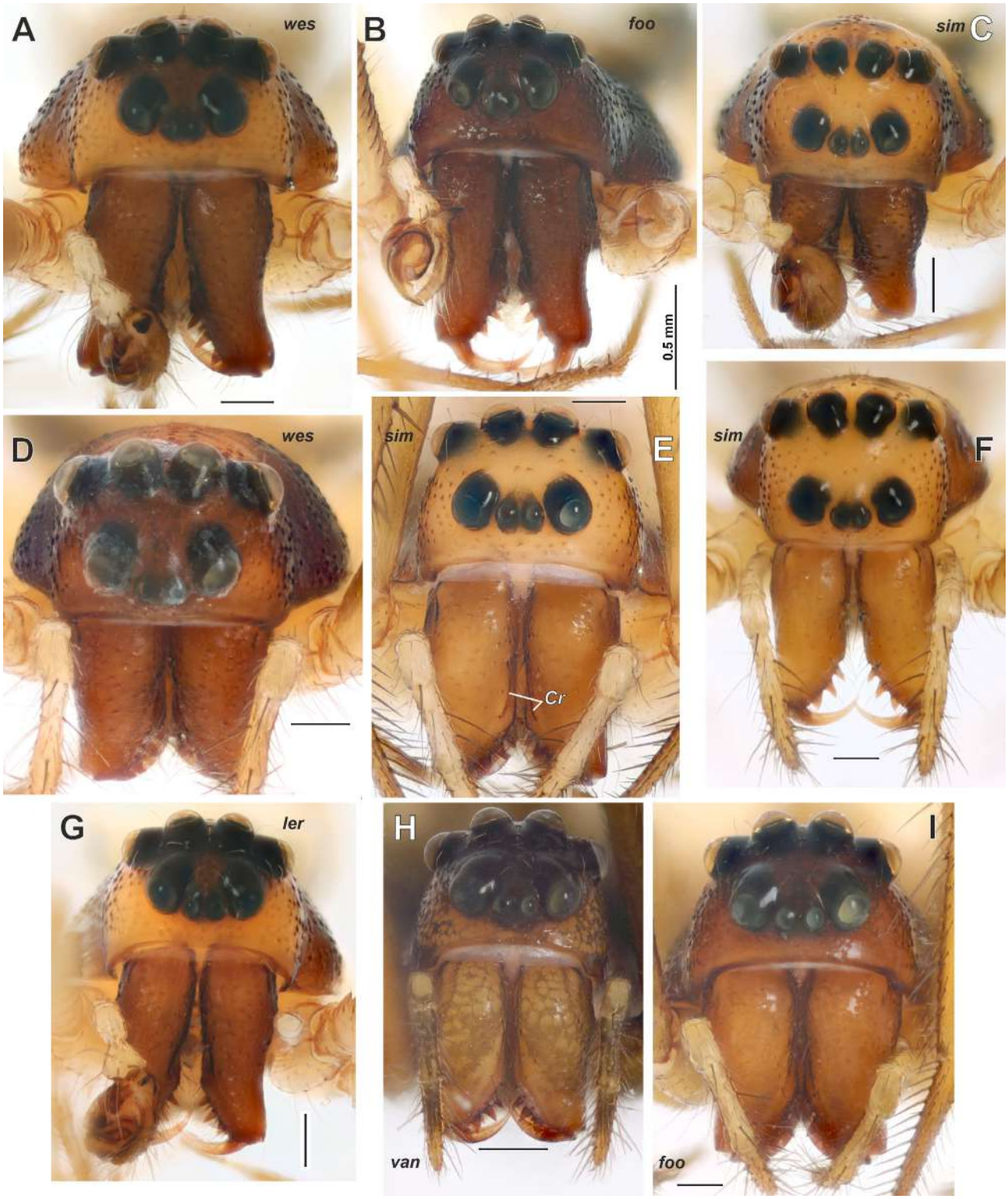

FIGURE 3. Frontal view of prosoma in *Diphya wesolowskae* **sp. nov.** (A, D), *D. foordi* **sp. nov.** (B, I), *D. simoni* Kauri, 1950 (C, E–F), *D. leroyorum* **sp. nov.** (G) and *D. vanderwaltae* **sp. nov.** (H). A–C, G Male; D–F, H–I Female. Scales = 0.2 mm unless otherwise indicated.

Palp and leg segment lengths

	Fe	Pa	Ti	Mt	Ta	Total
palp	0.40	0.14	0.16	-	0.37	1.07
I	1.57	0.50	1.43	1.59	0.76	5.84
II	1.43	0.49	1.21	1.29	0.66	5.07
III	0.79	0.26	0.57	0.64	0.43	2.68
IV	1.00	0.33	0.79	0.93	0.50	3.54

Spination of legs I–II

	Fe	Pa	Ti	Mt
I	2p2r	1d	2d3p1r	1d
II	1d2p2r	1d	2d2p1r	1d

Palp as in Figs 7F–G, 8D; femur slightly longer than cymbium; cymbial process short, broad at the base with abrupt tip, length wide ratio about 1.25; conductor well sclerotized, with tip bent anteriorly with right angle; embolus relatively short, ca. 2.7 times shorter than cymbium, with its process in anterior view (Fig. 7G).

Type material. Holotype ♂: **SOUTH AFRICA:** *Mpumalanga*: Mariepskop, 24°34.8'S, 30°52.2'E, leg. J. Horn, 18.V.2005 (forest, litter sifting) (NCA 2010/3454).

Comments. We are convinced that this species, known by holotype male only, cannot be conspecific with *D. vanderwaltae* **sp. nov.**, only known from the holotype female. The two species have very different color patterns and leg spination arrangements.

Distribution. Type locality only (Fig. 14).

Diphya simoni Kauri, 1950

Figures 1D–F, 2D-E, 3C, E–F, 4A–B, F, H–I, 5A–B, E, G–I, 6D, 7C, H, 8C, 9A–B, D–E, 10F–K, 11A, 12A–P, 13D, K–L

Diphya simoni Kauri, 1950: 8, fig. 6 (♀ holotype from **SOUTH AFRICA:** *Mpumalanga*: Kruger National Park, Pretoriuskop Camp, 4.XI.1948, Lund Museum, with dissected and lost epigyne—examined); Marusik, 2017: 127, figs 7–9, 19.
Diphya capensis Simon, 1894: 744 (*nomen nudum*); Bonnet, 1956: 1477 (marked as *nomen nudum*).
Diphya tanikawai Marusik, 2017: 135, figs 1–6, 13–18 (♀ holotype and paratype from **SOUTH AFRICA:** *Western Cape*: Cape Town, Table Mt., Platteklip Gorge, 33.9608°S, 18.408307°E, leg. Y.M. Marusik, 29.I.2017, NCA—examined) **syn. nov.**

Diagnosis. Both sexes of this species differ clearly from other South African species by having a distinct pattern on the carapace, which is lacking in the other species, or presenting only as a light median band. The male palp of this species is most similar to that in *D. foordi* **sp. nov.** and differs by the the straight anterior margin of the conductor (*vs*. roundly bent), the shorter cymbial process (1/5 of cymbial length *vs*. 1/2), and the relatively shorter embolic loop, ca. 1/2 of cymbial length *vs*. almost as long as cymbium. Females of *D. simoni* differ clearly from the other species by the shape of the septum, and the septum extended over the plate of the epigyne (Figs 12M, O–P, 13L).

Description. ***Male*** **(NCA 2008/3048).** TL 2.46. CL 1.41, CW 1.06. Carapace dark brown, with yellow median band. Shape and color of median band differing between males: wide, yellow, narrow at middle part (Fig. 1E), divided in 2 large, yellow spots (Fig. 1D), or in one male, these spots poorly visible (Fig. 1F). Clypeus yellowish, twice higher than AME diameter. Chelicerae and mouthparts dark brown. Chelicerae with 3 promarginal and 3 retromarginal teeth. Retromarginal teeth significantly smaller than promarginal ones. Sternum yellowish, with 3 pairs of black spots at edges and black longitudinal band. Femora of all legs light brown; III–IV with poorly visible or distinct rings. Patellae light brown; III–IV lighter than Pa I-II with poorly visible gray spots at lateral sides. Tibiae light brown; III–IV with gray rings. Metatarsi and tarsi I–II light-brown; III–IV lighter than I–II. Abdomen dorsally dark-brown, surrounded by white guanine line and with poorly visible pair of black spots at frontal part. Lateral sides dark gray, with thin longitudinal yellow stripes. Ventrally dark gray, surrounded by yellowish spots.

