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A SYNOPSIS OF AFRICAN *METELLINA* (ARANEI, TETRAGNATHIDAE, METAINAE) WITH DESCRIPTION OF A NEW SPECIES FROM SOUTH AFRICA

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A Synopsis of African *Metellina* (Aranei, Tetragnathidae, Metainae) with Description of a New Species from South Africa. Marusik, Yu. M., Larsen, N. — Until this study, *Metellina* Chamberlin et Ivie, 1941 was unknown in Africa and adjacent islands. A survey of the literature revealed that among nine species of *Meta* C. L. Koch, 1836 described from the region, two were misplaced in Metainae and actually belong to *Tetragnatha* Latreille, 1804: *T. maculata* Blackwall, 1865 (originally placed in the genus *Tetragnatha*) and *Tetragnatha vacillans* (Butler, 1876), **comb. n.** *Meta meruensis* Tullgren, 1910 misplaced in this genus, most likely belongs to *Leucauge* White, 1841 or a related genus. Six species are transferred from *Meta*, and new combinations are established for them: *Metellina barreti* (Kulczyński, 1899), **comb. n.**, *M. gertschi* (Lessert, 1938), **comb. n.**, *M. longipalpis* (Pavesi, 1883), **comb. n.**, *M. merianopsis* (Tullgren, 1910), **comb. n.**, *M. minima* (Denis, 1953), **comb. n.** and *M. villiersi* (Denis, 1955), **comb. n.** *Metellina haddadi* **sp. n.** is described from the foothills of the Table Mountain near Cape Town. The distribution of all species treated in this paper is mapped.

Key words: spider, Araneae, *Meta*, *Tetragnatha*, new combination, new species.

Introduction

Tetragnathidae is a relatively large and globally distributed family. Currently 987 extant species placed in 48 genera are known in the world (WSC, 2017). The family is relatively poorly studied in Africa, particularly in South Africa. So far, a revision of only one genus, *Pachygnatha* Sundevall, 1823 covering all species occurring in the African continent has been published (Bosmans & Bosselaers, 1994). There are some other publications dealing with *Sancus* Tullgren, 1910, a genus with two species occurring in Macaronesia, Tanzania and Kenya (Kuntner & Álvarez-Padilla, 2006), South African *Tetragnatha* Latreille, 1804 (Okuma & Dippenaar-Schoeman, 1988), and *Pachygnatha* of Burundi (Nzigidahera & Jocqué, 2014). Up to now, according to the World Spider Catalog (2017) 12 species of tetragnathids are known in South Africa, *Diphya* Nicolet, 1849 (1 species), *Leucauge* White, 1841 (3), *Pachygnatha* (1) and *Tetragnatha* Latreille, 1804 (7). In comparison, Finland has 14 species (Helsdingen, 2016). Two species from South Africa have been described and are known from juvenile specimens, and three species are known from females only. Half of the species found in the

country are known also in other regions of Africa and/or Asia, and the other half are reported only from South Africa. Five species are known from a single taxonomic entry. The actual number of tetragnathids known in South Africa is 24 (Dippenaar-Schoeman et al., 2010). Unfortunately, it is unclear who reported the additional 12 species or whether these records are based on publications or just on identifications of museum specimens.

While collecting on Table Mountain in Cape Town, we found a species belonging to *Metellina* Chamberlin et Ivie, 1941, a genus previously unknown in Africa and/or adjacent islands. Trying to identify our species and accounting that all species currently considered in *Metellina* were previously placed in *Meta* C. L. Koch, 1836, we checked descriptions of all *Meta* species known from the region. This search revealed that none of the nine African species listed in *Meta* (WSC, 2017) belong to this genus.

The goal of this paper is to describe the new species of *Metellina* and survey African species considered in *Meta*.

Material and methods

Specimens were photographed with a Canon EOS 7D camera attached to an Olympus SZX16 stereomicroscope and with a SEM JEOL JSM-5200 scanning microscope at the Zoological Museum, University of Turku, Finland. Digital images were montaged using CombineZP image stacking software. The epigyne was cleared in a KOH/water solution until soft tissues were dissolved. Photographs were taken in dishes with cotton or paraffin on the bottom to hold the specimens in position. All measurements are given in mm. The type material will be deposited in the ARC-National Collection of Arachnida, Pretoria (NCA), the Iziko South African Museum, Cape Town (SAMC), and the Zoological Museum of Moscow State University (ZMUM).

