Biodiversity Data Journal 12: e129438
doi: 10.3897/BDJ.12.e129438

Taxonomy & Inventories

The genera *Chrysilla* and *Phintelloides* revisited with the description of a new species (Araneae, Salticidae) using digital specimen DOIs and nanopublications

Christa L. Deeleman-Reinhold[‡,§], Wouter Addink[‡,|], Jeremy A. Miller[‡,¶]

‡ Naturalis Biodiversity Center, Leiden, Netherlands
§ Sparrenlaan 8, 4641 GA, Ossendrecht, Netherlands
| Distributed System of Scientific Collections - DiSSCo, Leiden, Netherlands
¶ Plazi, Bern, Switzerland

Corresponding author: Jeremy A. Miller (jeremy.miller@naturalis.nl)

Academic editor: Pedro Cardoso

Received: 11 Jun 2024 | Accepted: 02 Sep 2024 | Published: 03 Sep 2024

Citation: Deeleman-Reinhold CL, Addink W, Miller JA (2024) The genera *Chrysilla* and *Phintelloides* revisited with the description of a new species (Araneae, Salticidae) using digital specimen DOIs and nanopublications. Biodiversity Data Journal 12: e129438. https://doi.org/10.3897/BDJ.12.e129438

Abstract

Background

Two Southeast Asian spider collections: that of Frances and John Murphy, now in the Manchester University Museum and the Deeleman collection, now at the Naturalis Biodiversity Center in Leiden constituted the basis of this analysis of *Chrysilla* Thorell, 1887 and related genera. The latter collection also includes many thousands of spiders obtained by canopy fogging for an ecological project in Borneo by A. Floren.

New information

Some incongruences within the genera of the tribe Chrysillini are disentangled. The transfer of *C. jesudasi* Caleb & Mathai, 2014 from *Chrysilla* as type species of

Phintelloides Kanesharatnam & Benjamin, 2019, based on analysis of molecular data is validated by morphology. An interesting new species known only from the forest canopy in Borneo, *Phintelloides scandens* sp. nov, is described based on both male and female specimens. Distinguishing chrysilline genera is mostly based on traditional somatic characters, e.g., habitus, carapace and abdomen patterns, mouthparts, and genital organs. The utility of two character systems for distinguishing chrysilline genera is highlighted: 1) the presence of a flexible, articulating embolic tegular branch (etb) in combination with the conformation of the characteristic construction of the epigyne in *Chrysilla* and *Phintelloides*; 2) presence of red colour on carapace and abdomen of live males and females, in combination with abundant blue/violet/white iridescent scales such as in *Chrysilla* and *Siler*. The red colour usually gets lost in alcohol, hampering species identification of alcohol material. The genera *Chrysilla* and *Phintelloides* are redefined. Specimens of the heretofore unknown female of *Chrysilla deelemani* Prószyński & Deeleman-Reinhold, 2010 are described. The male and female of *Chrysilla lauta* and male of *C. volupe* are redescribed. The genus *Chrysilla* is diagnosed and discriminated from *Phintella* Bösenberg & Strand, 1906, *Siler* Simon, 1889, *Phintelloides* Kanesharatnam & Benjamin, 2019 and *Proszynskia* Kanesharatnam & Benjamin, 2019. The structure of the female genital organ of *Phintelloides flavumi* Kanesharatnam & Benjamin, 2019 is scrutinized and the generic placement of *Phintelloides* is discussed. Males and females of one of the most variable species, *Phintelloides versicolor* (C. L. Koch, 1846) are redescribed. *Phintelloides munita* (Bösenberg & Strand, 1906) is removed from synonymy with *P. versicolor*. *Phintella leucaspis* Simon 1903 (male, Sumatra) is synonymized with *P. versicolor*.

Biodiversity data are increasingly reliant on digital infrastructure. By linking physical specimens to digital representations of their associated data, we can lower barriers to information flow. Here we demonstrate a workflow whereby persistent identifiers (PIDs) in the form of DOIs issued by DataCite are assigned to specimens. Recognized taxa are identified by their catalog of life identifier, or by registration in ZooBank where no catalog of life identifier is available. We demonstrate the use of nanopublications, creating a series of machine readable, scientifically meaningful assertions regarding the provenance and identification of cited specimens. All human agents associated with the specimen data are linked to a persistent identifier issued by either ORCiD or Wikidata.

Keywords

Biodiversity informatics, canopy fogging, copulatory mechanics, discoloration, specimen preservation, tropical Asian jumping spiders

Introduction

Jumping spiders (family Salticidae) attract attention as a highly diverse taxon (>6600 species described across >680 genera, World Spider Catalog 2024) featuring colorful, day active, visually oriented species; this is especially true of the tropics. In some, such as the members of the tribe Chrysillini (Maddison 2015: 247), live specimens attract attention with sparkling colours: silvery white, violet, blue, green and red, often borne on iridescent scales and appressed setae on the integument of the carapace, abdomen and male palps. Unfortunately, colours may change or disappear altogether in alcohol preserved specimens. This can make preserved specimens and live animals of the same species appear so different that they are challenging to recognize as conspecifics. Compounding this taxonomic challenge, males and females are often dissimilar in habitus making it difficult to match sexes; a relatively low proportion of species are known from both sexes. It is not unusual to find species of Chrysillini that have had males and females described as separate species.

It is well known that in the tropics, fauna and flora are generally more diverse than in colder climates. The tropical rainforest, the most species-rich terrestrial habitat in the world, hosts the highest number of unknown, undescribed arthropod species. The forests of tropical Asia are among the world's tallest, characterized by emergent trees such as *Dipterocarpus*. Such trees may grow up to a height of 40-80 meters. Perhaps 99% of the species known from tropical forests have been collected from the lower 2 meters. Although we lack a rigorous estimate of the degree to which the canopy fauna is distinct from that of the lowest stratum, collections from forest canopy are a rich source for novel discovery. This publication is the latest in a series based on the unique and remarkable collection of more than 10,000 spiders collected by A. Floren during a long-term ecological project on Borneo (van Dorp 2020). This collection includes an unknown number of remarkable species that are quite unlike relatives from the understorey (Floren and Deeleman-Reinhold 2005), or are geographically distant from their closest known relatives (Deeleman-Reinhold et al. 2016). It is clear from the many new discoveries derived from the modest samples available that these forests harbour a profusion of undiscovered species. In the face of intensifying anthropogenic environmental change, we hope that fundamental research on the biodiversity of this critical region can be supported. Contemporary practices in international taxonomic research emphasize data mobilization as a mechanism for maximizing value of biodiversity data. This means lowering technological and social barriers to sharing, aggregating, and applying data flexibly to serve a broad spectrum of stakeholders, and providing data resources and inspiration to future generations of scientists.

The genera of Chrysillini that have been selected for this study belong to the core group of genera, characterized by the presence of a tegular bump on the male pedipalp (Fig. 1a, Maddison 2015: 247). A phylogenetic study of the Chrysillini explored in part the evolution of their conspicuous coloration (Kanesharatnam and Benjamin 2019). The most eye-catching genera in the group, such as *Chrysilla*, *Siler, Cosmophasis,* and *Orsima*, exhibit iridescent colours (such as red, green, blue and violet) on setae and scales on the

cephalothorax, abdomen and male palps. Others, such as *Phintella, Phintelloides,* and *Proszynskia*, express more modest colours (such as black, white, brown and yellow). Photos of live spiders (Fig. 2) can be found in the field guides of Borneo and Singapore (Koh and Bay 2019, Koh et al. 2022, Koh and Ming 2013), taxonomic publications (e.g., Caleb et al. 2018, Yamasaki et al. 2018), and online databases (Metzner 1996-2020, Prószyński 2016). It is clear that some genera in this group have been ill defined in the past as witnessed by the frequent transfer of species between genera. In particular, the genus *Chrysilla* has often been misinterpreted. For much of the history of *Chrysilla*, no species were known from both sexes. Female *Chrysilla* species have an epigyne with a characteristic structure. *Chrysilla* are usually sexually dimorphic; *C. acerosa* Wang & Zhang, 2012 is an exception. Kanesharatnam and Benjamin (2019) recently established the genus *Phintelloides* for a set of new species from Sri Lanka, revealing a remarkable radiation. *Phintelloides* species are united by putative synapomorphies, such as specific black and white patterns on the carapace, the shape of the tegulum in the male palp, and the path of the copulatory ducts of the epigyne.