Palp and leg segment lengths

	Fe	Pa	Ti	Mt	Ta	Total
palp	0.37	0.09	0.07	-	0.36	0.89
I	1.46	0.49	1.24	1.41	0.71	5.31
II	1.29	0.46	1.11	1.21	0.66	4.73
III	0.79	0.29	0.53	0.57	0.40	2.57
IV	1.00	0.29	0.74	0.86	0.43	3.31

Legs I-II spination

	Fe	Pa	Ti	Mt
I	3p2r	1d	2d3p1r	1d
II	1d2(3)p3r	1d	2d1p1r	1d

Palp as in Figs 7C, H, 8C, A–B, D–E; femur as long as cymbium; cymbial process short, 3 times shorter than cymbium, length:width ratio 2; conductor straight, gradually tapering; embolus long, almost as long as cymbial length.

***Female* (NCA 2011/2888).** TL 3.65, CL 1.64, CW 1.24. Carapace yellowish, with dark-brown edges and with Y or X markings. Clypeus yellowish, somewhat lower than AME diameter. Ocular area yellow. Chelicerae and mouthparts light brown. Chelicerae with 3 promarginal and 3 or 4 retromarginal teeth. Retromarginal teeth significantly smaller than promarginal ones. Sternum brown, with dark edges and longitudinal stripe. Legs as in male, but spots and rings more distinct. Abdomen dorsally light brown, with number of guanine spots and couple of large black spots in frontal part. Lateral sides dark gray, with yellow spots and stripes. Ventrally as in males, but lighter.

Palp and leg segment lengths

	Fe	Pa	Ti	Mt	Ta	Total
palp	0.43	0.21	0.40	-	0.44	1.49
I	1.63	0.64	1.49	1.57	0.83	6.15
II	1.50	0.50	1.29	1.51	0.73	5.53
III	1.09	0.37	0.73	0.79	0.46	3.43
IV	1.36	0.43	0.99	1.07	0.50	4.34

Spination of legs I–II

	Fe	Pa	Ti	Mt
I	1p	-	1d3p1r	1d
II	1d1r	1d	2d2(1)p1r	1d

Mt I–II and distal parts Ti I–II with row of prolateral spines.

Epigyne as in Figs 11A, 12A–P, 13D, K–L; shape of epigyne and its appearance variable, especially septal stem and base (Figs 12A–L); septum about 1.33 times wider than long, stem short, shorter than septal base, with subparallel lateral margins or diverging posteriorly (stem triangular), stem with distinct lateral pockets (*Lp*); whole septal base extending across epigynal plane, central part of base with extended lateral parts (Figs 12M,P, 13L), central part (= septum base, *Sb*) well distinct in ventral view in some specimens (Figs 12A,L) or almost indistinct (Figs 12C, E–F). Receptacles pear-shaped, with globular heads and thinner posterior part, globular parts slightly spaced.

Other material examined. SOUTH AFRICA: *Eastern Cape*: Cape St. Francis, 34°11.4’S, 24°49.2’E, leg. J. Leroy, 8.IV.2007 (plants), 1♀ (NCA 2010/121); Hogsback, Amatola Mountains, 32°35.4’S, 26°55.2’E, leg. UFS Entomology students, 25.III.2007 (foliage, beating), 1♂ 4♀ (NCA 2007/1240); Same locality and collectors, 4.IV.2006 (pine plantation, sweepnet), 1♀ (NCA 2010/2666); Jeffrey’s Bay, 34°03.6’S, 24°54.6’E, leg. L. Wiese, 17.VI.2006 (orb-webs), 2♀ (NCA 2010/3143); Port Elizabeth, Klein River Gorge Wilderness, 33°57.0’S, 25°36.6’E, leg. J. Neethling & C. Luwes, 7.XII.2011 (bushveld, litter sifting), 1♂ (NCA 2013/1080). *KwaZulu-Natal*: Midlands, Baynesfield, 29°40.620’S, 29°55.32’E, leg. I. Yekwayo, 1.I.2014 (grassland, pit trap), 1♂ (NCA 2015/1559), 1♀ (NCA 2015/1558); Midlands, Good Hope Plantation, Boston, 29°39.046’S, 29°58.565’E, leg. I.

Yekwayo, 1.I.2014 (grassland, pit trap), 1♂ (NCA 2015/1547), 1♀ (NCA 2015/1560). *Mpumalanga*: Mariepskop, Vacuum, 24°34.8'S, 30°52.2'E, L. Taylor, 1.II.2014 (grassland, mountain), 1♂ 1♀ (NCA 2015/4967). *North West*: Zeerust, 25°31.8'S, 26°04.8'E, leg. N. Hahn, 2.IV.2010 (ground habitat, rocky outcrop, active search below knee), 1♀ (NCA 2011/2888). *Western Cape*: Hermanus, 34°24'S, 19°15'E, leg. V.L. Hamilton-Attwell, 6.XII.2006 (litter sifting), 1♂ (NCA 2008/3048); Table Mountain National Park, Constantia Nek, 34°00.6'S, 18°24.6'E, leg. C. Uys, 7.XI.2008 (litter sifting), 1♀ (NCA 2010/2531); Same locality, Cecilia Rooikat, Pinus 33°59.4'S, 18°25.2'E, leg. C. Uys, 23.V.2008, 1♀ (NCA 2010/3128).

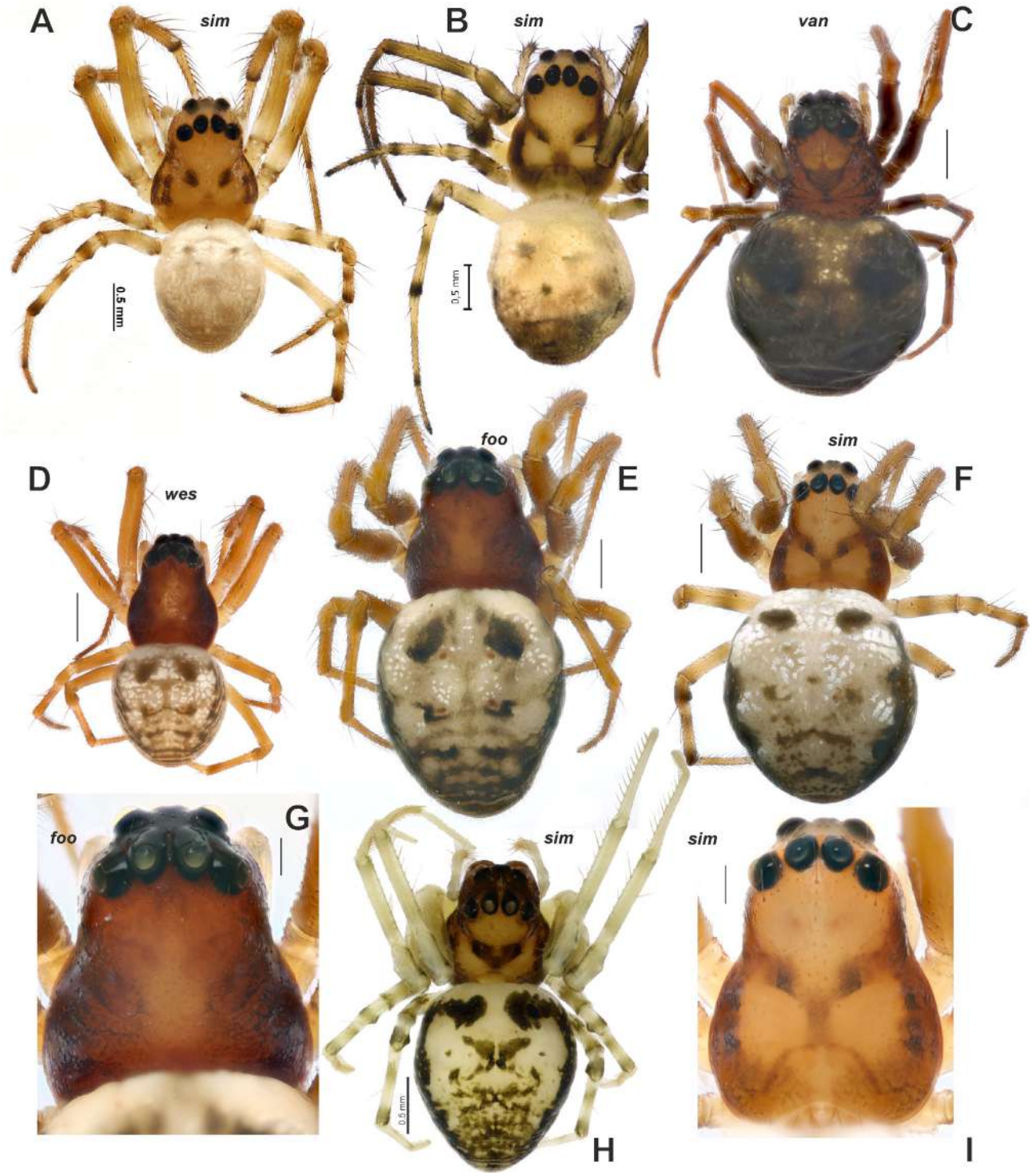

FIGURE 4. Female habitus of *Diphya simoni* Kauri, 1950 (A–B, F, H–I), *D. vanderwaltae* **sp. nov.** (C), *D. wesolowskae* **sp. nov.** (D) and *D. foordi* **sp. nov.** (E, G) (B Holotype of *D. tanikawai* Marusik, 2017; H Holotype of *D. simoni*). A–F, H; G–I Habitus, dorsal; G, I Prosoma, dorsal.