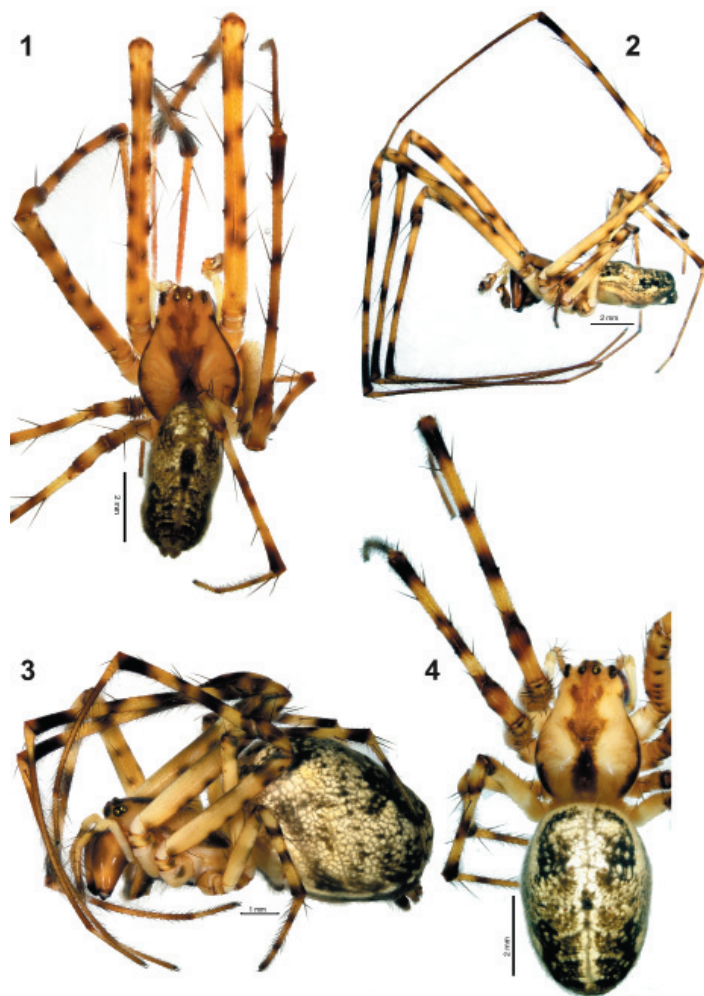


Fig. 1–4. Habitus of *Metellina haddadi* sp. n.: 1–2 — male, dorsal and lateral; 3–4 — female, lateral and dorsal.

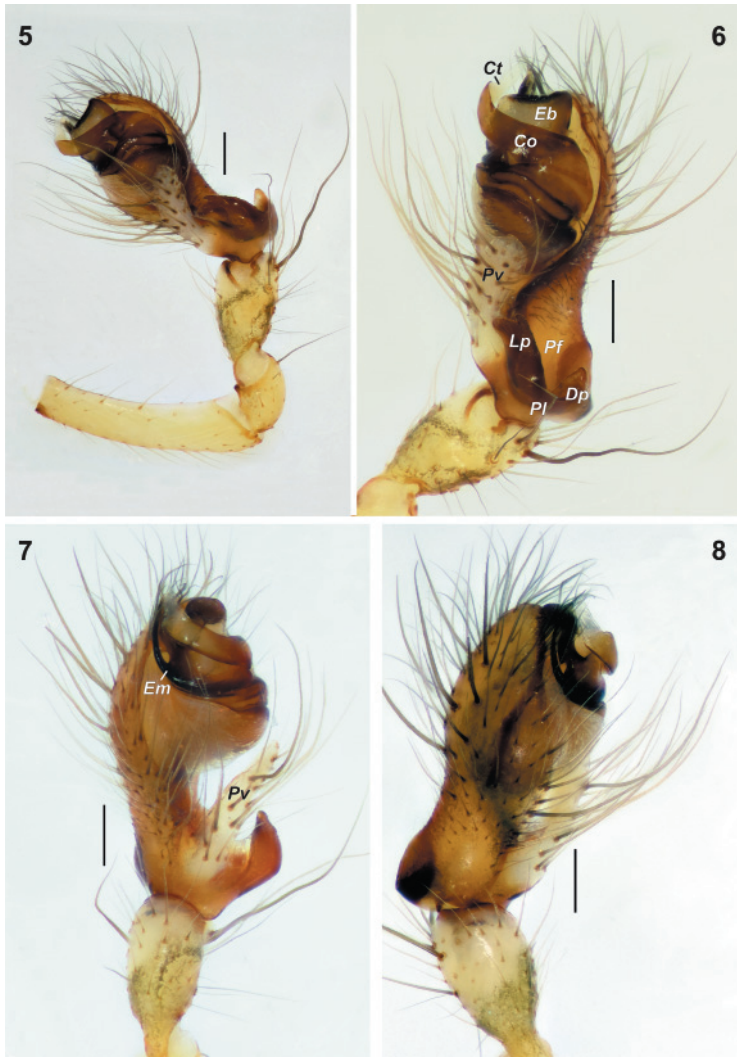


Fig. 5–8. Male palp of *Metellina haddadi* sp. n.: 5 — whole palp showing comparative length of segments and length of setae; 6–8 — distal part, ventro-retrolateral, ventral-prolateral and prolateral. Scale bar 0.2 mm. Abbreviations: *Co* — conductor; *Ct* — tip of conductor; *Dp* — dorsal part of *Pl*; *Eb* — base of embolus; *Em* — embolus; *Lp* — lateral part of *Pl*; *Pf* — deep fovea of paracymbium; *Pl* — dorso-lateral branch of paracymbium; *Pv* — ventral branch of paracymbium.

Taxonomic survey

Metellina Chamberlin & Ivie, 1941

Metellina Chamberlin & Ivie, 1941: 14; Levi, 1980: 32; Álvarez-Padilla & Hormiga, 2011: 779.