Colour pattern can be useful for species identification in such flamboyant spiders. Unfortunately, there is an inconvenient discrepancy between colours in live or freshly preserved specimens, and specimens that have been preserved in alcohol for some time. In most cases, we found that long preserved specimens (for example, >20 years) had lost nearly all colour. Red is among the colours most prone to disappearing in alcohol. Label data sometimes record color notes. Red areas visible on photographs of live animals may appear in preserved specimens as bare, pale brown, usually without any setae, hairs or scales at all.

Pigment colouration can be supplemented by regions with tiny iridescent multicolored scales and flattened setae. Several of the alcohol preserved specimens we examined were swimming in clouds of floating colourless scales of various size. Some iridescent scales bearing blue, violet, or green can be retraced on the teguments of carapace and abdomen but the colours were not always the same as that on photos; in both live and alcohol specimens, colours may change when shifting direction of viewing or change of position of light source. Iridescent blue and violet usually are associated with round scales, the size of these scales may differ on different parts of the body.

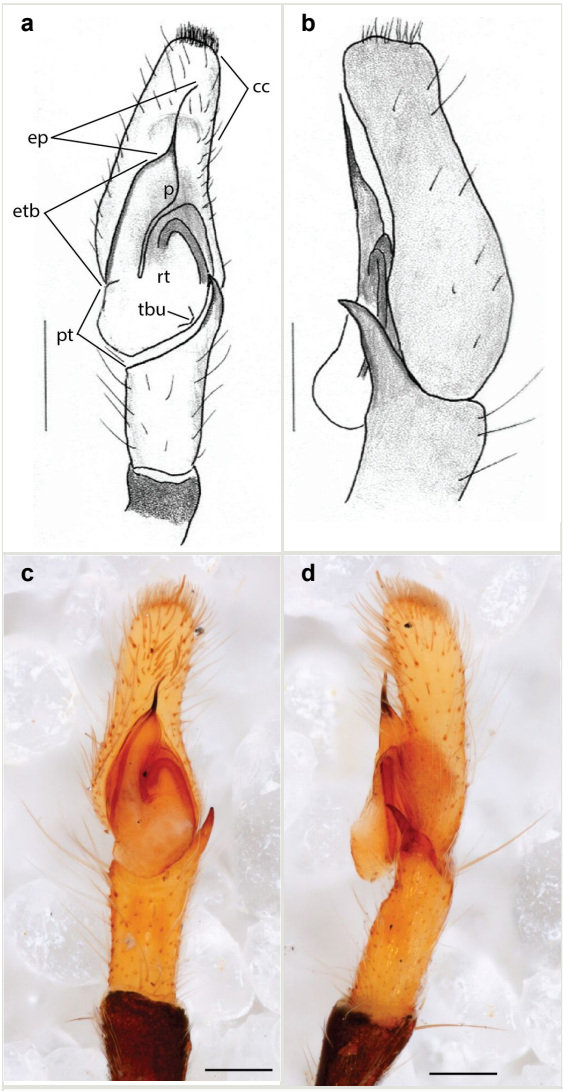

Figure 1.

Annotated illustrations and photographs of male pedipalp in *Chrysilla lauta* Thorell, 1887

a: *Chrysilla lauta* Thorell, 1887, left male pedipalp, ventral view **cc** cymbium cap **ep** embolus proper **etb** embolar tegular branch **p** distal projection of embolar tegular branch beyond retrolateral lobe of tegulum excluding embolus proper **pt** proximal lobe of tegulum **rt** retrolateral lobe of tegulum **tbu** tegular bump. Scale bar: 0.3 mm doi

b: *Chrysilla lauta* Thorell, 1887, left male pedipalp, retrolateral view. Scale bar: 0.3 mm doi

c: *Chrysilla lauta* Thorell, 1887, ventral view, CM 15726, scale bar 0.2 mm doi

d: *Chrysilla lauta* Thorell, 1887, retrolateral view, CM 15726, scale bar 0.2 mm doi

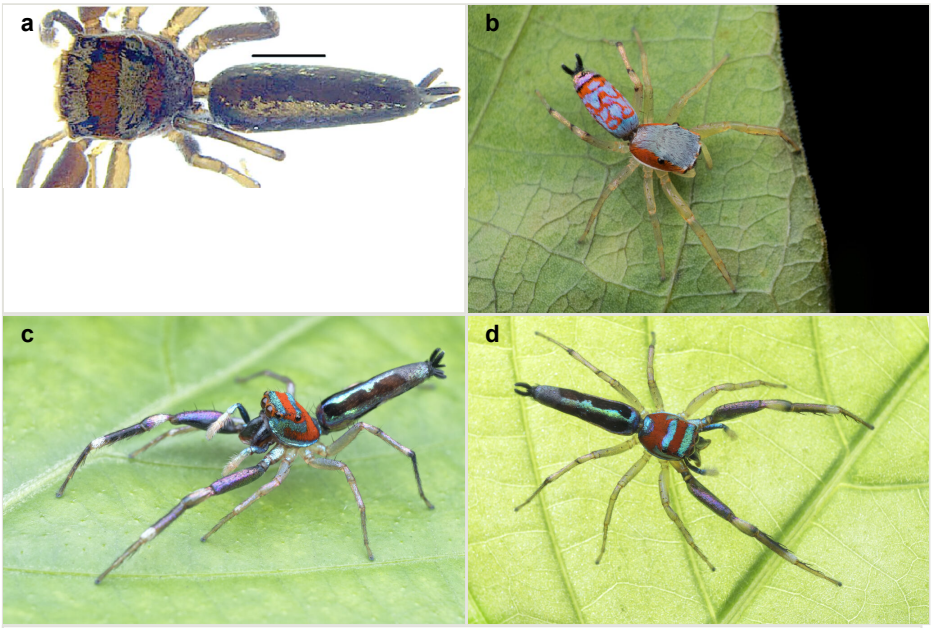

Figure 2.

Selected images of *Chrysilla lauta* Thorell, 1887 reproduced from field guides and taxonomic literature showing fresh specimens and animals in living color

a: *Chrysilla lauta* Thorell, 1887, Kanesharatnam and Benjamin, 2019, fig. 19A, male habitus, dorsal view. Scale bar 1 mm doi

b: *Chrysilla lauta* Thorell, 1887, Koh et al., 2022, p. 347, live female, reproduced with permission, photo credit Paul Y.C. Ng doi

c: *Chrysilla lauta* Thorell, 1887, Koh et al., 2022, p. 347, live male, reproduced with permission, photo credit Melvyn Yeo doi

d: *Chrysilla lauta* Thorell, 1887, Koh et al., 2022, p. 347, live male, reproduced with permission, photo credit Melvyn Yeo doi

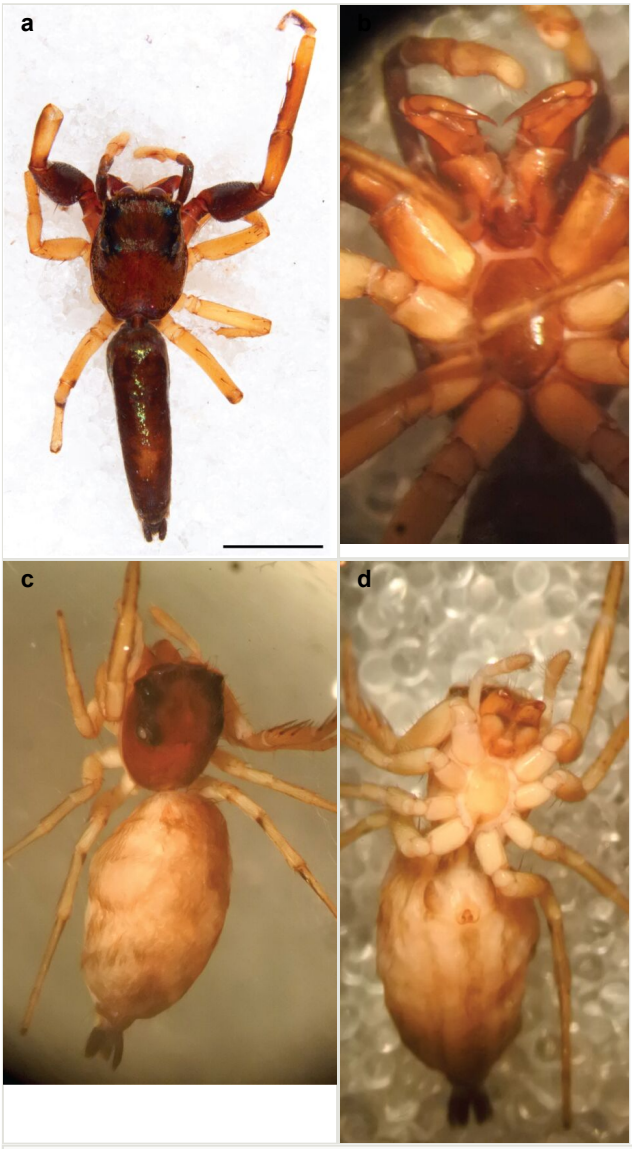

Figure 3.