Comments. The epigyne of the holotype female of *D. simoni* was not found; maybe it remained on the preparation slide. Study of the numerous specimens with a differently developed septum, and females collected with males, lead us to conclusion that the two species names should be synonymized, although their type localities are far away from each other. All specimens that we consider as *D. simoni* have a well-developed pattern on the carapace, and females have distinct hoods (pockets) on the septal stem.

Distribution. This species has the widest range among African *Diphya* and is known across the whole of South Africa, from the Western Cape Province to Mpumalanga Province (type locality) (Fig. 14). The type locality of *D. simoni* is located far away from other localities but is very close to those of *D. leroyorum* **sp. nov.** (known from the holotype male only). This can be caused either by mislabeling, or because we wrongly synonymized *D. tanikawai*. Types of both species and all studied specimens have a distinct carapace pattern, which is absent in *D. leroyorum* **sp. nov.**

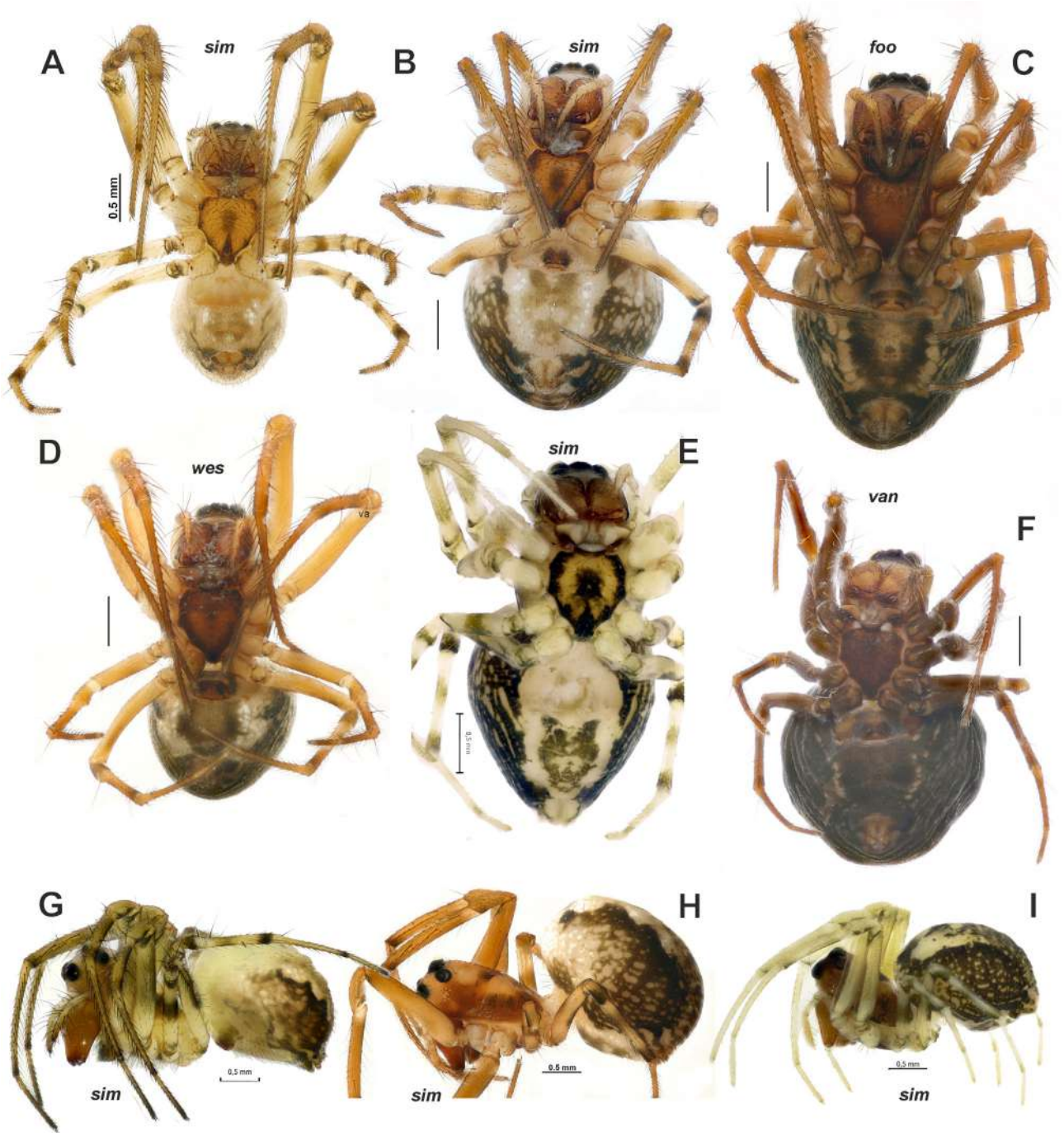

FIGURE 5. Female of *Diphya simoni* Kauri, 1950 (A–B, E, G–I), *D. foordi* **sp. nov.** (C), *D. wesolowskae* **sp. nov.** (D) and *D. vanderwaltae* **sp. nov.** (F). A–F Habitus, ventral; G–I Habitus, lateral.

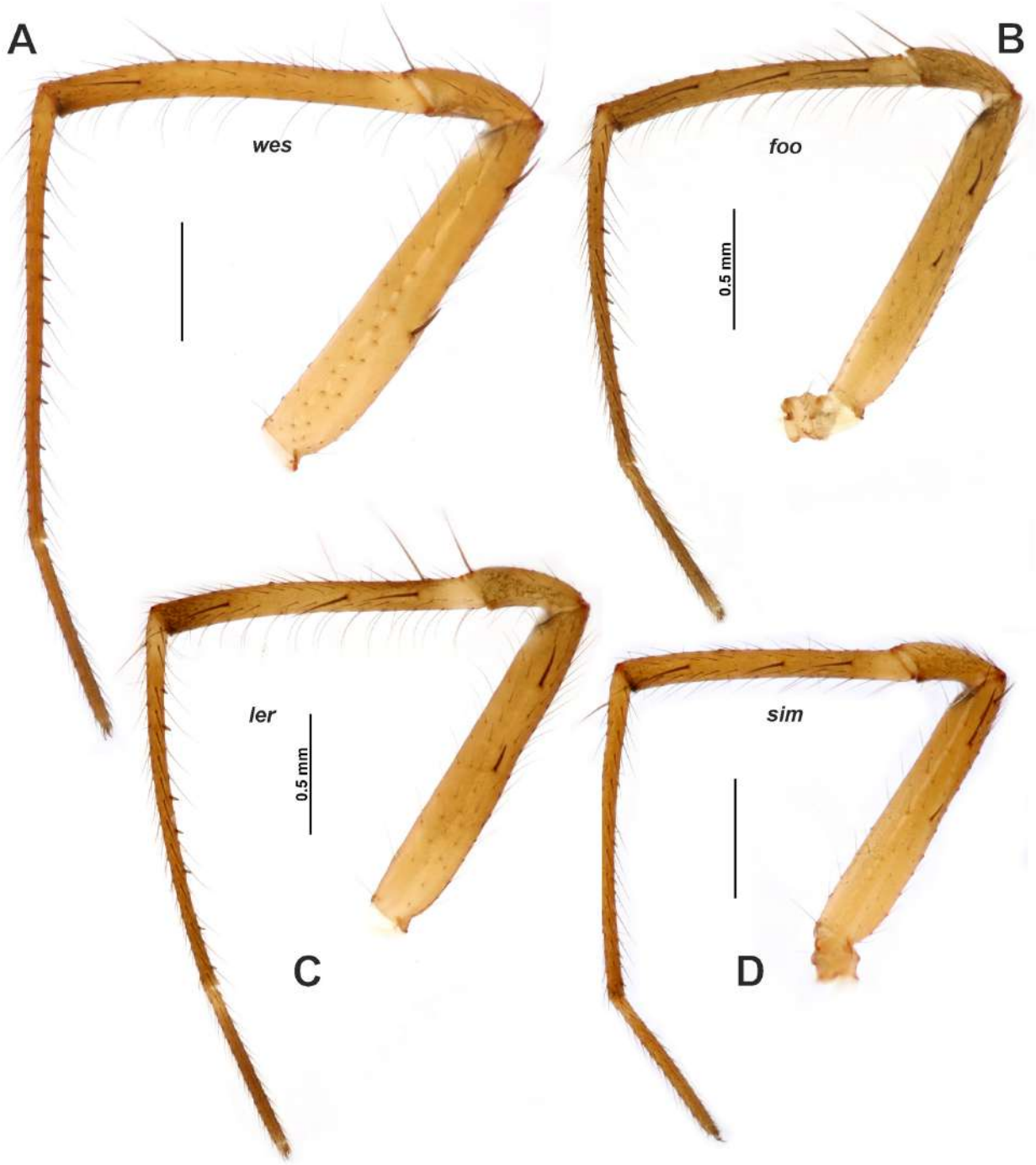

FIGURE 6. Prolateral view of male leg I of *Diphya wesolowskae* **sp. nov.** (A), *D. foordi* **sp. nov.** (B), *D. leroyorum* **sp. nov.** (C) and *D. simoni* Kauri, 1950 (D). Scales = 0.2 mm unless otherwise indicated.