Type species: *Pachygnatha curtisi* McCook, 1894 (from California).

Comments. Seven species were considered to belong in this genus (WSC, 2017). All of them are known from the Holarctic: Western and Central USA and Europe to Central Asia. None were reported from Africa or adjacent islands. Before the revision by Levi (1980), all species of the genus were considered in *Meta*.

Diagnosis. *Metellina* can be distinguished from *Meta* by an oval abdomen vs. a subglobular abdomen, the ventral position of conductor hiding the embolus vs. the prolateral

conductor not hiding the embolus and a lack of a ventral projection of epigyne covered by hairs vs. presence. The copulatory organs suggest that *Metellina* is most similar to *Menosira* Chikuni, 1955, a monotypic genus known from Far East Asia. The two genera well differ by the abdominal pattern: *Menosira* has 2 longitudinal white spots on the abdomen that are lacking in *Metellina*. In addition, *Menosira* has a thick embolus vs. a gradually tapering embolus in *Metellina*, and the epigyne lacks the membranous part present in all *Metellina*.

Remarks. When trying to identify our specimens, we checked all *Meta* species known from Africa and adjacent islands and recognized that none are congeneric with *Meta*

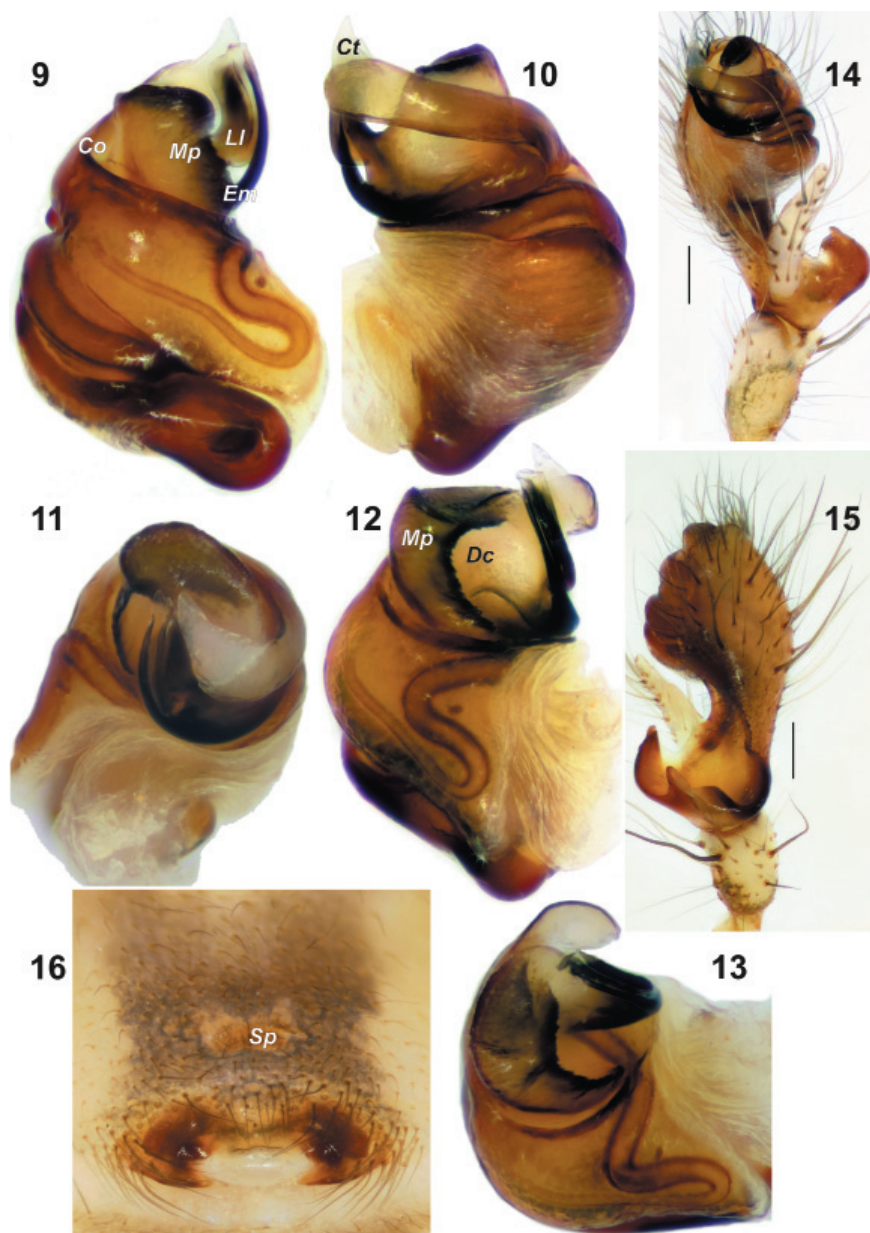


Fig. 9–16. Copulatory organs of *Metellina haddadi* sp. n.: 9–11 — bulb, prolateral; ventral and anterior; 12–13 — bulb, anterior-prolateral, different aspects; 14–15 — distal part of male palp, ventral and dorsal; 16 — epigyne, ventral. Scale 0.2 mm, if indicated. Abbreviations: Co — conductor; Ct — tip of conductor; Dc — deep cavity of Mp; Em — embolus; LI — lamellate process of Eb; Mp — main part of Eb; Sp — transversal sclerotized plate.