Chrysilla lauta Thorell, 1887, photographs of male and female preserved specimens

a: *Chrysilla lauta* Thorell, 1887, male habitus, dorsal view, CM 15726, scale bar 2 mm doi
b: *Chrysilla lauta* Thorell, 1887, male prosoma, ventral view, CM 15726 doi
c: *Chrysilla lauta* Thorell, 1887, female habitus, dorsal view, CM19182 doi
d: *Chrysilla lauta* Thorell, 1887, female habitus, ventral view, CM19182 doi

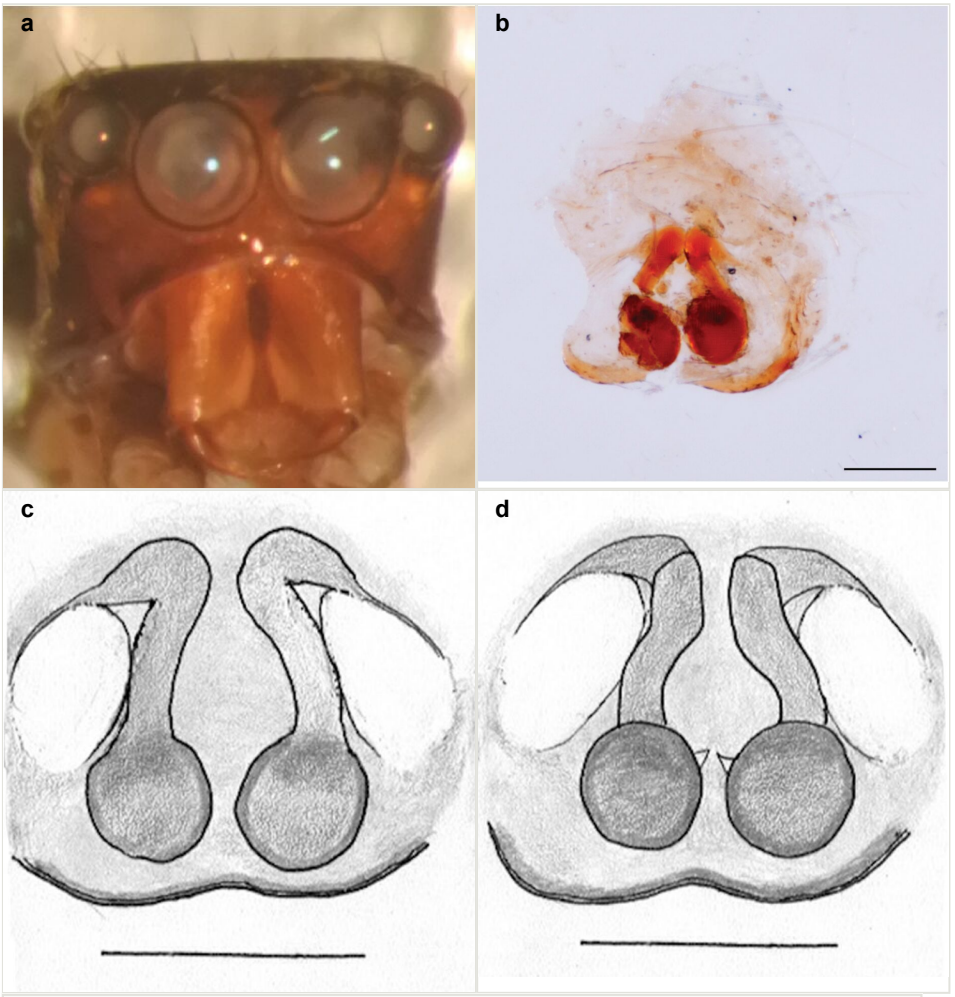

Figure 4.

Chrysilla lauta Thorell, 1887, photographs and illustrations of preserved specimens and female reproductive structures

a: *Chrysilla lauta* Thorell, 1887, male prosoma, anterior view, CM 15726 doi

b: *Chrysilla lauta* Thorell, 1887, female vulva, dorsal view, CM19182, scale bar 0.1 mm doi

c: *Chrysilla lauta* Thorell, 1887, female epigynum, ventral view, illustration, scale bar 0.2 mm doi

d: *Chrysilla lauta* Thorell, 1887, female epigynum, dorsal view, illustration, scale bar 0.2 mm doi

Copulatory mechanics in *Chrysilla* and *Phintelloides*

The male pedipalp of *Chrysilla* and *Phintelloides* features an atypical configuration. The tegulum is cleft into pro- and retrolateral parts: the prolateral branch we call embolar tegular branch (etb), with the embolus proper (ep) sitting on top; the base of the etb is attached dorsally, hidden by the larger retrolateral part (rt) containing the U-shaped spermduct-loop (sdl). The etb is long and flexible, freely movable, articulated at the base with the proximal tegular lobe (pt). This can be ascertained by manual examination with fine forceps and needle. The structure of the epigyne is likewise unusual, having copulatory ducts distally diverging as a bird-neck-shaped curve (bnc) with often inflated walls (possibly glands?) directed outwards, ending as an open bird's beak (here called atrium, a); it lacks a distinct copulatory opening. Also, the pockets in the posterior ridge of the epigyne (pp) are rigid and probably play a role in anchoring the proximal part of the palp.

In search for the copulatory opening, CLD-R separated a palp and a cleared epigyne from specimens of *Phintelloides scandens* sp. nov. and of *Chrysilla lauta* (Figs 5, 16) and an epigyne of *Phintelloides flavumi* (Fig. 11) and manipulated them, measuring the lengths and widths testing if these would allow a transfer of sperm into the spermatheca by introducing the tegulum and embolus inside the vulva (Figs 5, 16; tegulum in yellow, etb in red). In each species, the length of the embolus proper proved to match the length of the copulatory duct.

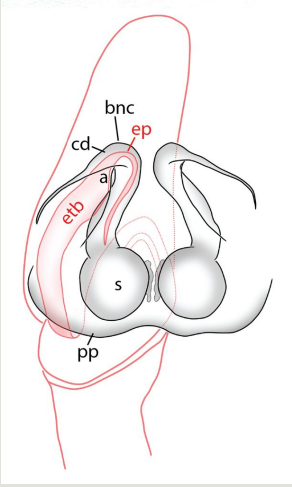

Figure 5. doi

Chrysilla lauta Thorell, 1887, schematic illustrations showing hypothetical interaction between male and female genitalia **a** atrium **bnc** bird's neck curve **cd** copulatory duct **ep** embolus proper **etb** embolar tegular branch **pp** posterior pockets **s** spermatheca

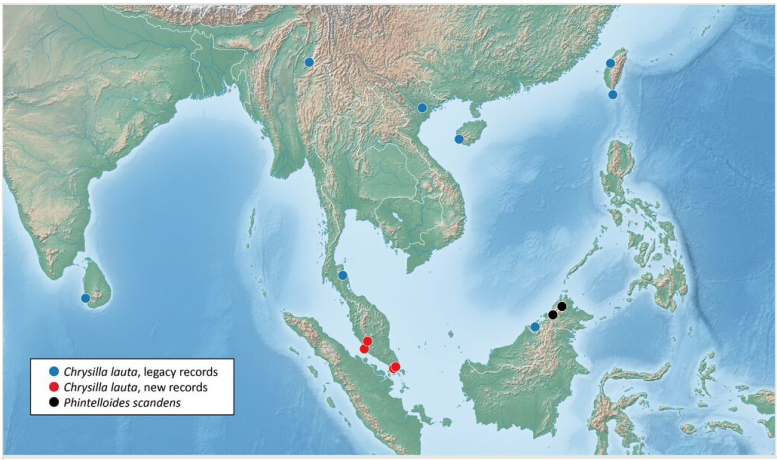

Figure 6. doi

Map showing occurrence records for selected species. *Chrysilla lauta* Thorell, 1887: blue circle for previously published records, red circle for new records; *Phintelloides scandens* sp. nov.: black circles.