Diphya vanderwaltae **sp. nov.**
Figures 3H, 4C, 5F, 11C, 13A–C, 14

Etymology. The specific name is a matronym in honour of Vida van der Walt. She is a Salticidae photographer who has contributed to the field with her photography of living jumping spiders in South Africa.

Diagnosis. The new species differs of all other *Diphya* species by the dark coloration of the body and femora, lacking a distinct abdominal pattern, having a triangular epigynal septum, closely spaced copulatory openings and receptacles almost touching each other (vs. at least abdomen with pattern, femora colored as other leg segments, septum not triangular, and receptacles distinctly spaced). Male unknown.

Description. ***Female*** **(Holotype, NCA 2007/306).** TL 3.30, CL 1.46, CW 1.16. Carapace dark brown, with black triangular spot in central part, median band indistinct. Ocular area black. Clypeus dark-brown, higher than AME diameter. Chelicerae and mouthparts brown. Chelicerae with 3 promarginal and 3 retromarginal teeth. Sternum uniformly black, without dark edges, spots or stripes. Femora dark gray, with yellowish longitudinal lines. Patellae, tibiae and metatarsi of all legs uniformly dark gray. Tarsi dark gray; III–IV lighter than I–II. Abdomen dorsally dark gray (lighter in frontal part, with some guanine spots). Lateral and ventral sides almost black, with few yellowish spots.

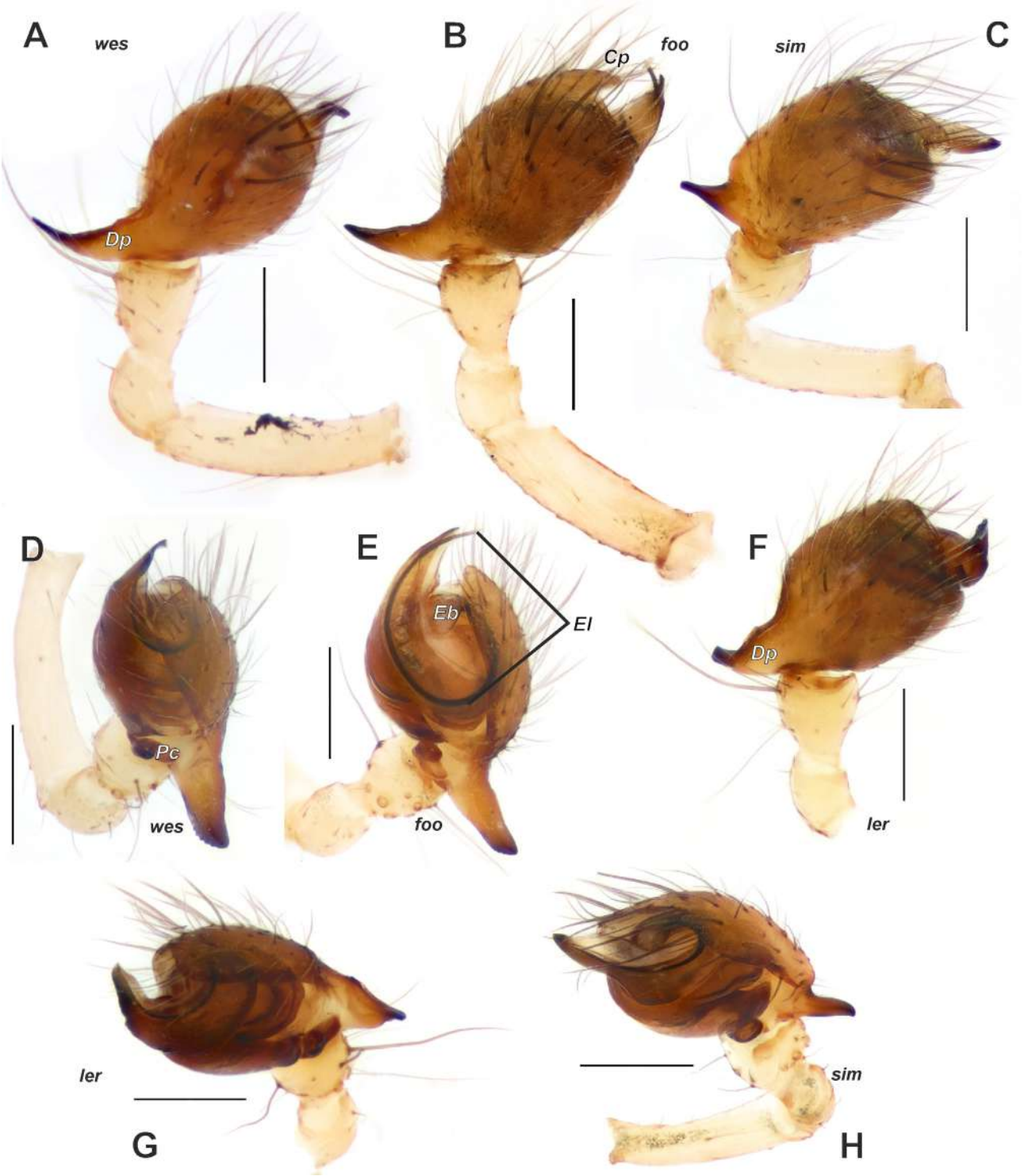

FIGURE 7. Male palp of *Diphya wesolowskae* **sp. nov.** (A, D), *D. foordi* **sp. nov.** (B, E), *D. simoni* (C, H) and *D. leroyorum* **sp. nov.** (F–G). A–C, F Antero-prolateral; D–E, G–H Antero-retrolateral. Scales = 0.2 mm.

Palp and leg segment lengths

	Fe	Pa	Ti	Mt	Ta	Total
palp	0.31	0.19	0.34	-	0.46	1.30
I	1.29	0.59	1.29	1.40	0.74	5.30
II	1.36	0.56	1.14	1.14	0.60	4.80
III	0.93	0.36	0.60	0.64	0.43	2.96
IV	1.07	0.36	0.89	0.86	0.46	3.63

