

Myrmarachnini (Araneae: Salticidae: Salticinae: Astioida) of Salonga National Park, D.R. Congo, with description of a new species and two new species records

Myrmarachnini (Araneae: Salticidae: Salticinae: Astioida) национального парка Салонга, с описанием нового вида и двумя новыми находками видов

Brogan L. Pett^{1,2*}, Dieu Merci Mpongo Iyomi³, Menard Mbende³
Б.Л. Пет^{1,2*}, Д.М.М. Йоми³, М. Мбенде³

¹ SpiDivERse, Biodiversity Inventory for Conservation npo (BINCO), 3380 Walmersumstraat, Glabbeek, Belgium. E-mail: brogan.pett@outlook.com

² Centre for Ecology and Conservation, College of Life and Environmental Sciences, University of Exeter, Penryn Campus, Penryn, Cornwall, TR10 9FE, UK.

³ WWF DRC, 14, Avenue Sergent Moke, Q. Socimat, Kinshasa, RD Congo.

* Corresponding author

KEY WORDS: Aranei, ant mimicry, Congo basin, jumping spiders, rainforest, taxonomy.

КЛЮЧЕВЫЕ СЛОВА: Аранеи, мимикрия муравьев, бассейн Конго, пауки-скакунчики, дождевой лес, таксономия.

ABSTRACT. Three species of Myrmarachnini Simon, 1901 (Salticidae) were collected as part of a biodiversity inventory of Salonga National Park, Africa's largest protected tropical rainforest reserve in D.R. Congo. *Myrmarachne salongensis* sp.n. (♂♀) is described as a new species based on the unique genitalic morphology, distinct cheliceral dentition and colour pattern of the dorsum. Two species — *Myrmarachne foenisex* Simon, 1909 and *Belippo calcarata* (Roewer, 1942) — are reported from the park for the first time.

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РЕЗЮМЕ. В рамках проекта по инвентаризации биоразнообразия национального парка Салонга, крупнейшего в Африке охраняемого заповедника тропических лесов в Демократической Республике Конго, были собраны три вида Myrmarachnini Simon, 1901 (Salticidae). Новый вид *Myrmarachne salongensis* sp.n. (♂♀) описывается на основе уникальной морфологии гениталий, отличительного вооружения хелицер и цветового рисунка дорзума. Два вида — *Myrmarachne foenisex* Simon, 1909 и *Belippo calcarata* (Roewer, 1942) — отмечаются впервые в фауне парка.