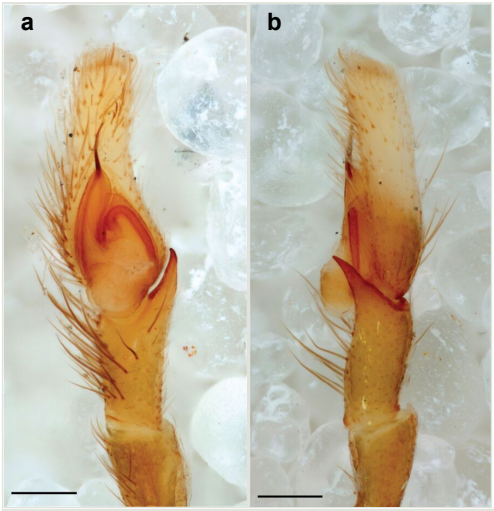

Figure 7.

Chrysilla volupe (Karsch, 1879), photographs of right male pedipalp reversed so as to appear as a left pedipalp to facilitate comparison

a: *Chrysilla volupe* (Karsch, 1879), reversed right male pedipalp, ventral view, CM 15916 doi

b: *Chrysilla volupe* (Karsch, 1879), reversed right male pedipalp, retrolateral view, CM 15916 doi

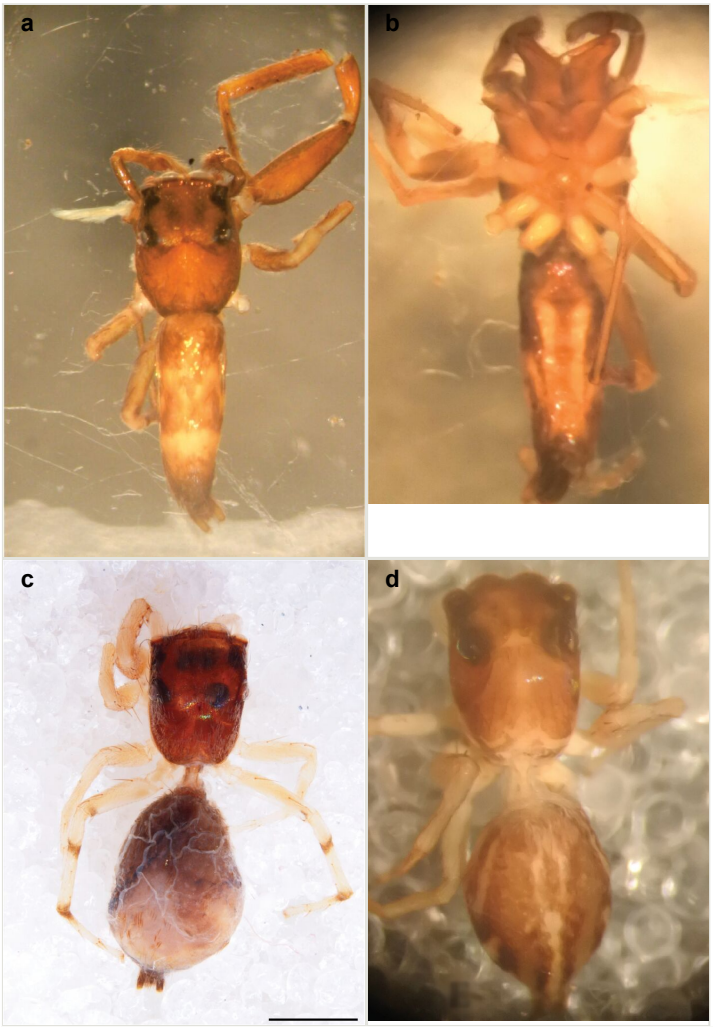

Figure 8.

Chrysilla volupe (Karsch, 1879) and *Chrysilla deelemani* Prószyński & Deeleman-Reinhold, 2010, photographs of male and female preserved specimens

a: *Chrysilla volupe* (Karsch, 1879), male habitus, dorsal view, CM 15916 doi

b: *Chrysilla volupe* (Karsch, 1879), male habitus, ventral view, CM 15916 doi

c: *Chrysilla volupe* (Karsch, 1879), female habitus, dorsal view, RMNH.ARA.18259, scale bar 1 mm doi

d: *Chrysilla deelemani* Prószyński & Deeleman-Reinhold, 2010, female habitus, dorsal view, RMNH.ARA.18265 doi

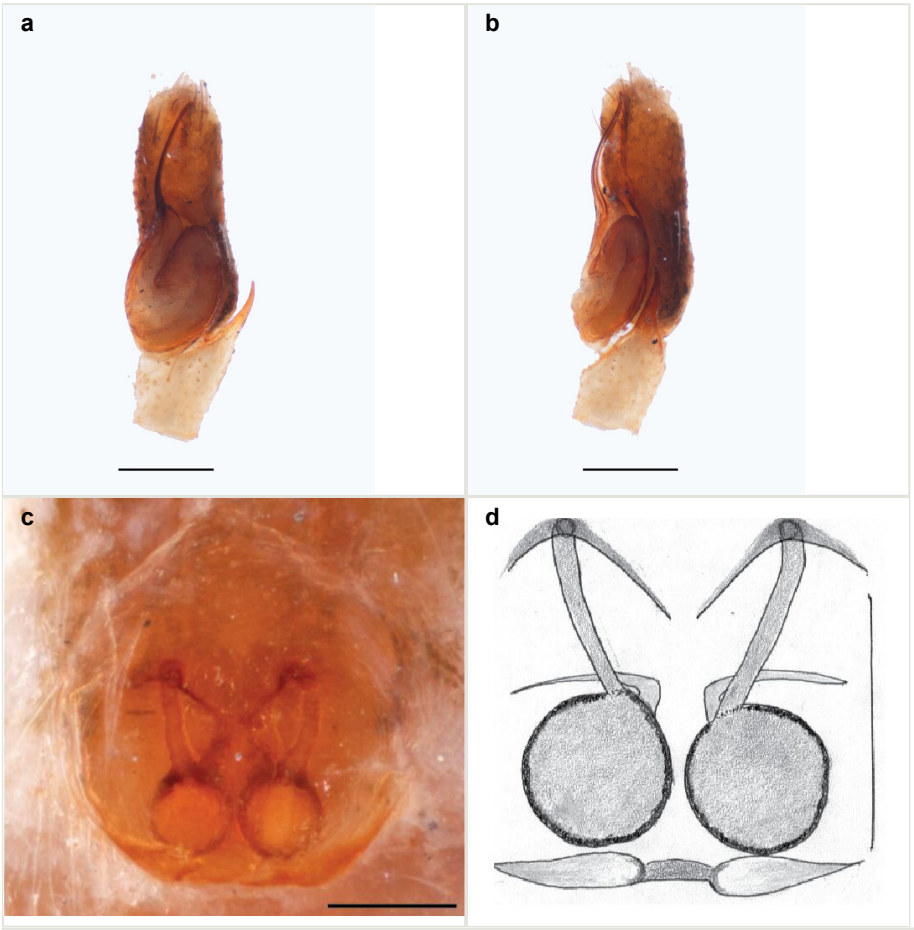

Figure 9.