Spination of legs I–II

	Fe	Pa	Ti	Mt
I	1p	1d	2d3p1r	1d
II	-	1d	1d2p1r	1d

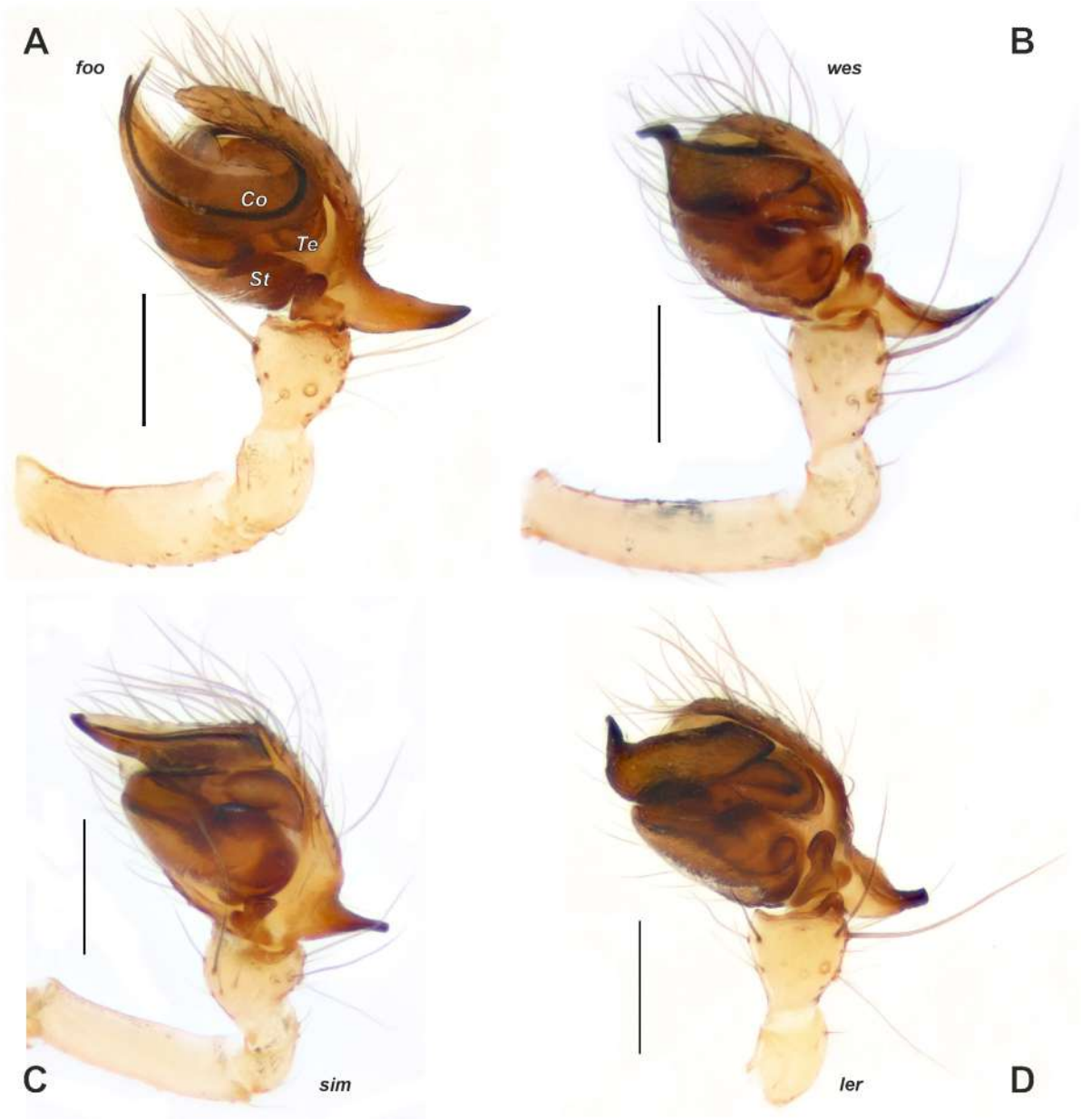

FIGURE 8. Retrolateral view of male palp of *Diphya foordi* **sp. nov.** (A), *D. wesolowskae* **sp. nov.** (B), *D. simoni* Kauri, 1950 (C) and *D. leroyorum* **sp. nov.** (D). Scales = 0.2 mm.

Epigyne as in Figs 11C, 13A–C; with large and triangular base of septum (width/height ratio 3.0), very short and thin septal stem, and 2 distinct, closely separated copulatory openings; receptacles elongate, with shallow constrictions, almost touching each other.

Type material. Holotype ♀: **SOUTH AFRICA:** *Eastern Cape*: Cwebe Nature Reserve, 32°16.8'S 28°54'E, leg. C. Haddad, 30.X.2006 (sifting leaf litter, coastal dune forest) (NCA 2007/306).

Comments. We are convinced that this species, known from the female only, cannot be conspecific with *D. leroyorum* **sp. nov.**, known from the holotype male only. The two species have very different patterns and leg spination arrangements.

Distribution. Type locality only (Fig. 14).

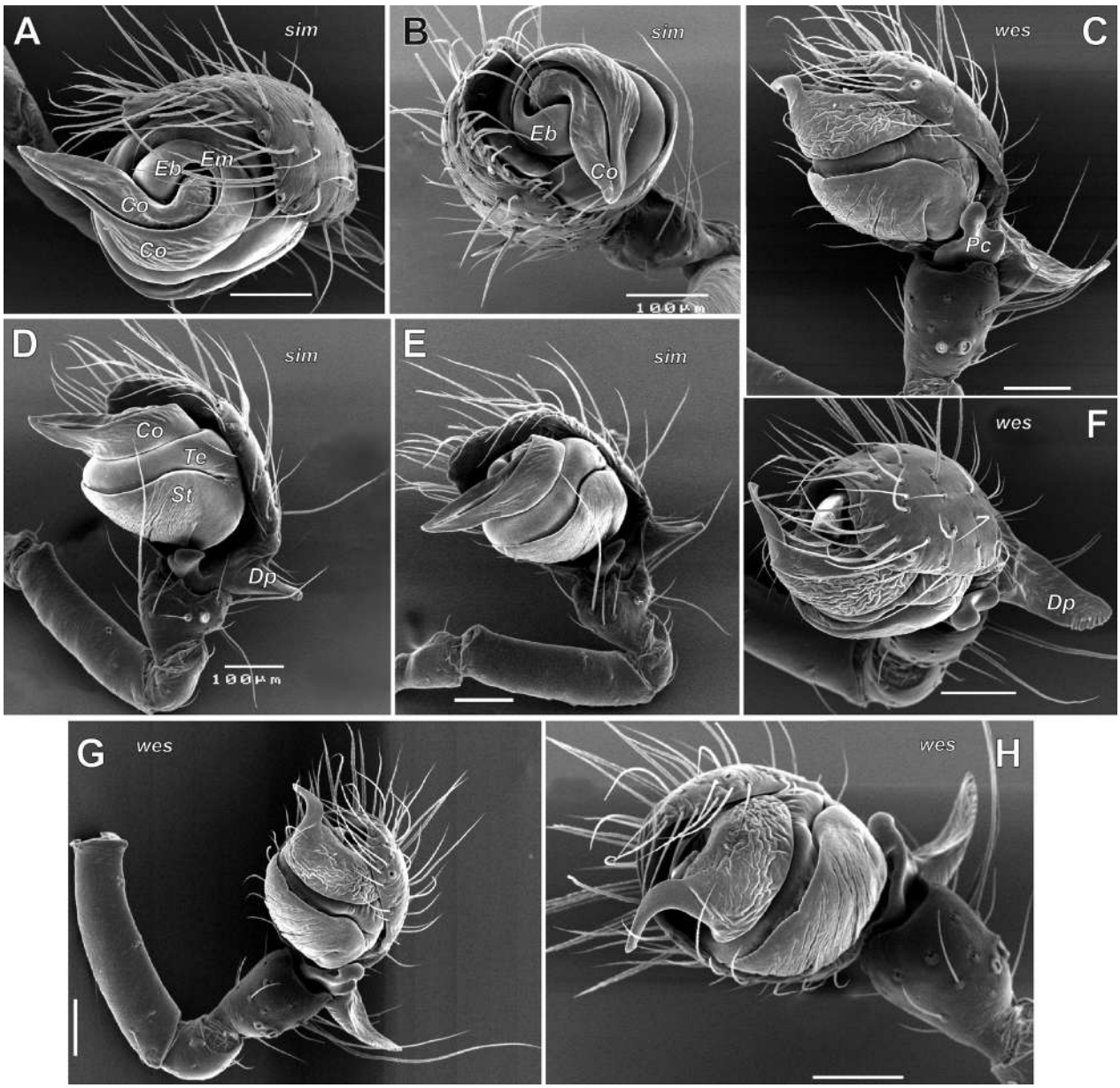

FIGURE 9. SEM micrographs of the male palp of *Diphya simoni* Kauri, 1950 (A–B, D–E) and *D. wesolowskae* **sp. nov.** (C, F–H). A, F Anterior; B Antero-ventral; C–D Retrolateral; E, G Ventro-retrolateral; H Subventral. Scales = 0.1 mm.

***Diphya wesolowskae* sp. nov.**

Figures 1A–B, 2A, H, 3A–D, 4D, 5D, 6A, 7A, D, 8B, 9C, F–H, 10A–E, 11D, 13H–J

Etymology. The specific name is a matronym in honor of Wanda Wesołowska (Wrocław, Poland) for her contributions to taxonomic studies of African Salticidae and on the occasion of her 70th birthday celebration.

Diagnosis. The new species can be easily distinguished from the widely distributed *D. simoni* by the lack of a carapace pattern. Males of *D. wesolowskae* **sp. nov.** can be distinguished from other congeners by the relatively long palpal femur (cf. Figs 7A–D, 8B), distinctly longer than cymbium, the roundly bent and sharply pointed dorsal cymbial process (in lateral view), and the tip of the conductor bent ventrally (vs. not bent, or bent anteriorly). Females of the new species are most similar to those of *D. foordi* **sp. nov.**, and differ by wider septal stem (ca. 1/3 of septal base width *vs*. ca. 1/5).

Description. ***Male*** **(Holotype, NCA 2015/1557).** TL 2.8, CL 1.61, CW 1.19. Carapace brown or dark brown, with poorly visible yellow to brown longitudinal band; carapace edges in posterior half with thin yellow lines. Ocular area black; clypeus yellowish, somewhat higher than AME diameter. Chelicerae and mouthparts dark brown; chelicerae with 3 promarginal and 4 retromarginal teeth. Sternum brown, with blackish edges and longitudinal stripe. Femora I–II uniformly light brown; III–IV darker brown dorsally. Patellae I–III brown; IV slightly darker brown. Tibiae yellow, somewhat darker distally; tibiae III–IV darker than I–II. Metatarsi I–II dark yellow; III–IV yellow, gray dorsally. Tarsi I–II dark yellow, III–IV yellow. Abdomen dorsally brown or dark brown, with pair of large black spots anteriorly (two males with lighter abdomen and indistinct pattern consisting of spots and lines), surrounded by white guanine line. Lateral sides grayish (blackish at rear parts), with thin longitudinal yellow stripes. Ventrally dark gray, surrounded by yellowish spots.