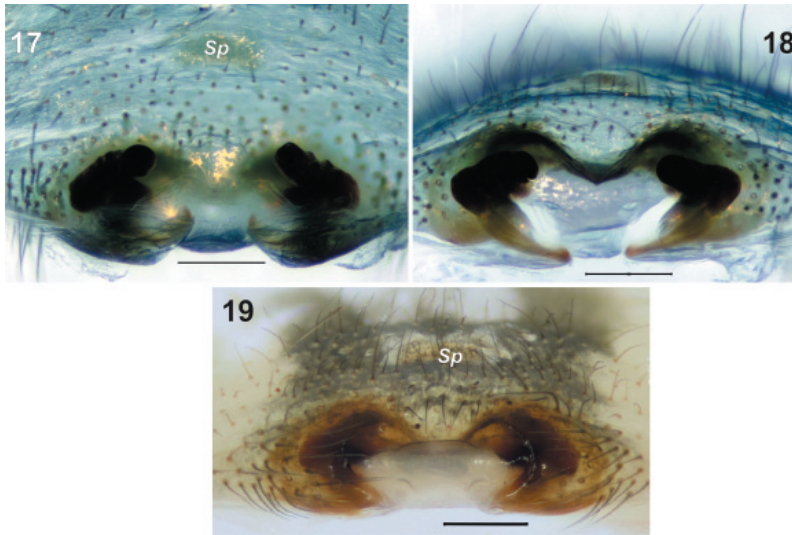


Fig. 17–19. Epigyne of *Metellina haddadi* sp. n.: 17 — dorso-caudal; 18 — dorsal; 19 — ventral-caudal. Scale 0.2 mm. Abbreviations: Sp — transversal sclerotized plate.

menardi (Latreille, 1804), the type species of the genus. Below, we list these species. Eight of nine species found in the region are known by a single taxonomic entry, and six are known from the type locality only. A survey of these species (in alphabetic order of the specific names) is given below.

Survey of African species listed in *Meta*

Metellina barreti (Kulczyński, 1899), **comb. n.** (fig. 3)

Meta barreti Kulczyński, 1899: 389, pl. 8, f. 79 (juv.).

Meta barretti: Wunderlich, 1992: 362, f. 327–329 (♂, ♀).

Note. The species was described and is known from Madeira only (WSC, 2017). Wunderlich (2008) already doubted its belonging to *Meta* and mentioned that it may belong to *Metellina*. Judging from the description and illustration provided by Wunderlich (1992), this species certainly must be transferred to *Metellina*, and therefore a new combination is suggested.

Metellina gertschi (Lessert, 1938), **comb. n.** (fig. 34)

Meta gertschi Lessert, 1938: 437, f. 18–19 (♂).

Note. The species is known by the original description only (WSC, 2017). It was described based on a single male from Belgian Congo (now the Democratic Republic of Congo). Judging from the figure of the male palp given by Lessert (1938) the species does not belong to *Meta*, but most likely to *Metellina* and therefore is transferred to the latter genus.

Metellina longipalpis (Pavesi, 1883), **comb. n.** (fig. 34)

Meta longipalpis Pavesi, 1883: 19 (♂, ♀).

Note. The species was described based on a syntype series of 12 males and 68 females collected in two localities in Ethiopia. Although it was not illustrated, we believe that this species belongs to *Metellina* because Lessert (1938) indicated its similarity to *M. merianae*