Chrysilla deelemani Prószyński & Deeleman-Reinhold, 2010, photographs and illustrations of reproductive structures

a: *Chrysilla deelemani* Prószyński & Deeleman-Reinhold, 2010, male pedipalp, ventral view, RMNH.ARA.18264, scale bar 0.2 mm doi

b: *Chrysilla deelemani* Prószyński & Deeleman-Reinhold, 2010, male pedipalp, retrolateral view, RMNH.ARA.18264, scale bar 0.2 mm doi

c: *Chrysilla deelemani* Prószyński & Deeleman-Reinhold, 2010, female epigynum, ventral view, RMNH.ARA.18265, scale bar 0.1 mm doi

d: *Chrysilla deelemani* Prószyński & Deeleman-Reinhold, 2010, female vulva, dorsal view, illustration, scale bar 0.2 mm doi

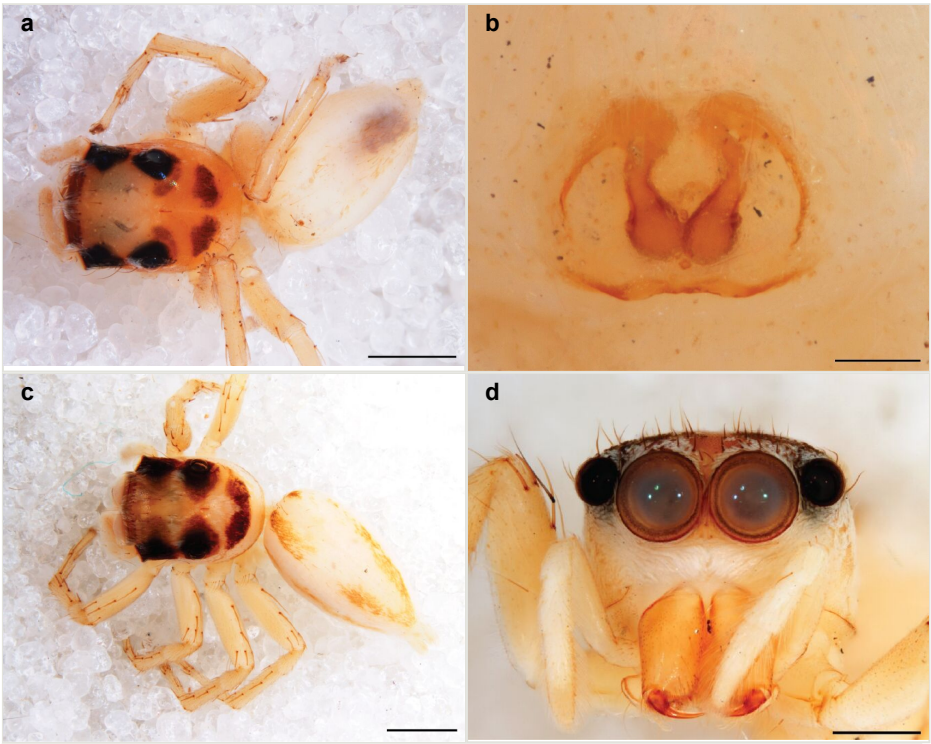

Figure 10.

Phintelloides jesudasi (Caleb & Mathai, 2014) and *Phintelloides flavumi* Kanesharatnam & Benjamin, 2019, photographs of preserved female specimens

a: *Phintelloides jesudasi* (Caleb & Mathai, 2014), female habitus, dorsal view, RMNH.ARA. 18258, scale bar 1 mm doi

b: *Phintelloides jesudasi* (Caleb & Mathai, 2014), female epigynum, ventral view, RMNH.ARA. 18258, scale bar 0.1 mm doi

c: *Phintelloides flavumi* Kanesharatnam & Benjamin, 2019, female habitus, dorsal view, RMNH.ARA.18250, scale bar 1 mm doi

d: *Phintelloides flavumi* Kanesharatnam & Benjamin, 2019, female prosoma, anterior view, RMNH.ARA.18250, scale bar 0.5 mm doi

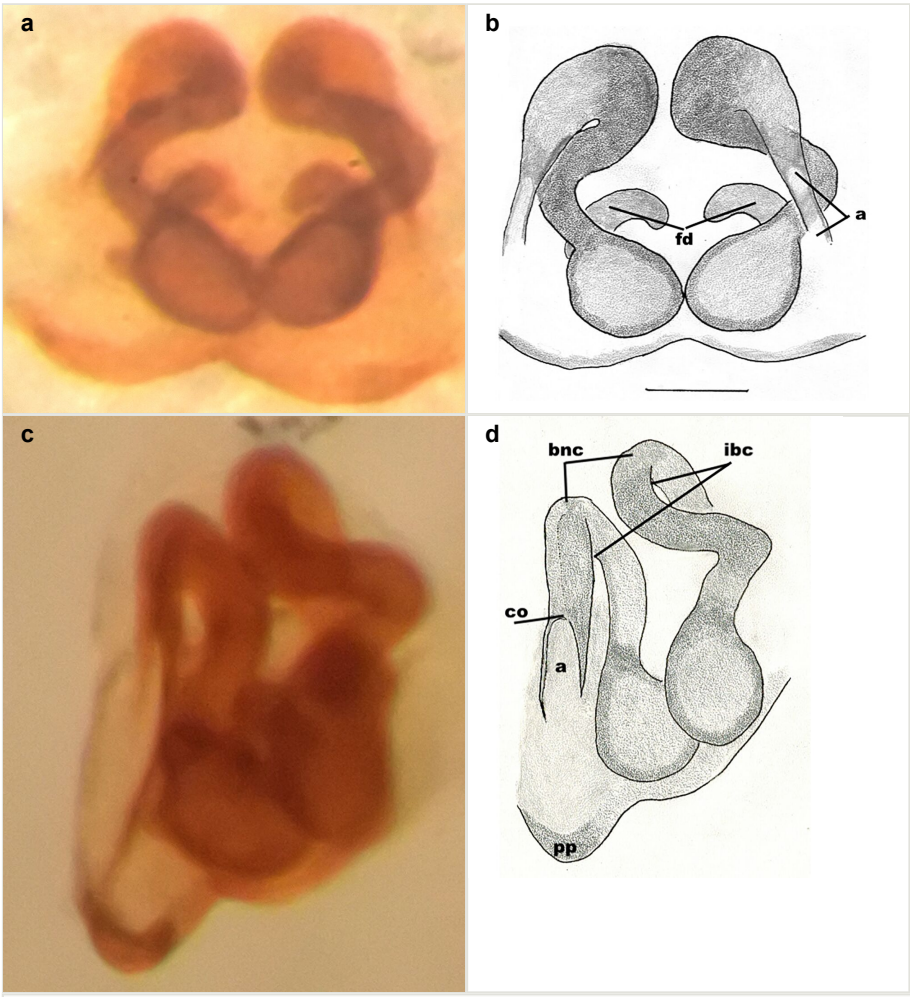

Figure 11.

Phintelloides flavumi Kanesharatnam & Benjamin, 2019, photographs and illustrations of female reproductive structures

a: *Phintelloides flavumi* Kanesharatnam & Benjamin, 2019, female vulva, dorsal view, RMNH.ARA.18250 doi

b: *Phintelloides flavumi* Kanesharatnam & Benjamin, 2019, female vulva, dorsal view, illustration **a** atrium **fd** ferilization ducts. Scale bar 0.1 mm doi

c: *Phintelloides flavumi* Kanesharatnam & Benjamin, 2019, female vulva, oblique view, RMNH.ARA.18250 doi

d: *Phintelloides flavumi* Kanesharatnam & Benjamin, 2019, female vulva, oblique view, illustration **a** atrium **bnc** bird's neck curve **co** copulatory opening **ibc** inner bend of bird's-neck shaped curve **pp** posterior pockets doi