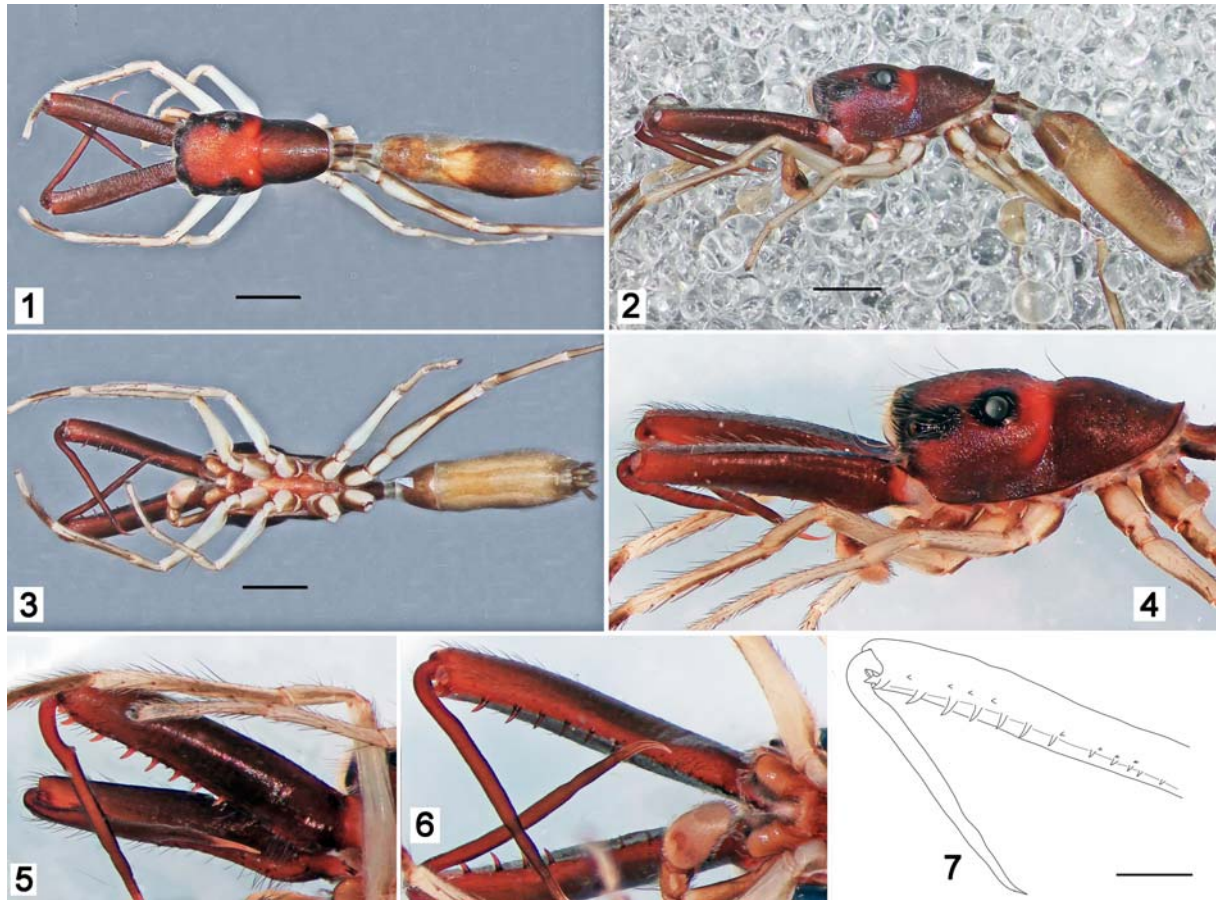
Introduction

The jumping spiders (Salticidae Blackwall, 1841) are the most diverse spider family in the world, with

6,618 species in 677 genera [WSC, 2023]. In the Afrotropical Region, over 1,000 salticid species are known. Despite having the relatively large number of described species, an Afrotropical spider fauna remains geographically understudied and still insufficiently studied more generally. Data are limited to a few countries and localities/reserves in these countries. For instance, the D.R. Congo, the largest country in Africa, with an exceptional diversity of imperilled and globally unique biomes [Olson *et al.*, 2001], contains only 66 salticid species recorded to date [WSC, 2023]. Based on the data from comparable sized tropical countries with high biodiversity that are better studied (e.g., India — 356 species, or Mexico — 332 species; see Metzner [2023]), it is assumed that the D.R. Congo may contain at least 500 salticid species.

Within the D.R. Congo resides Africa's largest national park, Salonga. Based on an extensive literature search and the database of the Royal Museum for Central Africa, Tervuren [RMCA; Natural Heritage, 2023], the magnitude of knowledge deficit on Congo's invertebrates is the fact that, with an area of 36,000 km², there are no spider records from Salonga National Park.

The Myrmarachnini Simon, 1901 is the most speciose tribe of ant-like jumping spiders, partly due to the globally distributed genus *Myrmarachne* MacLeay, 1839 (although primarily known from the Old World) accounting for 190 species [WSC, 2023]. In continental Africa, 41 species have been described to date. Wanless [1978] revised the Afrotropical Myrmarachnini and described 24 new *Myrmarachne* and two *Belippo* species. Prószyński [2016] split *Myrmarachne s.lat.* into nine other genera (excluding *Myrmarachne*),



Figs 1–7. Male holotype of *Myrmarachne salongensis* sp.n.: 1 — body, dorsal view; 2 — same, lateral view; 3 — same, ventral view; 4 — carapace, lateral view; 5 — chelicerae, ventro-lateral view; 6 — same, ventral view; 7 — left chelicerae, ventral view. Scale bars: 1 mm (1–3), 0.25 mm (7).

Рис. 1–7. Самец-голотип *Myrmarachne salongensis* sp.n.: 1 — тело, дорзально; 2 — то же, сбоку; 3 — то же, снизу; 4 — головогрудь, сбоку; 5 — хелицеры, снизу-сбоку; 6 — то же, снизу; 7 — левая хелицера, снизу. Масштаб: 1 мм (1–3), 0,25 мм (7).

eight of which are still valid (*Myrmavola* was synonymised with *Hermosa* Peckham et Peckham, 1892 by Marusik & Blick [2019]).

The rapid biodiversity assessment in Salonga National Park, which was undertaken in four weeks in November–December 2022, collected spiders as a focal group (see Jocqué *et al.* [2023] for further details), among which there were two *Myrmarachne* and one *Belippo* species. Of them, *Myrmarachne foenisex* Simon, 1909 and *Belippo calcarata* (Roewer, 1942) are recorded from the park for the first time. Additionally, a new *Myrmarachne* was also found in the park. The aim of the present paper is to present two identified and one new species of the Myrmarachnini from the Salonga National Park.