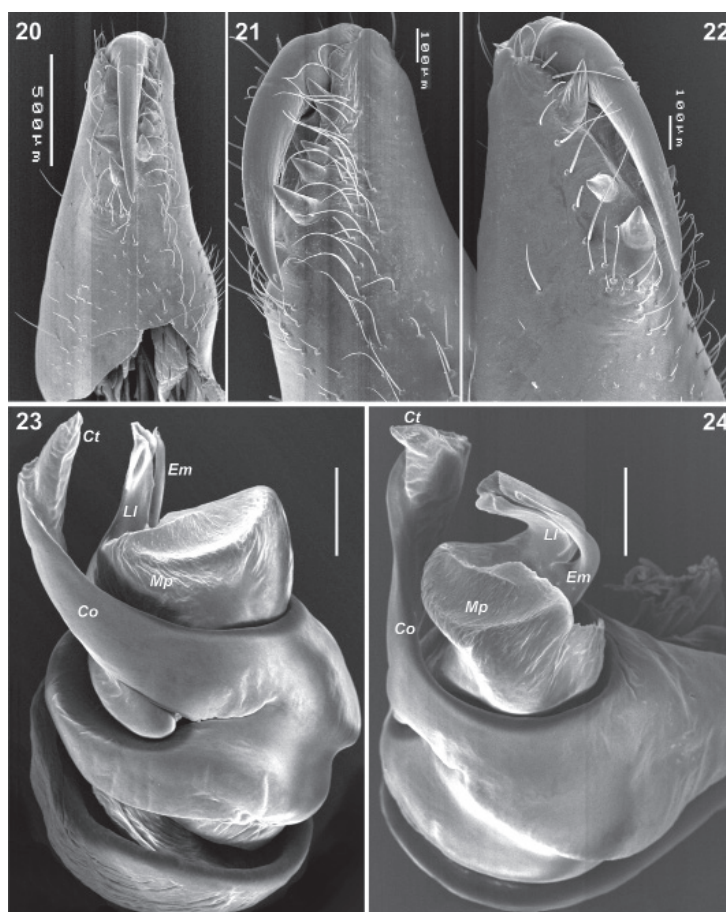


Fig. 20–24. Male chelicera and bulb of *Metellina haddadi* sp. n.: 20 —chelicera, mesal; 21–22 — distal part of chelicera, mesal-posterior and mesal-anterior; 23–24 — bulb, retrolateral and anterior-retrolateral. Scale bar 0.1 mm. Abbreviations: Co — conductor; Ct — tip of conductor; Em — embolus; Lf — lamellate process of Eb; Mp — main part of embolic base.

(Scopoli, 1763) “Va riferita al gruppo della nostra *M. merianae* (Scop.)”. Therefore, we transfer *longipalpis* from *Meta* to *Metellina*.

***Tetragnatha maculata* Blackwall, 1865 (fig. 34)**

Tetragnatha maculata Blackwall, 1865: 99 (♂, ♀).

Note. This species was described based on specimens from St. Nicholas Island (Cape Verde Islands). The WSC (2017) erroneously indicates that the species is known from the female only, although Blackwall (1865) described the male palp and clearly indicated that he had both male and female. Simon (1883) mentioned this species as *Meta maculata* in a list of species from Cape Verde Islands, and provided no reason why he transferred this species to *Meta*. In addition, the size of the species, 1/5 of an inch (about 5 mm), is too small for *Meta* and *Metellina*. Therefore, we are placing this species back in *Tetragnatha*.

***Metellina merianopsis* (Tullgren, 1910), comb. n. (fig. 34)**

Meta merianopsis Tullgren, 1910: 151, pl. 3, f. 75, a–d (♂, ♀).

Note. The species was described based on a large series of syntypes (68 ♂, ♀) from Meru and Kilimanjaro Mountains (Tanzania). The WSC (2017) erroneously indicates that this species is known from females only, although Tullgren provided a clear description of the male and illustrated palp. Judging from the figures of the male palp and the species name meaning “resembling *merianae*” (*Metellina merianae* was considered *Meta* in Tullgren’s time), we transfer this species to *Metellina*.

“*Meta*” *meruensis* Tullgren, 1910 (fig. 34)

Meta meruensis Tullgren, 1910: 151, pl. 3, f. 74 (♀).

Note. The species is described based on the holotype female from Meru Mountain (Tanzania). Judging from the figure of the epigyne, it is misplaced in *Meta* and may belong to *Leucauge*.

Metellina minima (Denis, 1953), **comb. n.** (fig. 34)

Meta obscura minima Denis, 1953: 6, f. 4 (♀).

Meta minima: Denis, 1962: 82 (elevated from subspecies); Wunderlich, 1992: 363, f. 330–332 (♂, ♀).

Note. The species was described from the Canary Islands. Wunderlich (2008) already doubted that its belonging to *Meta* and presumed that it could be a member of *Metellina*. The shape of the male palp and epigyne, as well as the size (smaller than *Meta* s. str.), indicate that it belongs to *Metellina*, and therefore we suggest a new combination.