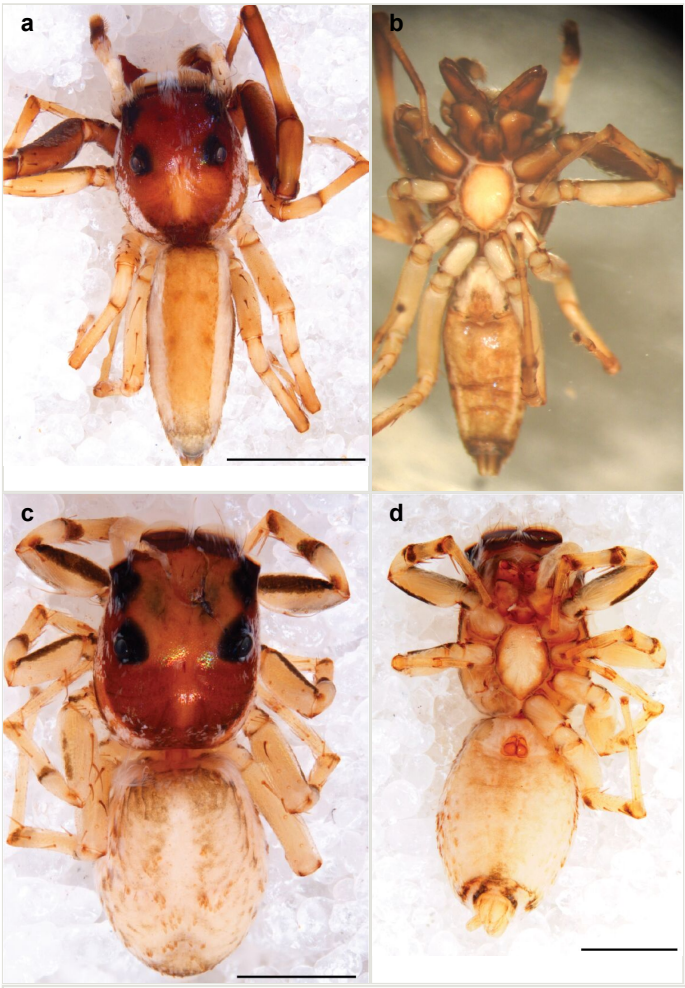

Figure 12.

Phintelloides scandens sp. nov., photographs of male ane female preserved specimens

a: *Phintelloides scandens* sp. nov., male habitus, dorsal view, RMNH.ARA.18255, scale bar 2 mm doi

b: *Phintelloides scandens* sp. nov., male habitus, ventral view, RMNH.ARA.18255 doi

c: *Phintelloides scandens* sp. nov., female habitus, dorsal view, RMNH.ARA.18257, scale bar 1 mm doi

d: *Phintelloides scandens* sp. nov., female habitus, ventral view, RMNH.ARA.18257, scale bar 1 mm doi

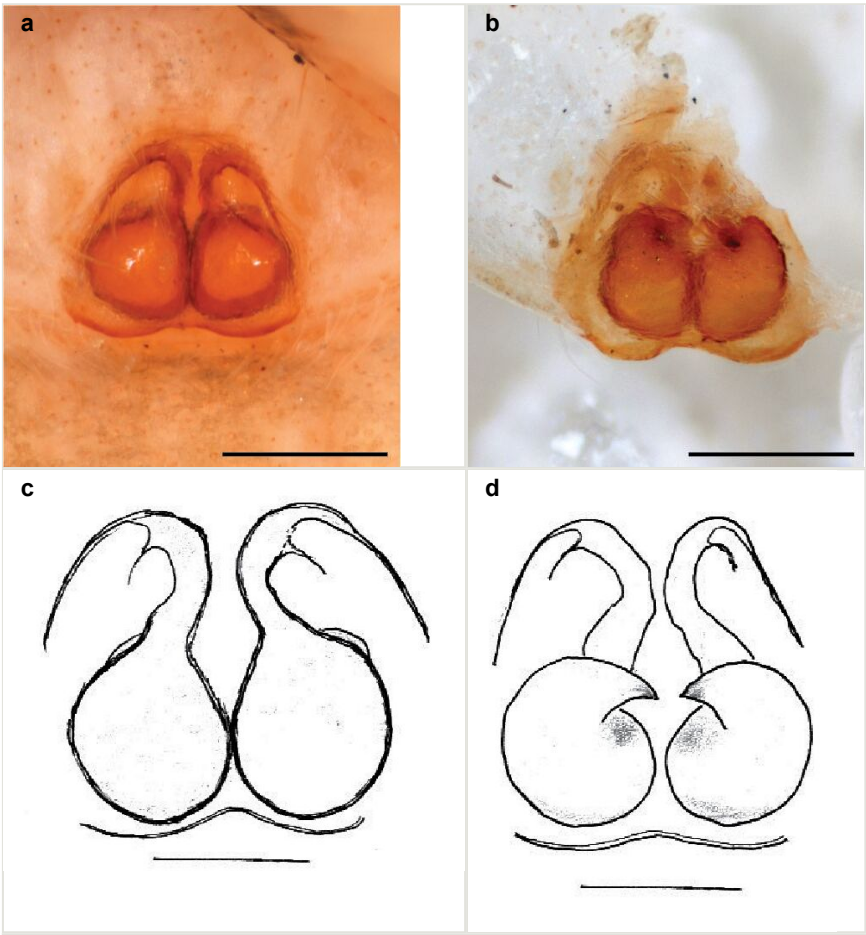

Figure 13.

Phintelloides scandens sp. nov., photographs and illustrations of female reproductive structures

a: *Phintelloides scandens* sp. nov., female epigynum, ventral view, RMNH.ARA.18257, scale bars 0.2 mm doi

b: *Phintelloides scandens* sp. nov., female vulva, dorsal view, RMNH.ARA.18257, scale bars 0.2 mm doi

c: *Phintelloides scandens* sp. nov., female epigynum, ventral view, illustration, scale bars 0.2 mm doi

d: *Phintelloides scandens* sp. nov., female vulva, dorsal view, illustration, scale bars 0.2 mm doi

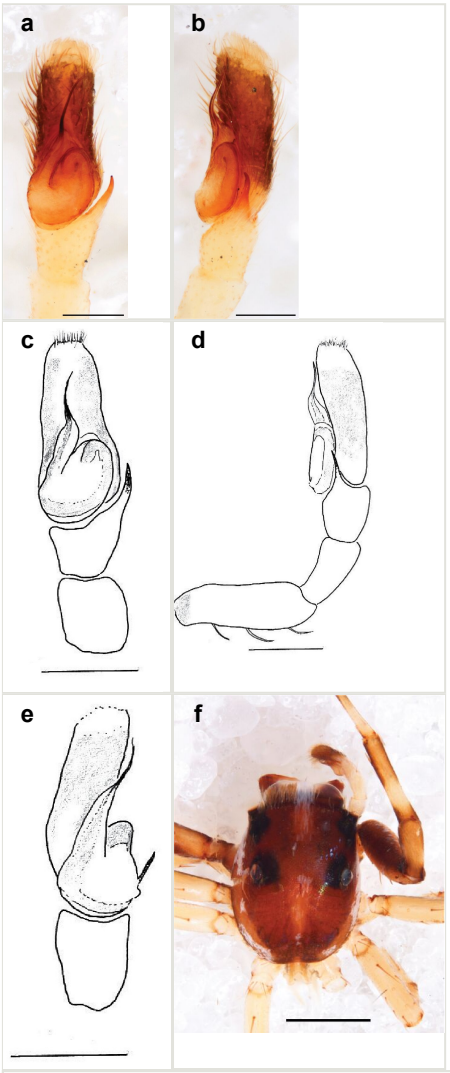

Figure 14.

Phintelloides scandens sp. nov., photographs and illustrations of male pedipalp and prosoma

a: *Phintelloides scandens* sp. nov., male holotype, pedipalp, ventral view, RMNH.ARA.18251, scale bar 0.2 mm doi

b: *Phintelloides scandens* sp. nov., male holotype, pedipalp, retrolateral view, RMNH.ARA.18251, scale bar 0.2 mm doi

c: *Phintelloides scandens* sp. nov., male pedipalp, ventral view, illustration, scale bar 0.2 mm doi

d: *Phintelloides scandens* sp. nov., male pedipalp, retrolateral view, illustration, scale bar 0.2 mm doi

e: *Phintelloides scandens* sp. nov., male pedipalp, prolateral view, illustration, scale bar 0.2 mm doi

f: *Phintelloides scandens* sp. nov., male holotype, prosoma, dorsal view, RMNH.ARA.18251, scale bar 1 mm doi