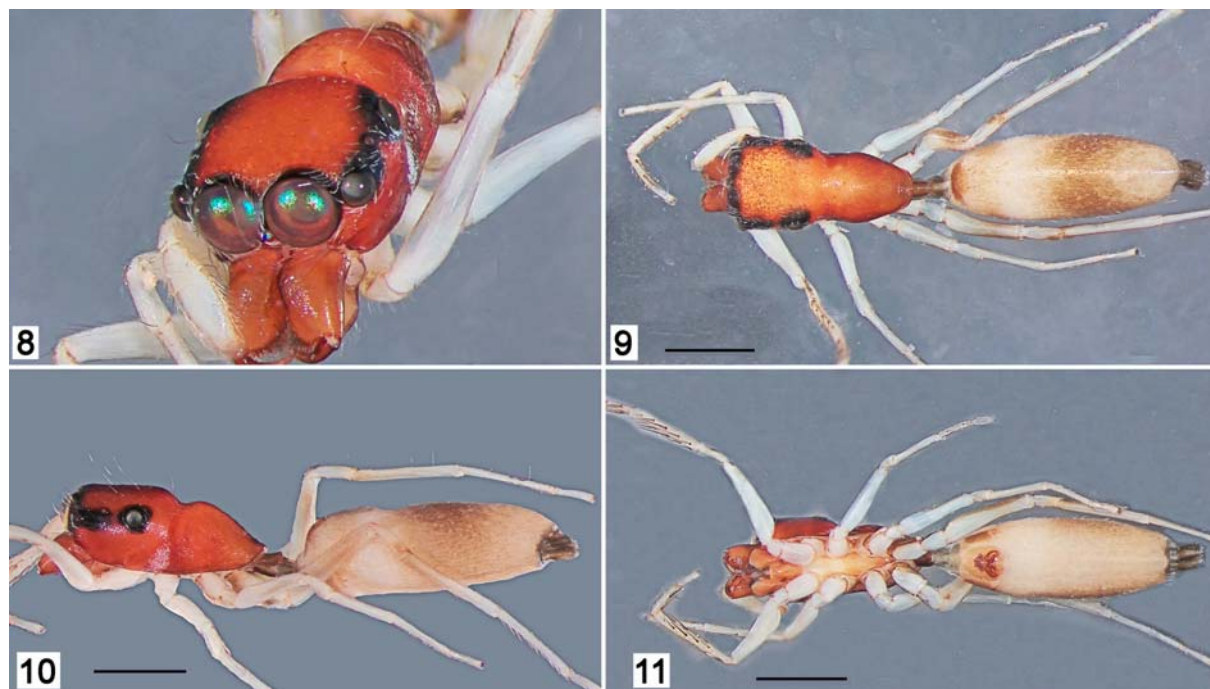
Materials and methods

Spiders were collected in November–December 2022 during an expedition to Salonga co-ordinated by the Biodiversity Inventory for Conservation (BINCO) in partnership with the World Wide Fund for Nature (WWF) D.R.C. (see Jocqué *et al.* [2023]). All spiders were collected by a dedi-

cated active search for the salticids, although pitfall trapping, leaf litter sieving, and winker funnels were also used.

The material collected was preserved in 70% ethanol. All measurements are in millimetres (mm). Leg measurements are presented as follows: femur, patella, tibia, metatarsus, tarsus. Eye measurements denote diameters of individual eyes. The left pedipalp of the male holotype was dissected and illustrated. The illustrated paratype epigyne was first dissected using a custom-made fine hooked needle to excise the epigynal plate, digested in warm lactic acid solution for 3–5 minutes before being observed in methyl salicylate. The cleared epigyne was temporarily mounted on a slide and examined under a compound microscope. Examinations were carried out with an AmScope ZM-4T stereomicroscope or an Olympus BX61. Images were taken using either a Zeiss Discovery V12 with an Axiocam 208 colour camera or an Olympus BX61 with a DP74 camera. All images were z-stacked with between 10–30 images merged into a single photomontage using Helicon Focus 6.7 (www.heliconsoft.com). Images were enhanced in Adobe Photoshop version 21.0.1 for contrast and white balance. Figure plates were composed also in Adobe Photoshop.

All specimens have been deposited in the Royal Museum for Central Africa (RMCA), Tervuren, Belgium. Export permit for biological samples was issued to BINCO by the



Figs 8–11. Female paratype of *Myrmarachne salongensis* sp.n.: 8 — carapace, frontal view; 9 — body, dorsal view; 10 — same, lateral view; 11 — same, ventral view. Scale bars: (9–11) 1 mm.

Рис. 8–11. Самка-паратип *Myrmarachne salongensis* sp.n.: 8 — головгрудь, спереди; 9 — тело, сверху; 10 — то же, сбоку; 11 — то же, снизу. Масштаб: (9–11) 1 мм.

Ministère de l'environnement et développement durable, secretariat général à l'environnement et développement durable, le secrétaire général, Kinshasa.

Pedipalp terminology. Wanless [1978] used the term 'flange' to describe the median retrolateral tibial apophysis (mRTA) and the term 'tibial apophysis' to describe the apical retrolateral tibial apophysis (aRTA); both structures could present in *Myrmarachne* males. The terms mRTA and aRTA are used here to more accurately follow modern salticid taxonomy terminology, as they correspond to the structures used by Wanless [1978].