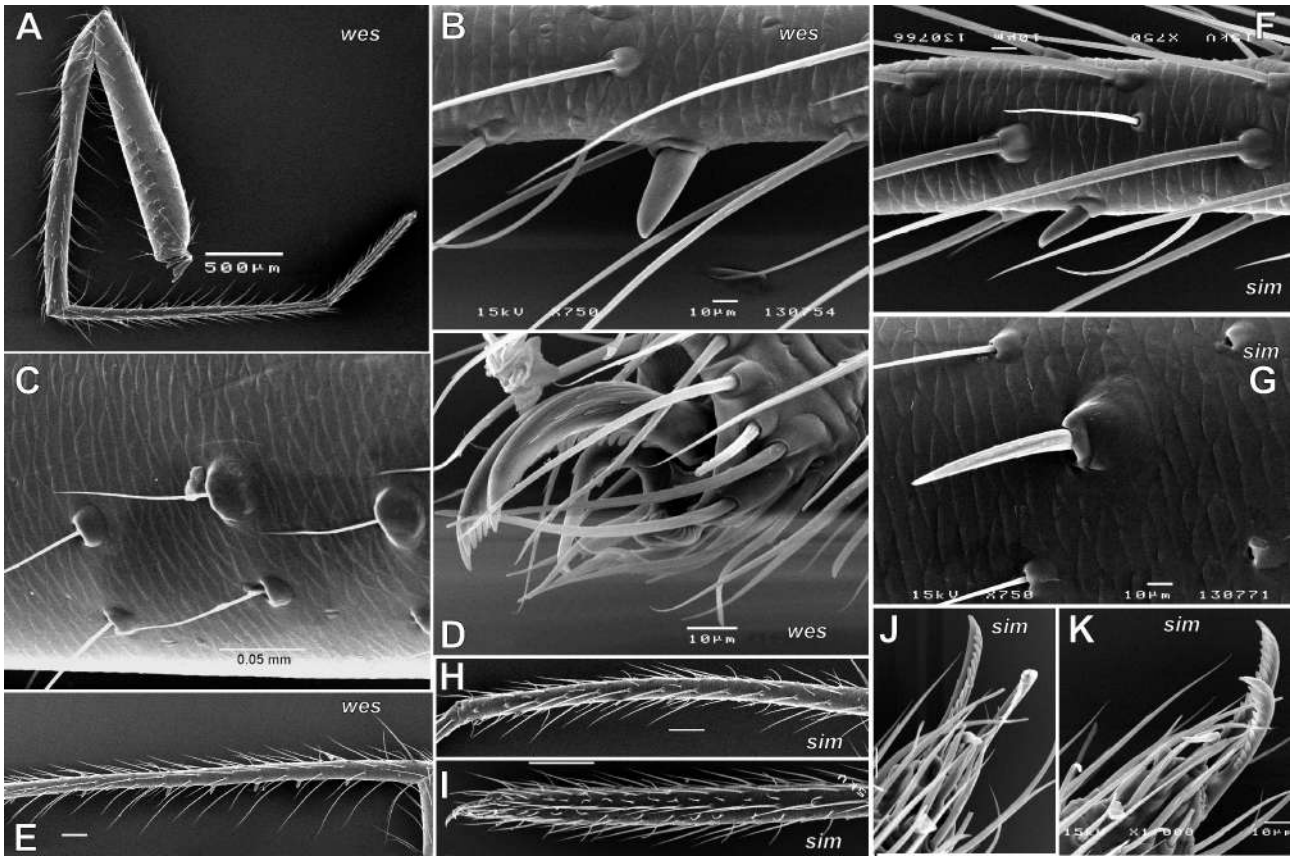

FIGURE 10. SEM micrographs of leg I of *Diphya wesolowskae* **sp. nov.** (A–E, C) and *D. simoni* Kauri, 1950 (F–K). A Whole leg, prolateral; B, F Magnified metatarsus, showing modified ventral spines; C, G Microstructure of the cuticle; E, H Metatarsus, prolateral; D, J–K Tarsal claws, different aspects; I Tarsus, ventral. Scales = 0.1 mm if not otherwise indicated.

Palp and leg segment lengths

	Fe	Pa	Ti	Mt	Ta	Total
palp	0.43	0.16	0.14	-	0.36	1.09
I	1.79	0.59	1.57	1.57	0.79	6.31
II	1.56	0.57	1.29	1.43	0.73	5.58
III	0.93	0.36	0.64	0.66	0.43	3.02
IV	1.17	0.34	0.86	1.00	0.49	3.86

Spination of legs I–II

	Fe	Pa	Ti	Mt
I	2p2r	1d	3d3p1r	1d
II	1d2p2r	1d	2d2p1r	-

Mt I–II and upper parts Ti I–II with row of prolateral spines.

Palp as in Figs 7A, D, 8B, 9C, F, G–H; tibia long, 4 times longer than wide, ca. 1.2 longer than cymbium; tibia long, almost 1/2 of femur length; cymbium with long dorsal process, appearing as sharply pointed in lateral view (Fig. 8B), but rounded in anterior view (Fig. 9F); conductor well sclerotized, with tip bent ventrally; embolus and embolic loop relatively short, loop as long as dorsal cymbial process.

Female **(Paratype, NCA 2014/3607).** TL 3.17. CL 1.60, CW 1.17. Carapace dark brown, with yellow-brown longitudinal band; edge of carapace with very thin yellow line in its rear half. Ocular area dark brown. Clypeus dark brown, lower than AME diameter. Chelicerae and mouthparts brown. Chelicerae with 3 promarginal and 3 retromarginal teeth. Sternum dark brown, with dark edges and longitudinal stripe. Femora light brown. Patellae light brown; III–IV darker than I–II. Tibiae light brown; III–IV darker dorsally. Metatarsi and tarsi light brown; III–IV darker than I–II. Abdomen dorsally light brown, with number of guanine spots, couple of large black spots and several pairs of stripes. Lateral sides dark gray, with yellow spots and stripes. Ventrally grayish.

Palp and leg segment lengths

	Fe	Pa	Ti	Mt	Ta	Total
palp	0.43	0.16	0.36	-	0.49	1.43
I	1.59	0.63	1.39	1.53	0.81	5.94
II	1.44	0.56	1.24	1.29	0.64	5.17
III	0.93	0.36	0.67	0.79	0.47	3.21
IV	1.29	0.36	0.94	0.93	0.53	4.04