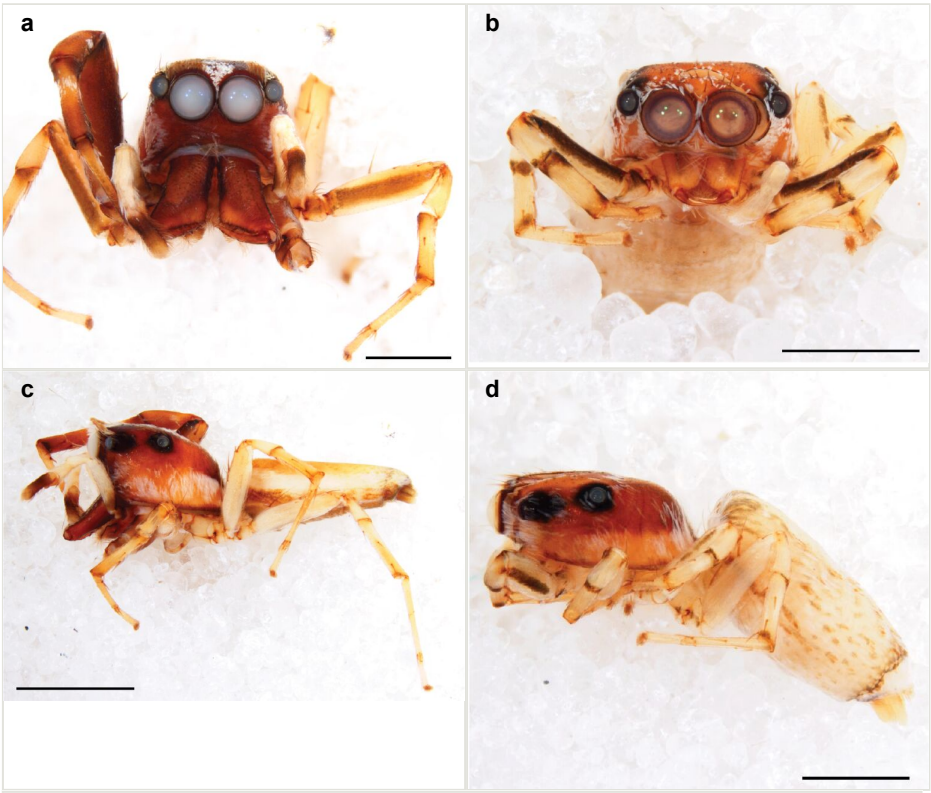

Figure 15.

Phintelloides scandens sp. nov., photographs of male and female preserved specimens

a: *Phintelloides scandens* sp. nov., male prosoma, anterior view, RMNH.ARA.18255, scale bar 1 mm doi

b: *Phintelloides scandens* sp. nov., female prosoma, anterior view, RMNH.ARA.18257, scale bar 1 mm doi

c: *Phintelloides scandens* sp. nov., male habitus, lateral view, RMNH.ARA.18255, scale bar 2 mm doi

d: *Phintelloides scandens* sp. nov., female habitus, lateral view, RMNH.ARA.18257, scale bar 1 mm doi

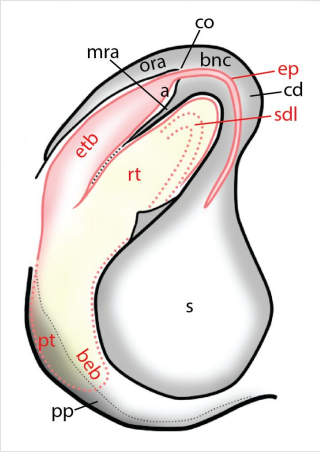

Figure 16. doi

Phintelloides scandens sp. nov., schematic illustrations showing hypothetical interaction between male and female genitalia **a** atrium **beb** base of embolar tegular branch **bnc** bird's neck curve **cd** copulatory duct **co** copulatory opening **ep** embolus proper **etb** embolar tegular branch **mra** median rim of atrium **ora** outer rim of atrium **pp** posterior pockets **pt** proximal lobe of tegulum **rt** retrolateral lobe of tegulum **s** spermatheca **sdl** sperm duct loop

In females of *P. scandens* viewed from the ventral aspect, two round adjacent excavations are seen on in the left and the right part of the epigyne (Figs 11c, d, 16). The outer one, the atrium (Fig. 16: a), confined between the outer (ora) and the inner (mra) atrium rim, encompasses the copulatory opening (co) and during copulation hosts the etb. The inner excavation is separated from the atrium by the median rim (mra) and is confined by the proximal wall of the bird-neck (bnc). It is blind and matches the shape and size of the retrolateral part of the tegulum (rt). The total length of the tegulum just about equals the distance between the pockets in the posterior ridge in the epigyne (pp) and the inner excavation. The shape of the distal part of the etb matches the shape of the atrium and its length equals the length of the ora and mra so that the embolus proper (ep) can be pushed into the copulatory opening. This supports the idea that during copulation the tegulum is lengthwise pinched between the posterior pocket and the inner excavation and provides a grip for the stability of the male palp while pushing the etb into the atrium and the embolus into the copulatory ducts.

In *P. flavumi*, as can be seen in the vulva oriented in oblique ventro-lateral view (Fig. 11c, d), the atrium is clearly seen in the shape of a funnel which would be suitable to lodge the etb, so that the embolus can be pushed through the copulatory opening (co). Behind it the inner (lower) bend of the bird-neck-curve can be seen, providing a rounded excavation, suitable to anchor the tegulum tip.

In *C. lauta* the hypothetical functioning during copulation is also visualized in ventral view (Fig. 5). The inner excavation is obscured by the bird neck curve which is inclined ventrally. A large atrium is seen between the outer and the inner atrium rim leading to the copulatory opening. By contrast with *P. scandens*, in *C. lauta* the total length of the

tegulum exceeds the distance between the posterior pocket and the atrial cavity. However, the proximal part of the tegulum in *C. lauta* is considerably swollen ventrally (Fig. 1b, d); an attempt to visualize the possible mating positions is made in Fig. 5, where the tegular bulge (tbu) is anchored against the posterior ridge of the epigyneal pocket (pp); the etb (red) is inserted into the atrium, the embolus (ep) inside the copulatory duct, the retrolateral part of the tegulum (yellow) distally resting on the ventral surface of the epigyne; the contours of the palp positioned on the ventral surface of the epigyne is presented as red dotted line. A similar construction in male and female genital organs is found in the genus *Bristowia* Reimoser, 1934 (Szüts 2004).

Materials and methods

A stereomicroscope Zeiss Stemi SV11, ocular 10 x objective zoom 0.8 - 6.6 x, with Muiji halogen microscope lamp and Schott glass fiber optic lighting was used for examination and photography. Drawings were made with Zeiss drawing tube with drawing pens MICRON 1,0, 3,0 5,0 and 7,0 mm, lead pencils H, B and 2B and H, 3B and 8B cretacolor on special drawing paper. Photographs were made with a DS-R:1 digital camera driven by NIS Elements software with composite extended focus images generated using Helicon Focus 7 (Kozub et al. 2000). Additional photographs were made using a Nikon J5 digital camera. Measurements were made by using an ocular micrometer and reported in millimeters. Body lengths exclude protruding eye lenses and spinnerets; leg length measured on the dorsal side. Epigynes were detached for examination and temporarily immerged in clove oil for clearing.

The following abbreviations are used in the text and figures:

- a - atrium
- AME - anterior median eyes
- beb – base of embolar tegular branch
- bnc – bird’s neck curve
- cc - cymbium cap, distance between distal edge of alveolus and top of cymbium
- cd - copulatory duct or insemination duct
- CM – Collection Murphy, in MMUE
- co - copulatory opening
- ep – embolus proper
- etb - prolateral embolar tegular branch
- fd - fertilisation duct
- ibc - inner bend of bird's-neck shaped curve
- MMUE – Manchester Museum, University of Manchester, U.K. (Arzuza Buelvas 2018)
- mra - median rim of atrium
- ora - outer rim of atrium
- p – projection of prolateral embolar tegular branch (etb) beyond retrolateral lobe of tegulum (rt), exluding embolus proper (ep)
- pt – proximal tegular lobe

- pp - posterior pockets
- RMNH – Naturalis Biodiversity Center, Leiden, NL, formerly Rijksmuseum van Natuurlijke Historie
- rt – retrolateral part of tegulum
- rta - retrolateral tibial apophysis
- s - spermatheca
- sdl - sperm duct loop
- tbu - tegular bump

Total length is measured exclusive of AME lenses and spinnerets. Leg measurements are presented thus: total (femur – patella – tibia – metatarsus – tarsus). All measurements in milimetres.