Abbreviations used in the text and figure plates: aCD — anterior portion of copulatory ducts, AE — anterior eye, AER — anterior eye row, AME — anterior median eye, AL — abdomen length, ALE — anterior lateral eye, aRTA — apical retrolateral tibial apophysis, AW — abdomen width, CH — carapace height, CL — carapace length, CW — carapace width, F — femur, FD — fertilisation ducts, mRTA — median retrolateral tibial apophysis, Mt — metatarsus, ORW — width of the anterior ocular row from widest point of ALEs, pCD — posterior part of copulatory ducts, PE — posterior eyes, PER — posterior eye row, PME — posterior median eyes, PLE — posterior lateral eyes, SL — sternum length, ST — spermathecae, SW — sternum width, T — tarsus, Ti — tibia. Legs I–IV — leg numbers.

Taxonomy

Genus *Myrmarachne* MacLeay, 1839

Type species: *Myrmarachne melanocephala* MacLeay, 1839 (Bengal, India).

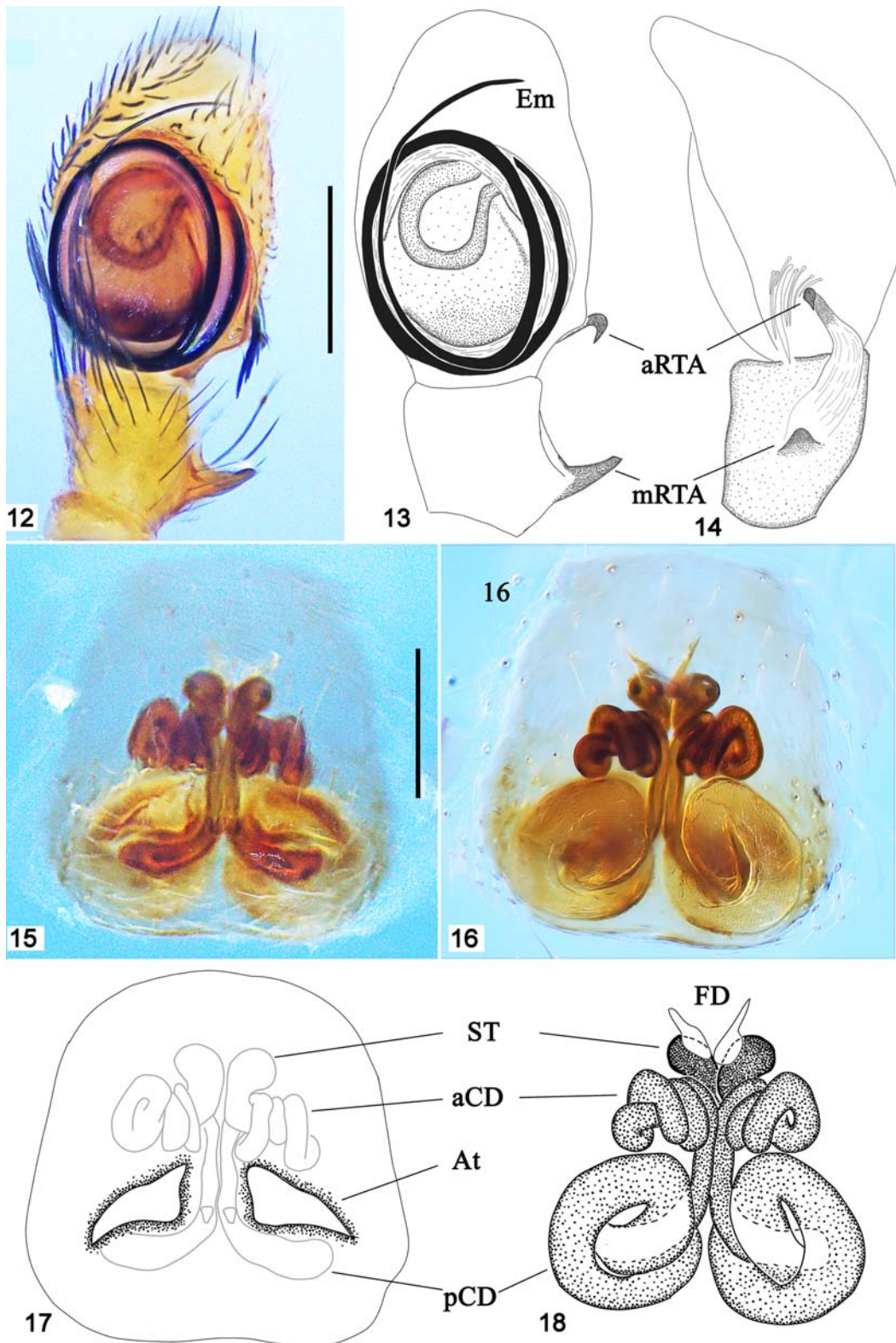
Myrmarachne salongensis Pett, sp.n. Figs 1–18.