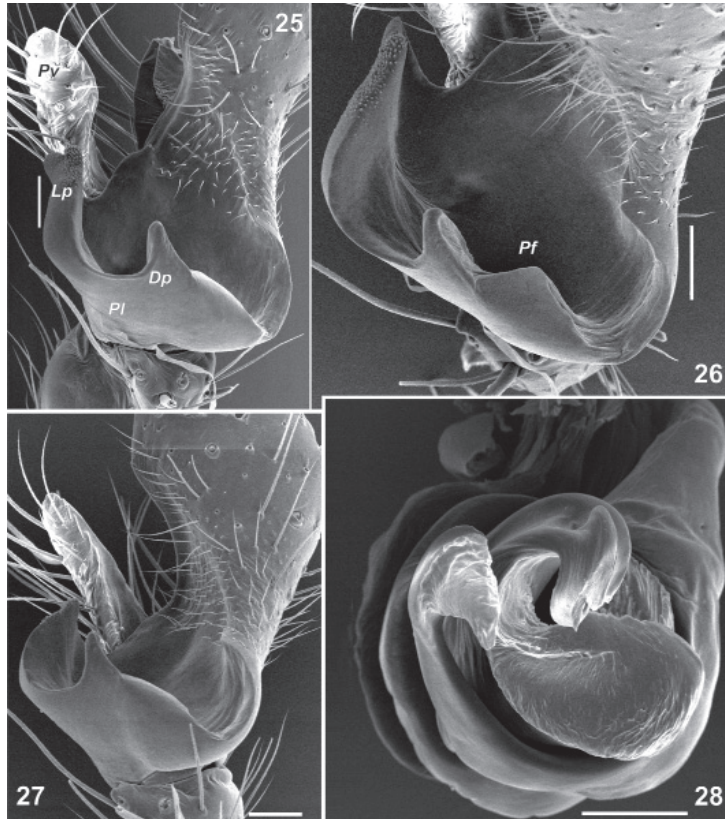


Fig. 25–28. Male palp of *Metellina haddadi* sp. n.: 25, 27 — cymbium and paracymbium, anterior-prolateral and dorsal; 26 — paracymbium, anterior; 28 — bulb; anterior. Scale bar 0.1 mm. Abbreviations: *Dp* — dorsal part of *Pl*; *Lp* — lateral part of *Pl*; *Pf* — deep fovea of paracymbium; *Pl* — dorso-lateral branch of paracymbium; *Pv* — ventral branch of paracymbium.

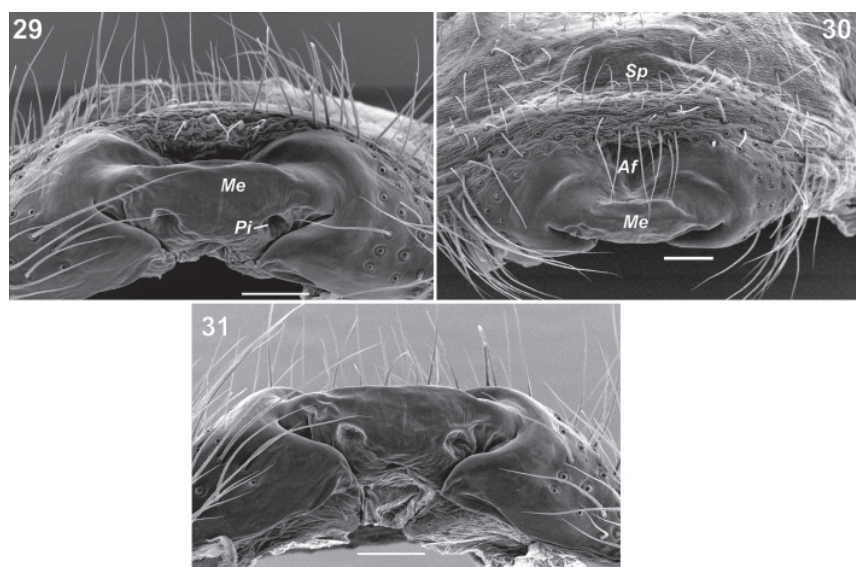


Fig. 29–31. Epigyne of *Metellina haddadi* sp. n. ventro-caudal, central and caudal. Scale bar 1 mm. Abbreviations: *Af* — anterior fovea of epigynal plate; *Me* — median plate; *Pi* — shallow pit of *Me*; *Sp* — transversal sclerotized plate.

***Tetragnatha vacillans* (Butler, 1876), comb. n. (fig. 34)**

Meta vacillans Butler, 1876: 441 (♂, ♀); Butler, 1878: 503, pl. 52, f. 4 (♂, ♀).

Note. The species is known from Rodrigues Island. Although the copulatory organs of this species are not illustrated, figures of the habitus clearly indicate that it belongs to *Tetragnatha*, and therefore we suggest a new combination.

***Metellina villiersi* (Denis, 1955), comb. n. (fig. 34)**

Meta villiersi Denis, 1955: 1031, f. 8–10 (♂, ♀).

Note. This species is known by a single taxonomic entry. It was well illustrated and known from 7 female and 3 male syntypes from Guinea. The figure of the male palp indicates its belonging to *Metellina*.

***Metellina haddadi* sp. n. (figs 1–34)**

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Types: Holotype ♂ (NCA) and paratypes 2 ♂, 3 ♀ (NCA), 1 ♂, 4 ♀ (SAMC) and 2 ♂, 2 ♀ 1 juv (ZMMU), South Africa, Western Cape, Cape Town, foothills of the Table Mountain, Newlands Forest, 33°58'14.2" S, 18°26'59.2" E, 250 m, 4.01.2014 (Y. M. Marusik & N. Larsen).

Diagnosis. The males of this new species well differ from African congeners by having the cymbium as long as the palpal femur (shorter in other species) and the shape of paracymbium which has a bifid lateral process (*Lp*) (not bifid in other species). The epigyne of the new species resembles that of *M. merianopsis* by having a ventral projection of the median plate. The two species can be differentiated by the presence of the sclerotized plate (*Sp*) in front of the epigyne in the new species and lacking in *M. merianopsis*.

Description. Male (holotype). Total length 7.90. Carapace 3.75 long, 2.50 wide. General appearance as in figs 1–2, 32. Carapace light brown, with dark-brown broad median band and marginal stripes. Fovea deep, appears as inverted Y. Chelicera, endites and sternum brown. Chelicera with 3 pro- and 4 retromarginal teeth (figs 20–22). Legs light brown, with dark round spots around spines on femora I–II, tibiae I–II with 4 dark annulations; tibiae III–IV with 2 dark annulations; coxa II with gray prolateral spot distally; coxa IV with grey hue basally, and coxa III. Abdomen twice as long as wide, background formed by white guanine spots, median dark band located in anterior part, posterior 1/3 with series of dark transverse stripes; venter with wide dark median band bordered by whitish stripes and a pair of round spots near spinnerets.