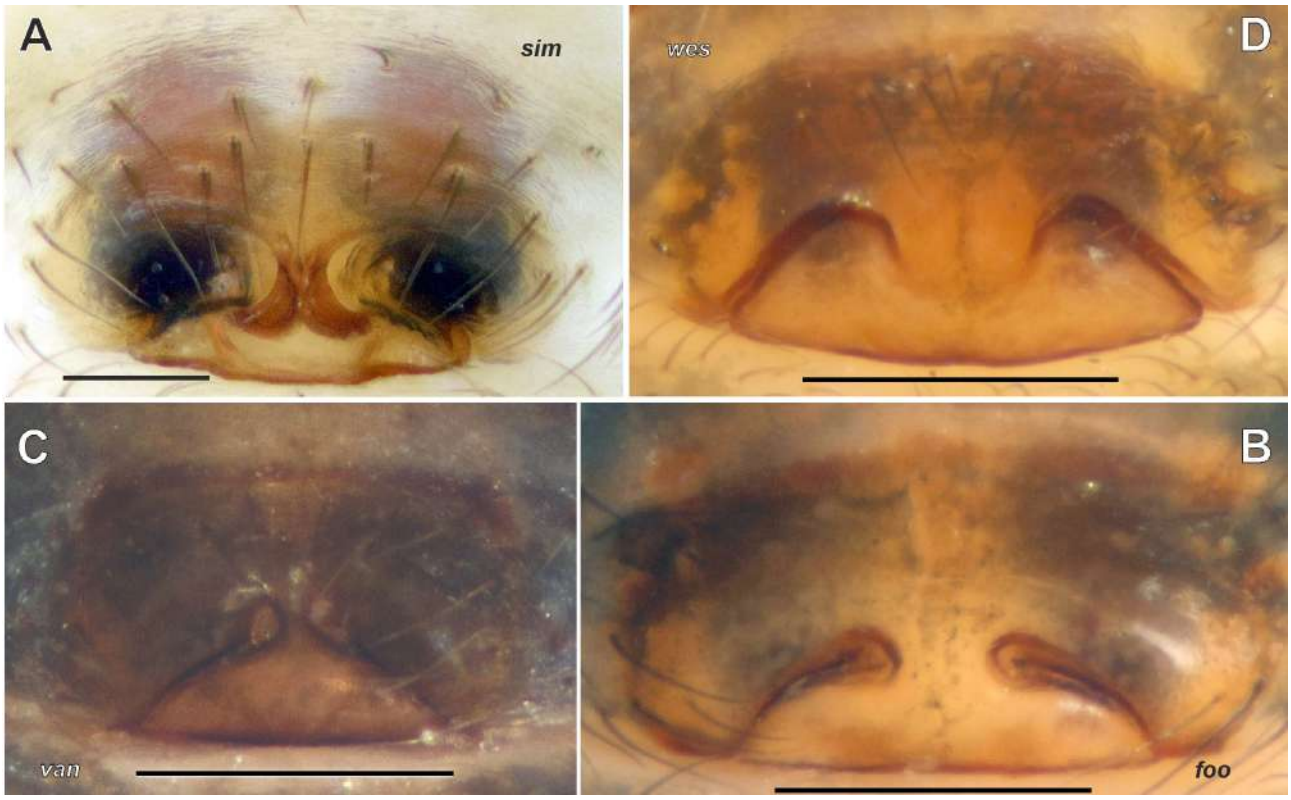

FIGURE 11. Epigyne, ventral view of *Diphya simoni* Kauri, 1950 (A), *D. foordi* **sp. nov.** (B), *D. vanderwaltae* **sp. nov.** (C) and *D. wesolowskae* **sp. nov.** (D). Scales = 0.2 mm.

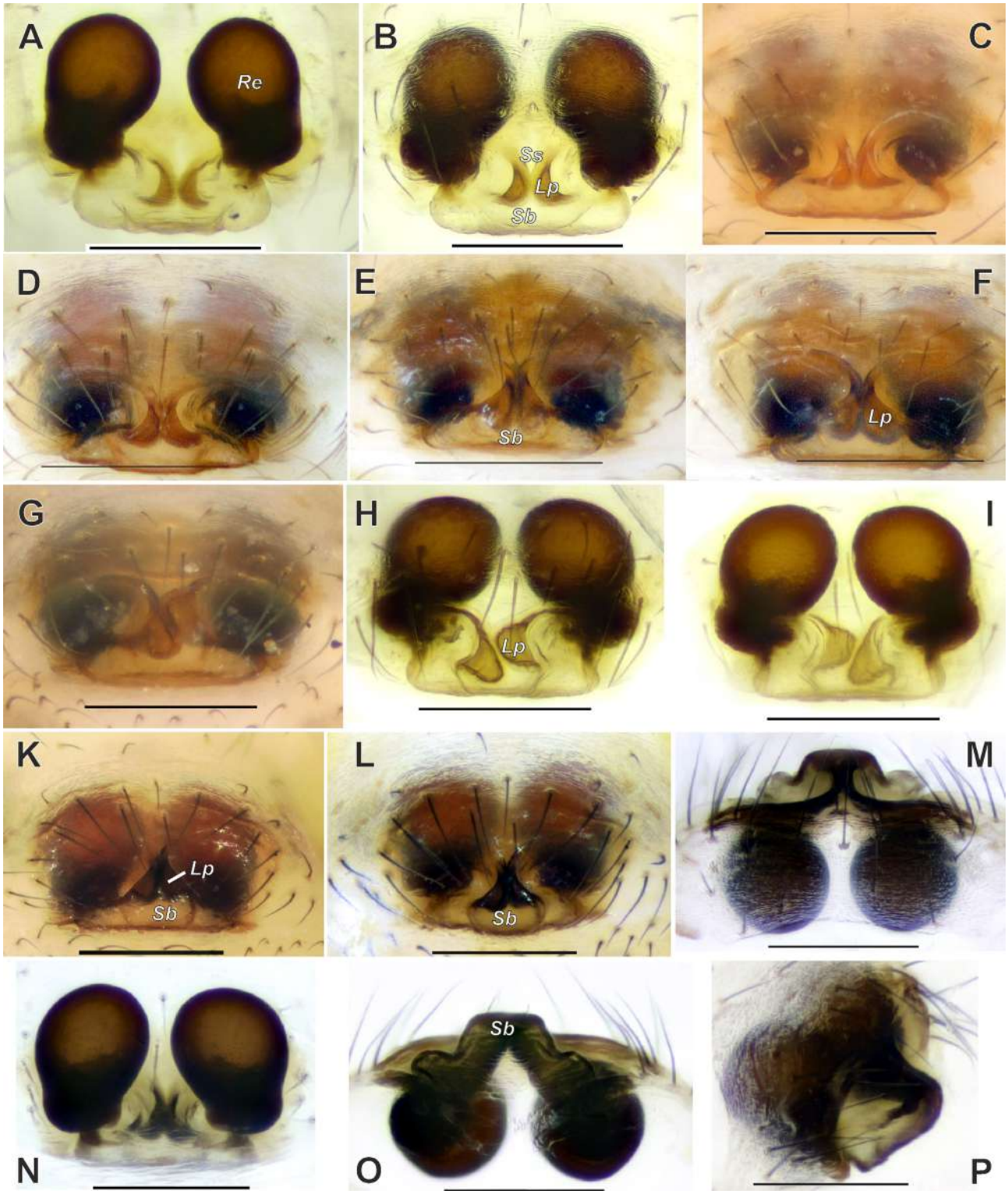

FIGURE 12. Variation of epigyne in *Diphya simoni* Kauri, 1950. A, I, N Macerated, dorsal; B, H, Macerated, ventral; C–G, K–L Intact, ventral; M Macerated, anterior; N–P Macerated, dorsal, posterior and antero-lateral. Scales = 0.2 mm.

Spination of legs I–II

	Fe	Pa	Ti	Mt
I	1p	1d	2d3p1r	1d
II	1d	1d	2d2p1r	-

Mt I–II and upper parts Ti I–II with row of prolateral spines.

Epigyne as in Figs 11D, 13H–J; epigynal plate wider than long, with transversal septal base; septum with short and broad stem (ca. 1/3 of septal base width), septum lacking distinct pockets; receptacle elongate-oval, 2 times longer than wide, converging anteriorly, spaced (not touching each other).

Type material. Holotype ♂: **SOUTH AFRICA:** *KwaZulu-Natal*: Baynesfield, 29°40.620'S, 29°55.320'E, leg. I. Yekwayo, 1.V.2014 (grassland, midlands, pit trap) (NCA 2015/1557).