TYPES. HOLOTYPE ♂ (RMCA_ARA 247643), D.R. Congo, Parc National de la Salonga (21.02188 –2.28766), 22:20h, 505m a.s.l., 3.12.2022, B.L. Pett. — PARATYPES: 1 ♀ (RMCA_ARA 247643), together with the holotype; 1 ♀ (RMCA_ARA 247644), Parc National de la Salonga (21.02188 –2.28766), 20:34h, 505m a.s.l., 6.12.2022, B.L. Pett; 1 ♂ (RMCA_ARA 247645), Parc National de la Salonga (20.532806, –1.665972), 09:58h, on vegetation 1 m height by small river, 11.12.2022, B.L. Pett; 1 ♀ (RMCA_ARA 247646), Parc National de la Salonga (21.02188 –2.28766), 21:54h, 505m a.s.l., 5.12.2022, B.L. Pett.

COMPARATIVE MATERIAL. *Myrmarachne mussungue* Wanless, 1978: Holotype ♀ (BMNH; Ang. 608.7; MD, Dundo), Angola, environs of Dundo, Source of R. Mussungue, March 1948, A.B. Machado. — Paratype ♀ (BMNH; Ang. 11281.1), Angola, Dundo 1953, A.B. Machado.

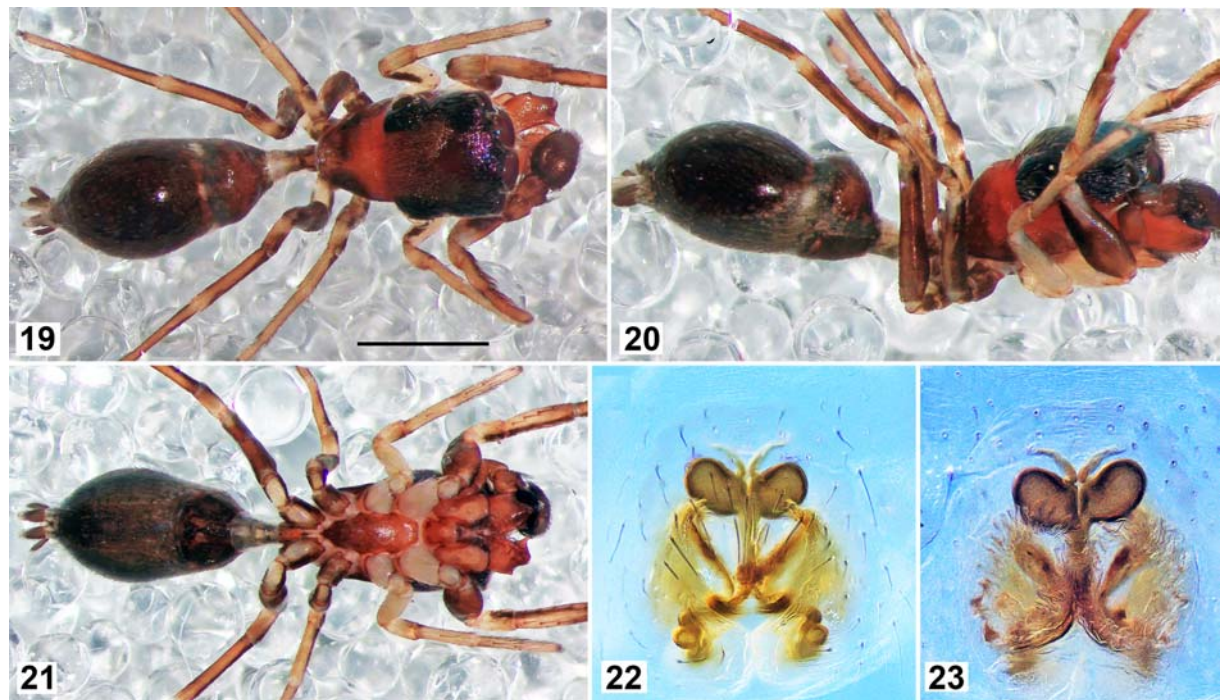
ETYMOLOGY. The specific epithet is derived from 'Salonga', the National Park where the species was discovered.

DIAGNOSIS. The females most closely resemble those of *M. mussungue* Wanless, 1978, but can be distinguished by (i) epigynal atria laterally expanded triangular (vs. mostly vertical to diagonal-triangular); (ii) very large widely spiralled pCD that is about 1.5x the width of aCD region (vs. narrow loop pCD that is of the same width as aCD); (iii) tibia I spination 5-5 (vs. 5-4), (iv) abrupt decline in carapace height posterior to constriction, and (v) dark band covering about 1/3 of abdomen. The males are most similar to those of *M. hesperia* (Simon, 1887) and more widely to the species group to which *M. hesperia* males belong (including *M. evidens* Roewer, 1965 and *M. naro* Wanless, 1978), but can be distinguished by: (i) the clearly posteriorly directed RTA (unique character in the genus); (ii) tibia I spination 5-5 (4-4



Figs 12–18. Copulatory organs of *Myrmarachne salongensis* sp.n.: 12, 13 — left male palp, ventral view; 14 — same, retrolateral view; 15 — cleared epigyne, ventral view; 16 — same, dorsal view; 17 — external epigyne, ventral view; 18 — cleared epigyne, dorsal view. Abbreviations as explained in Material and methods. Scale bars: 0.25 mm (12, 15).