Fig. 32–33. *Metellina haddadi* sp. n. in natural habitats: 32 — male and female; 33 — resting female, showing ventral abdominal pattern.

Leg segment lengths in male

	Fe	Pt	Ti	Mt	Ta	Total
Palp	1.07	0.4	0.5		1.07	3.13
I	8.0	2.0	8.8	8.5	2.2	29.5
II	7.0	1.8	7.0	7.6	1.7	25.1
III	3.7	1.1	2.7	3.3	1.1	11.9
IV	5.0	1.1	4.0	4.5	1.1	15.7

Spination of leg I: femur d1p4r7 to10; patella d1; tibia d1 or 2 p3 r3; metatarsus d1p1r1. Metatarsi and partly tibiae I–II with strong, erect, inflexible setae.

Palp as in figs 5–15, 23–28. Femur as long as cymbium and slightly shorter than patella+tibia, tibia and cymbium and ventral part of paracymbium with long macrosetae. Cymbium long, more than 3 times longer than wide, paracymbium complex, with subconical, weakly sclerotized ventral part (*Pv*) covered with long setae and heavily sclerotized dorso-lateral part (*Pl*), the latter with 2 processes: the bifid lateral process (*Lp*) and the dorsal process (*Dp*); the dorso-lateral part of the paracymbium and cymbium form a deep fovea (pocket) (*Pf*). The tegulum and sperm duct distinct, transverse; conductor (*Co*) wide at base, with parallel margins, tip (*Ct*) tapering, weakly sclerotized; embolic division with massive and complex base (*Eb*) comprising a main square part (*Mp*) with a deep cavity (*Dc*) and lamellate process (*Ll*) guiding the embolus (*Em*); embolus partly hidden by conductor.

Female (paratype). Total length 9.3. Carapace 3.75 long, 2.65 wide. Prosoma coloured as in male (figs 4, 32). Abdomen lighter than male, with more guanine spots, long, light median band, running all over dorsum, mid part with short, dark stripe; median band bordered with wide sublateral bands, mid part of bands lighter than anterior and posterior parts; sides of abdomen white with slanted dark band anteriorly and series of broken slanted stripes.

Leg segment lengths in female

	Fe	Pt	Ti	Mt	Ta	Total
Palp	1.1	0.4	0.8		1.25	3.55
I	5.6	1.75	5.7	5.9	1.6	20.55
II	4.5	1.5	4.05	4.5	1.25	15.8
III	2.7	1.0	1.85	2.15	0.85	8.55
IV	3.8	1.05	3.0	3.25	0.9	12.0



Fig. 34. Type localities of species from Africa and adjacent islands now considered in *Metellina* or either described or considered in *Meta*: 1 — *Tetragnatha maculata*; 2 — *Metellina barreti*; 3 — *M. minima*; 4 — *M. villiersi*; 5 — *M. longipalpis*; 6 — *M. gertschi*; 7 — “*Meta*” *meruensis*; 8 — *Metellina merianopsis*; 9 — *M. haddadi* sp. n., 10 — *Tetragnatha vacillans*.

Spination of leg I: femur d2 p4 or 5 r5; patella d1; tibia d2 p3 r3; metatarsus d1 p1 r1. Metatarsi and partly tibiae I–II as in male with erect, inflexible setae, but shorter and less dense in comparison to males.

Epigyne as in figs 16–19, 29–31. Epigynal plate almost 3 times wider than long, median plate (*Me*) weakly sclerotized, slightly projected ventrally; anterior part of plate with distinct fovea (*Af*); in caudal view, median plate pentagonal, with pair of shallow pits (*Pi*). Small transverse rectangular sclerotized plate (*Sp*) located anterior to epigyne. Receptacles cylindrical, bent in mid part, basal part diverging, distal parts converging, distal part spaced by about 3.5 diameters.

Variations. Body length in males varies from 6.5 to 7.4 and in females from 7.0 to 9.3.

Habitat. The species occur in large numbers in shaded places along mountain creeks with stony banks. During the daytime it is not easy to find specimens although webs are rather common. In the nighttime, spiders stay at the web hub and can be easily seen and collected.

Distribution. Known only from the type locality (fig 34).

Etymology. The specific name is a patronym in honour of our friend and colleague Charles Haddad (Bloemfontein, South Africa) who helped to organize YM’s trip to South Africa.