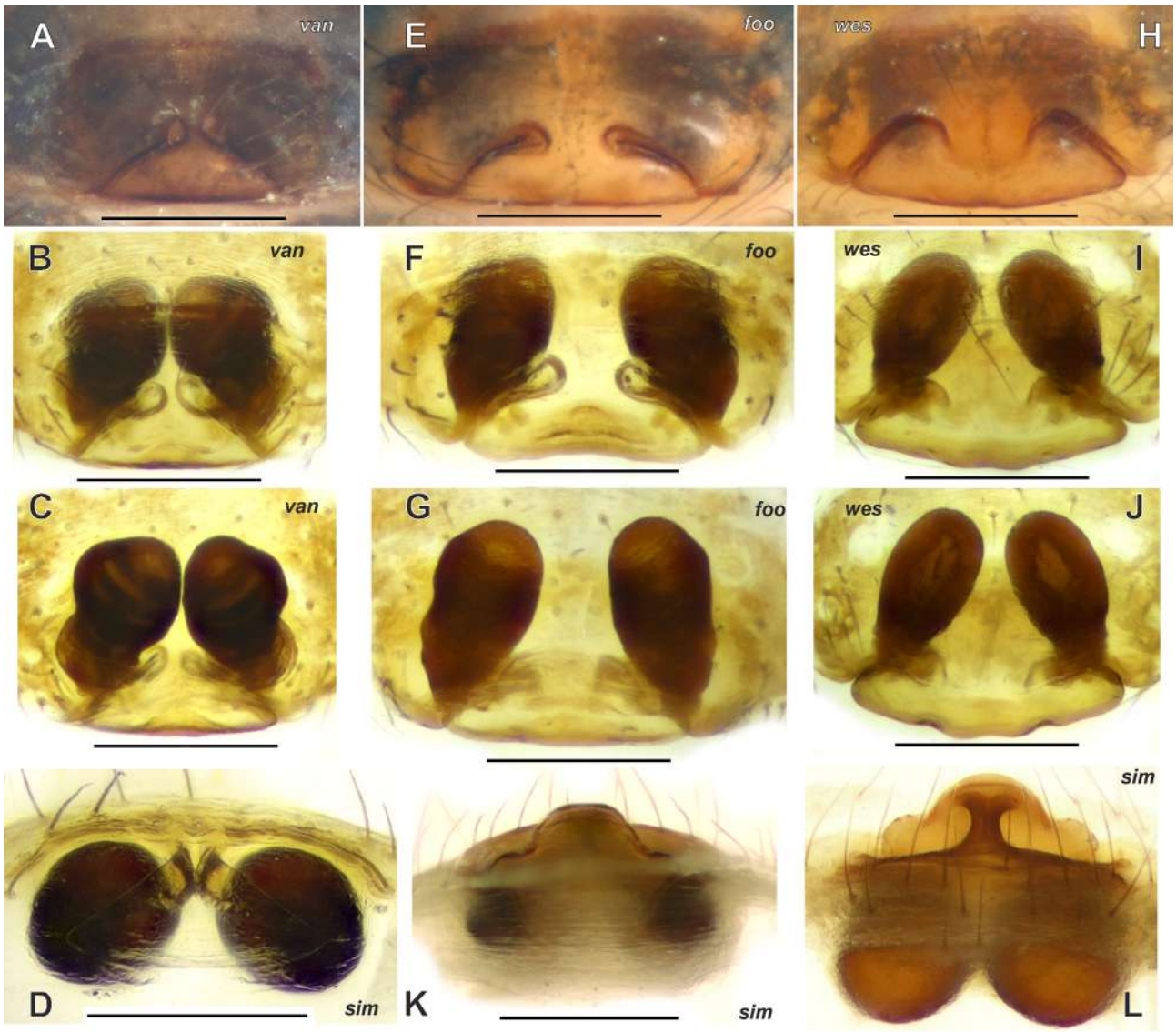

FIGURE 13. Epigyne of *Diphya vanderwaltae* **sp. nov.** (A–C), *D. foordi* **sp. nov.** (E–G), *D. wesolowskae* **sp. nov.** (H–J) and *D. simoni* Kauri, 1950 (D, K–L). Scales = 0.2 mm.

Paratypes: **SOUTH AFRICA:** *KwaZulu-Natal*: Cathedral Peak, 28°56.4'S, 29°11.4'E, leg. C. Uys, 6.I.2005 (grassland, active search), 1♀ (NCA 2014/3908); Injasuthi Forest, leg. C. Uys, 22.VI.2004 (active), 1♀ (NCA 2014/3915); Injasuti Nature Reserve, 29°07.2'S, 29°13.2'E, leg. C. Uys, 22.VI.2004 (forest, active search), 1♂ (NCA 2014/3914); Same locality and collector, 21.IX.2004, 1♂ (NCA 2016/1670); Same locality and collector, 22.VI.2004, 1♀ (NCA 2014/3607); Ithala Game Reserve, Ntshodwe Camp, 27°32.699'S 31°16.911'E, leg. C. Haddad & Z. Mbo, 27.I.2014 (short forest, sifting leaf litter), 1♀ (NCA 2013/4945); Royal Natal National Park, 28°43.8'S, 28°55.2'E, leg. C. Uys, 15.I.2005 (grassland, active search), 1♂ (NCA 2014/3902). *Limpopo*: Entabeni Forest, 23°00'S, 30°13.8'E, leg. J. Horn, 17.I.2002 (forest, sweepnet), 1♀ (NCA 2010/3451); Same locality, leg. C. Schoeman, 3.XII.2012 (pit trap), 1♂ (NCA 2014/3336); Entabeni Nature Reserve, 22°59.518'S, 30°15.422'E, leg. S. Foord, 11.II.2008 (grassveld/plantation, sweepnet), 1♂ (NCA 2010/1948); Grootbosch Forest, 23°43.8'S, 30°01.8'E, leg. J. Horn, 22.X.2001 (forest, sweepnet), 1♂ (NCA 2010/3949); Same locality and collector, 9.I.2002,

1♂ 1♀ (NCA 2010/3455); Same locality and collector, 14.XI.2001, 1♀ (NCA 2010/3947); Same locality and collector, 9.I.2002, 1♀ (NCA 2010/3456); Lajuma Mountain Retreat, 23°02.280'S, 29°26.520'E, leg. AFRAS members, 6.II.2008 (hand collecting), 1♂ (NCA AcAT 2008/3346); Lekgalameetse Nature Reserve, Farm The Downs, 24°08.4'S, 30°18.6'E, leg. V. Gelebe, 18.I.2009 (grassland, tall forest, active search below knee), 1♂ (NCA 2013/1401); Same locality, 24°08.294'S, 30°11.759'E, leg. V. Gelebe (tall forest with grassland, below the knee), 1♀ (NCA 2015/3712); Same locality and collector, 11.II.2008 (forest, pit trap), 1♂ (NCA 2009/1292).

Distribution. This species is known from the eastern parts of South Africa only, and has been found in the KwaZulu-Natal and Limpopo Provinces (Fig 14).

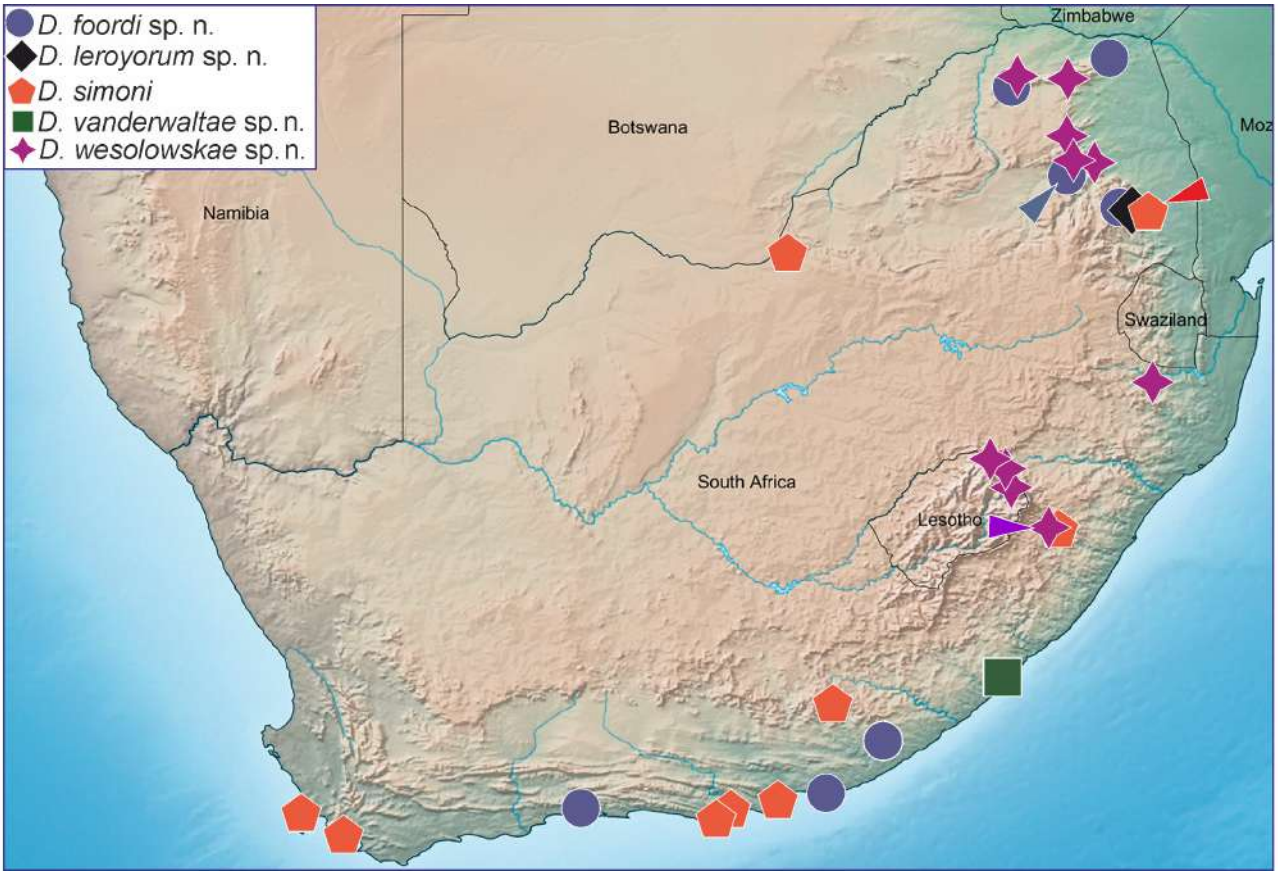

FIGURE 14. Distribution records of *Diphya* species in South Africa. Arrows indicate type localities.

Acknowledgements

We thank Ilari Sääksjärvi and Seppo Koponen (Zoological Museum, University of Turku, Finland) for permission to use their laboratory facilities. We thank Petro Marais, Collection Manager of NCA, for access to specimens. We also thank two anonymous reviewers for helpful comments and suggestions.

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