Рис. 12–18. Копулятивные органы *Myrmarachne salongensis* sp.n.: 12, 13 — левая пальпа самца, снизу; 14 — то же, сбоку-сзади; 15 — очищенная эпигина, снизу; 16 — то же, сверху; 17 — внешняя эпигина, снизу; 18 — очищенная эпигина, сверху. Сокращения как объяснено в Материалах и методах. Масштаб: 0,25 мм (12, 15).



Figs 19–23. *Belippo calcarata* (Roewer, 1942): 19 — male habitus, dorsal view; 20 — same, lateral view; 21 — same, ventral view, 22 — cleared epigyne, ventral view; 23 — same, dorsal view. Scale bar: (19) 1 mm.

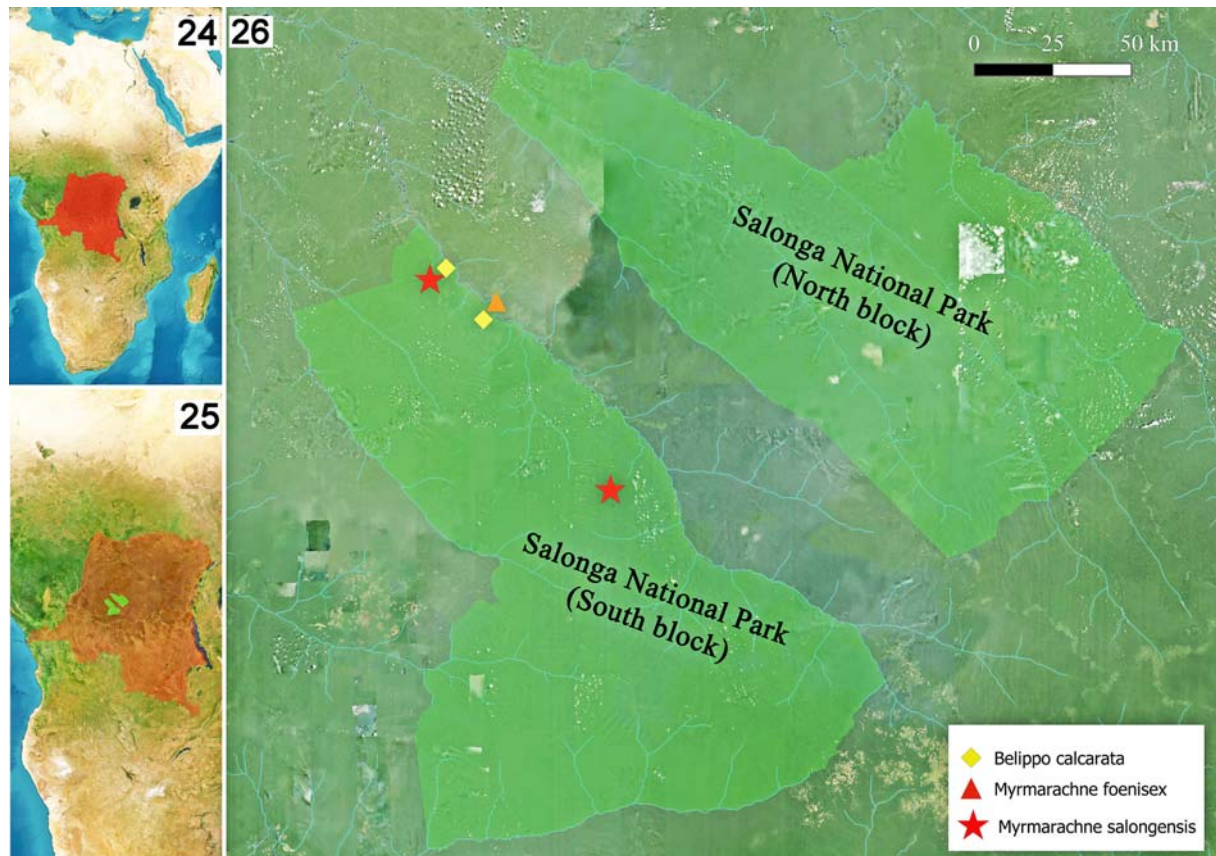
Рис. 19–23. *Belippo calcarata* (Roewer, 1942): 19 — габитус самца, сверху; 20 — то же, сбоку; 21 — то же, снизу, 22 — очищенная эпигина, снизу; 23 — то же, сверху. Масштаб: (19) 1 мм.

in *M. evidens*, *M. naro* and *M. hesperia*), (iii) mRTA that is more than half width of tibia and arises in the posterior third of tibia (*vs.* mRTA less than half tibia width in *M. naro* and *M. hesperia*, in *M. naro*, mRTA also arises from anterior third of tibia), and (iv) dark band covering around half of the dorsal scutum.