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References

- Álvarez-Padilla, F., Hormiga, G. 2011. Morphological and phylogenetic atlas of the orb-weaving spider family Tetragnathidae (Araneae: Araneioidea). *Zoological Journal of the Linnean Society*, **162**, 713–879.
- Blackwall, J. 1865. Descriptions of recently discovered spiders collected in the Cape de Verde Islands by John Gray, Esq. *Annals and Magazine of Natural History*, (3), 80–101.
- Bosmans, R., Bosselaers, J. 1994. Spiders of the genera *Pachygnatha*, *Dyschiriognatha* and *Glenognatha* (Araneae, Tetragnathidae), with a revision of the Afrotropical species. *Zoologica Scripta*, **23**, 325–352.
- Butler, A. G. 1876. Preliminary notice of new species of Arachnida and Myriopoda from Rodriguez, collected by Mssrs George Gulliver and H. H. Slater. *Annals and Magazine of Natural History*, **17** (4), 439–446.
- Butler, A. G. 1878. Myriopoda and Arachnida. In: Zoology of Rodriguez. An account of the petrological, botanical and zoological collections made in Kerguelen's Land and Rodriguez during the Transit of Venus expedition. *Philosophical Transactions of the Royal Society of London*, **168**, 497–509.
- Chamberlin, R. V., Ivie, W. 1941. Spiders collected by L. W. Saylor and others, mostly in California. *Bulletin of the University of Utah*, **31** (8), 1–49.
- Denis, J. 1953. Araignées des environs du Marcadau et du Vignemale (Hautes-Pyrénées). *Bulletin de la Société d'Histoire Naturelle de Toulouse*, **88** (1–2), 83–112.
- Denis, J. 1955. Speologica africana: quelques araignées cavernicoles de Guinée française. *Bulletin de l'Institut Fondamental d'Afrique Noire*, **17** (A), 1024–1033.
- Denis, J. 1962. Les araignées de l'archipel de Madère (Mission du Professeur Vandel). *Publicações do Instituto Zoologia Doutor Augusto Nobre*, **79**, 1–118.
- Dippenaar-Schoeman, A. S., Haddad, C. R., Foord, S. H., Lyle, R., Lotz, L., Helberg, L., Mathebula, S., Van Den Berg, A., Van Den Berg, A. M., Van Niekerk, E., Jocqué, R. 2010. *First atlas of the spiders of South Africa*. South African National Survey of Arachnida. SANSA Technical Report version 1 (2010), 1–1160.
- Helding, P. J. van. 2016. Araneae. In: Fauna Europaea. Database European spiders and their distribution — Distribution — Version 2016.1
- Kulczyński, W. 1899. Arachnoidea opera Rev. E. Schmitz collecta in insulis Maderianis et in insulis Selvages dictis. *Rozprawy i Sprawozdania z Posiedzeń Wydziału Matematyczno Przyrodniczego Akademii Umiejętności*. Krakow, **36**, 319–461.
- Kuntner, M., Álvarez-Padilla, F. 2006. Systematics of the Afro-Macaronesian spider genus *Sancus* (Araneae, Tetragnathidae). *Journal of Arachnology*, **34** (1), 113–125.
- Lessert, R. 1938. Araignées du Congo belge (Première partie). *Revue de Zoologie et de Botanique Africaines*, **30**, 424–457.
- Levi, H. W. 1980. The orb-weaver genus *Mecynogea*, the subfamily Metinae and the genera *Pachygnatha*, *Glenognatha* and *Azilia* of the subfamily Tetragnathinae north of Mexico (Araneae: Araneidae). *Bulletin of the Museum of Comparative Zoology at Harvard College*, **149**, 1–74.
- Nzigidahera, B., Jocqué, R. 2014. On the genus *Pachygnatha* (Araneae, Tetragnathidae) in the Albertine Rift of Burundi, with the description of three new species. *European Journal of Taxonomy*, **93**, 1–16.
- Okuma, C., Dippenaar-Schoeman, A. S. 1988. *Tetragnatha* (Araneae: Tetragnathidae) in the collection of the Plant Protection Research Institute, Pretoria with a description of a new species. *Phytophylactica*, **20**, 219–232.
- Pavesi, P. 1883. Studi sugli aracnidi africani. III. Aracnidi del regno di Scioa e considerazioni sull'aracnofauna d'Abissinia. *Annali del Museo Civico di Storia Naturale di Genova*, **20**, 1–105.
- Simon, E. 1883. Études arachnologiques. 14e Mémoire. XXI. Matériaux pour servir à la faune arachnologique des îles de l'Océan Atlantique (Açores, Madère, Salvages, Canaries, Cap Vert, Sainte-Hélène et Bermudes). *Annales de la Société Entomologique de France*, **3** (6), 259–314.
- Tullgren, A. 1910. Araneae. In: *Wissenschaftliche Ergebnisse der Schwedischen Zoologischen Expedition nach dem Kilimandjaro, dem Meru und dem Umbegenden Massaiesteppen Deutsch-Ostafrikas 1905–1906 unter Leitung von Prof. Dr Yngve Sjöstedt*. Stockholm, **20** (6), 85–172.
- WSC, 2017. World Spider Catalog. Natural History Museum Bern. (<http://wsc.nmbe.ch>, version 18.0; accessed: 28.02.2017).

- Wunderlich, J. 1992. Die Spinnen-Fauna der Makaronesischen Inseln: Taxonomie, Ökologie, Biogeographie und Evolution. *Beiträge zur Araneologie*, **1**, 1–619.
- Wunderlich, J. 2008. Descriptions of fossil spider (Araneae) taxa mainly in Baltic amber, as well as on certain related extant taxa. *Beiträge zur Araneologie*, **5**, 44–139.

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