DESCRIPTION. HOLOTYPE ♂. *Measurements*: TL 4.14, CL 2.28, CW 0.96, CH 0.90, SL 1.20, SW 0.34, AL 1.86, AW 0.86, chelicera length 2.28, chelicera width 0.38. Legs. I: 1.28, 0.48, 1.22, 0.66, 0.40. II: 0.88, 0.42, 0.72, 0.54, 0.32. III: 1.00, 0.38, 0.80, 0.80, 0.30. IV: 1.48, 0.47, 1.26, 1.16, 0.38. Eyes: AME — 0.44, ALE — 0.20, PME — 0.04, PLE — 0.20, ORW — 1.16. *Colouration*: Carapace generally reddish brown (Figs 1, 2, 4), with a light orange band at thoracic constriction, cephalic region generally orange, white hairs around ocular region most dense between anterior eyes, chelicerae generally reddish brown (Figs 4–6); abdomen contains four faint bands of alternating darker and lighter patches, typically greyish to light yellow, two orange scuta covering much of dorsal face of abdomen; venter mostly pale with orange ventral scuta (Fig. 3), spinnerets ringed in black patch; legs all pale except Mt I dark, retrolateral face of F II, prolateral and retrolateral face of F III & IV darker. *Carapace*: Figs 1, 2, 4. Distinct constriction between cephalic and thoracic parts, posterior part declining very gently for anterior half and abruptly for posterior half; moderately hirsute across ocular region, very long hair just posterior to PME two very long hairs just posterior to constriction. *Sternum*: Inverted lanceolate-shaped, with two clear constrictions (Fig. 3), one between coxae II and one just anterior to coxae III, posterior half of sternum resembling an (inverted) sword. *Legs*: Formula 4132, legs very slender, few scattered trichobothria on tibiae and metatarsa right legs

III and IV missing. *Chelicerae*: Eleven teeth on promargin, eight on retromargin, small proximal lobe, fang about $\frac{3}{4}$ length of chelicerae with apophysis (Figs 5–7). *Abdomen*: Elongate oval, widest $\frac{3}{4}$ along length, small anterior scuta covers about $\frac{1}{4}$ of abdomen, larger posterior scuta covering about $\frac{2}{3}$ of abdomen, scuta divided by a very weak constriction (Figs 1–3). *Palp*: As in Figs 12–14. With well-developed and somewhat slender, pointed mRTA roughly $\frac{2}{3}$ rd width of tibia, aRTA present, with well-developed posteriorly directed hook; cymbium with circular patch of dense short grey setae at anterior third, fringe of eleven long hairs at basal retrolateral margin of cymbium directed posteriorly, mostly obscuring the aRTA in ventral view; embolus long, circling the bulb twice and terminating at with slender apex about 1.30 o'clock. *Leg spination*: I: F = pl1, Ti = 5-5, Mt = 2-2. II: Ti = 0-2, Mt = 2-2.

FEMALE. PARATYPE (RMCA_ARA 247646). *Measurements*: TL 5.14, CL 2.02, CW 0.78, CH 0.76, SL 1.12, SW 0.29, AL 3.12, AW 0.94, chelicera length 0.44, chelicera width 0.28. Legs. I: 1.16, 0.36, 0.96, 0.56, 0.36. II: 0.80, 0.34, 0.62, 0.42, 0.24. III: 0.92, 0.20, 0.68, 0.62, 0.28. IV: 1.26, 0.38, 1.04, 0.88, 0.34. Eyes: AME — 0.35, ALE — 0.18, PME — 0.05, PLE — 0.20, ORW — 1.04. *Colouration*, pattern and shape as in the male (Figs 8–11), except as follows: carapace bright orange, chelicerae substantially reduced with nine teeth on each of promargin and retromargin, single very small anterior dorsal scuta covering about $\frac{1}{7}$ th of abdomen, abdominal bands much more pronounced as overall colour is somewhat paler, black patch around and over spinnerets also more pronounced, two pairs of long abdominal setae in anterior third. *Leg spination*: I: Ti = 5-5, Mt = 2-2. II: Ti = 2-2, Mt = 2-2. *Epigyne* and spermathecae as in Figs 15–18: CO margins laterally expanded triangles,



Figs 24–26. Maps showing the location of D.R. Congo (24), Salonga National Park (25) and collecting localities of the Myrmarachnini species presented in this paper (26).

Рис. 24–26. Карты, показывающие местоположение Демократической Республики Конго (24), национального парка Салонга (25) точки сбора видов Мугмарачнini, представленных в данной работе (26).

leading into very large CDs that cover about 2x the ST area, CDs with large broad coil leading to very narrow and straight ST medially, ST area complex, with three coils directed laterally before curving back and reaching the head of ST at anterior edge of epigyne with small FD pointing anteriorly.

Myrmarachne foenisex Simon, 1909

Myrmarachne foenisex Simon, 1909: 415.

MATERIAL. D.R. CONGO: 1 ♀ (RMCA_ARA_247647), Parc National de la Salonga, Monkoto WWF basecamp (20.68038 – 1.74775), 18:06h, 362 m a.s.l., 28.11. 2022, B.L. Pett.

DISTRIBUTION. Senegal, Guinea, Ivory Coast, Ghana, Nigeria, Gabon, D.R. Congo, Angola [WSC, 2023; present data].

Genus *Belippo* Simon, 1910

Type species: *Belippo anguina* Simon, 1901 (São Tomé Island).

Belippo calcarata (Roewer, 1942)

Figs 19–23.

Myrmarachne calcarata Roewer, 1942: 253, pl. 19, fig. 9a,b.

Belippo calcarata: Wanless, 1978: 11, fig. 6a–l.

MATERIAL. D.R. CONGO: 1 ♂ (RMCA_ARA_247648), Parc National de la Salonga, Monkoto WWF basecamp (20.680389 –

1.74775), 1.5m high in vegetation, active, 12:58h, 10.12.2022, G.A. Jamie & B.L. Pett; 2 ♀♀ (RMCA_ARA_247649), Parc National de la Salonga, Monkoto WWF basecamp (20.680389 – 1.74775), 1.5m high in vegetation, active, 13:28h, 12.12.2022, G.A. Jamie & B.L. Pett; 1 ♂, 1 ♀ (RMCA_ARA_247650), Parc National de la Salonga (20.532806, –1.665972), 11:01h, 13.12.2022, B.L. Pett.

TAXONOMIC NOTES. There is a deep, slightly re-curved transverse depression midway along the epigyne (Fig. 22), with two heavily sclerotized straight-edged isosceles triangular depressions anteriorly. This distinctive epigynal character has not been illustrated or discussed in any published account on *B. calcarata*, but all other somatic and genitalic characters (see Figs 19–21, 23) match in both sexes.

DISTRIBUTION. Angola, D.R. Congo, Equatorial Guinea, Kenya, South Africa [WSC, 2023; present data].

Discussion

The Myrmarachnini fauna documented here represent the first published records of spiders from Salonga, Africa's largest rainforest reserve (Figs 24, 25). Within Salonga, the new species *Myrmarachne salongensis* sp.n. was found at the two sites deep in the primary rainforest (Figs 24, 26). The forest has dense leaf litter, high tree canopies and many large mature



Figs 27–30. Habitats at the collection sites: 27, 28 — “Highland camp”, *Myrmarachne salongensis* sp.n. only; 29, 30 — “Monkoto basecamp”, *Belippo calcarata* (Roewer, 1942) and *Myrmarachne foenisex* Simon, 1909. Photo credits: 27, 28 — Michiel van Noppen, 29 — Miguel Nunes, 30 — the author.

Рис. 27–30. Местообитания в точках сборов: 27, 28 — “лагерь Хайленд”, только *Myrmarachne salongensis* sp.n.; 29, 30 — “базовый лагерь Монкото”, *Belippo calcarata* (Roewer, 1942) и *Myrmarachne foenisex* Simon, 1909. Благодарности за фото: 27, 28 — Michiel van Noppen, 29 — Miguel Nunes, 30 — автор.

trees, with less direct sunlight penetrating to the forest floor (Figs 27, 28). The Monkoto basecamp site (the middle cluster of records in Fig. 26) is characterised by generally disturbed riparian vegetation, with some non-native plants and walkways cut through by villagers (Figs 29, 30). Perhaps it is not surprising that two species (*Belippo calcarata* and *Myrmarachne foenisex*) with very large ranges across Africa were found here.

Compliance with ethical standards

CONFLICT OF INTEREST: The authors declare that they have no conflict of interest.

Ethical approval: No ethical issues were raised during our research.

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BLP's identification of *B. calcarata*. Joseph Faulks (University of Exeter, UK) is thanked for allowing the usage of the bioimaging facilities at the Penryn Campus. Janet Beccaloni and Danni Sherwood (both BMNH) are thanked for facilitating the examination of the *Myrmarachne mussungue* types during BLP's research visit. Martijn van Roie (Ghent University & BINCO, Belgium) is thanked for useful comments on the early draft helping us to improve it. Two anonymous reviewers are thanked for comments that improved the ms, and Dmitri Logunov (Manchester Museum, UK) is thanked for handling and editing the ms. Finally and most importantly, Merlijn Jocqué (RBINS & BINCO, Belgium) is thanked for arranging, planning, managing and leading the 2022 Salonga expedition with exceptional composure and enthusiasm.

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