Hairs are thin filiform, erect or appressed; setae are elongate acuminate, flattened, sometimes appressed and iridescent; scales are round, thin and iridescent.

Use of identifiers

Digital Object Identifiers (DOIs) are globally unique, resolvable and persistent unique identifiers that are in widespread use for citing publications. In the realm of biodiversity informatics, they have been adopted to identify and electronically link multiple classes of data objects within taxonomic publications. Journal publishers like Pensoft as well as the biodiversity data group Plazi have developed workflows for biodiversity publications which issue DOIs for elements within the publication, such as figures, taxonomic treatments, and supplementary data (Penev et al. 2009, Fawcett et al. 2022, Miller et al. 2015). Taxonomic treatments are the content within a taxonomic publication concerned with one particular taxon, such as a species description including its diagnosis, figures, specimens, and other data (Agosti and Egloff 2009, Miller et al. 2015). The paper you are reading now contains 10 treatments, two generic treatments and 8 species treatments. The EU research project BiCIKL is an European Union Horizon 2020 biodiversity informatics infrastructure project that is innovating in the area of data mobilisation by means of persistent unique identifiers (Penev et al. 2022).

In this contribution to spider taxonomy, we demonstrate an innovation in the mobilisation of biodiversity data. All specimen records cited herein have been assigned a digital object identifier (DOI; Table 1) that points to a digital representation of the specimen, a digital specimen, which can become a digital extended specimen by digitally linking it to relevant ecological, environmental, and related data from numerous domains (Hardisty et al. 2022). This contribution from the BiCIKL project proposes an electronic extension of a physical object archived in a natural history collection and digitized through its institutional collections database (Addink et al. 2023).

Table 1.

Digital specimen DOIs and institutional identifiers for the specimens cited. Recognied species are hyperlinked to their Catalog of Life (https://www.catalogueoflife.org/) record; our new species and the revalidated species *P. minuta* are linked to Zoobank (https://zoobank.org/) records created for them. Institutional identifiers are catalog numbers in the case of the University of Manchester collection (MMUE), and machine readable persistent identifiers (PIDs) in the case of the Naturalis collection (RMNH).

Species	Digital Specimen DOI	Institutional Identifier (Material Entity ID)
Chrysilla lauta	https://doi.org/10.3535/G0G-G7D-N5J	MMUE G7572.5441
Chrysilla lauta	https://doi.org/10.3535/PER-LNE-HEW	MMUE G7572.6430
Chrysilla lauta	https://doi.org/10.3535/HS2-8W8-F23	MMUE G7572.6440
Chrysilla lauta	https://doi.org/10.3535/SGZ-EFZ-VRK	CM 19182
Chrysilla volupe	https://doi.org/10.3535/67X-9R9-YCM	MMUE 7572.6434
Chrysilla volupe	https://doi.org/10.3535/6H9-R1R-330	https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18249
Chrysilla volupe	https://doi.org/10.3535/WL8-0R1-42B	https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18259
Chrysilla deelemani	https://doi.org/10.3535/VYQ-YW1-AGE	https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18264
Chrysilla deelemani	https://doi.org/10.3535/Z2J-WMP-FDH	https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18265
Phintelloides flavumi	https://doi.org/10.3535/B59-03B-FWV	https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18250
Phintelloides jesudasi	https://doi.org/10.3535/SVV-BR5-KGE	https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18258
Phintelloides scandens, sp. nov.	https://doi.org/10.3535/5SG-PLB-MHT	https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18251
Phintelloides scandens, sp. nov.	https://doi.org/10.3535/85R-G3E-4M0	https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18252
Phintelloides scandens, sp. nov.		https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18253

Phintelloides scandens, sp. nov.		https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18254
Phintelloides scandens, sp. nov.		https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18255
Phintelloides scandens, sp. nov.		https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18256
Phintelloides scandens, sp. nov.		https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18257
Phintelloides versicolor	https://doi.org/10.3535/C69-M7K-VWC	CM 21848
Phintelloides versicolor	https://doi.org/10.3535/3NW-1BX-8BK	MMUE G7572.6413
Phintelloides versicolor	https://doi.org/10.3535/M42-Z4P-DRD	https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18260
Phintelloides versicolor	https://doi.org/10.3535/5MR-J6N-26M	https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18261
Phintelloides versicolor	https://doi.org/10.3535/Q6C-91C-BS5	https://data.biodiversitydata.nl/naturalis/specimen/RMNH.ARA.18262
Phintelloides munita, revalidated	https://doi.org/10.3535/MDR-6FG-49E	MMUE G7572.6412

The digital specimen is a mutable and versioned FAIR Digital Object (FDO) that is machine actionable through inclusion of a data type definition, a machine readable description of its data structure and allowed operations which is included in the metadata of the DOI record. Machine actionablilty allows systems to act upon the data by for example adding annotations with new information. Digital Specimen DOIs include, in contrast with most other DOIs, more metadata in the DOI record than only the URL to which it should redirect. This can be seen by specifying the noredirect parameter with the DOI, a feature of the Handle system on which DOIs are build, for example: https://doi.org/10.3535/1CE-SXA-2BC?noredirect. This allows the retrieval of some metadata describing the object without having to retrieve the full data object. It allows machines to quickly navigate billions of objects but can also be used in applications to provide a user with extra information about the object referenced by a DOI before going to its HTML landingpage, like the type of specimen, its name or its catalog number. Also, these DOIs implement multiple redirects (another feature of the Handle system): one for machines pointing to a JSON version of the data and one for humans pointing to a HTML landingpage. This can be further extended with for example a redirect directly to the bit-sequence of the object, which is useful for specimen images. In other words: a machine can decide to either retrieve the full digital media object including metadata and annotations, or directly retrieve the binary image file. The first digital specimen DOIs in

existence have been created for this publication through DataCite by making use of FDO infrastructure developed by DiSSCo.

Another innovation we demonstrate in this publication is the use of nanopublications, which are supported by the Pensoft Arpha journal system. A nanopublication is a scientifically meaningful assertion about something, that can be uniquely identified and attributed to its author, its original source (provenance) and citation record (publication info). A nanopublication can directly link a scientific paper to the specimens it discusses together with provenance information, like: "This digital specimen DOI is discussed in this article DOI, published on [date] by [author]". This makes it very easy to digitally track which specimens are cited in which publication and by whom.

In addition, all human agents associated with these specimens (for example, collectors) have been linked through a machine readable persistent unique identifier (Table 2). Where possible, we found existing identifiers such as ORCiD or Wikidata. Where no such pre-existing identifier could be found, we created records in Wikidata.

Table 2.

Wikidata identifiers for collectors and other human agents cited in the specimen data.

Name string	Full Name	Wikidata QID
F. Murphy	Frances Murphy	Q22111840
J. A. Murphy	John A. Murphy	Q22113060
P. R. Deeleman	Paul Robert Deeleman	Q60057036
C. L. Deeleman	Christa Deeleman-Reinhold	Q2964921
A. Floren	Andreas Floren	Q23068668
P. Schwendinger	Peter Schwendinger	Q7174897
W. Corley	Wendy Corley	Q125189589
S. Djojosudharmo	Suharto Djojosudharmo	Q125189757

Taken together, the use of machine readable persistent unique identifiers, constructed according to FAIR principles to facilitate the widest possible exchange of data, facilitate the linking of biodiversity data elements that are both logical and flexible. Biodiversity data are a challenge for several reasons, but they include both magnitude (occurrence records for all species across space and time), and the multiple forms of physical objects and electronic data that contribute to this sphere of knowledge. In an era of biodiversity crisis, the importance of an effective infrastructure to facilitate the storage and recall of these data and linked objects is coming into clear focus.

Taxon treatments

Chrysilla Thorell, 1887

- Catalogue of Life https://www.checklistbank.org/dataset/288943/taxon/62LN8

Nomenclature

World Spider Catalog: urn:lsid:nmbe.ch:spidergen:02890

Chrysilla Thorell, 1887 - Thorell 1887

Type species

Chrysilla lauta Thorell, 1887 - Thorell 1887 [378].

Description

Middle-sized (body length 3.2–7.2 mm) unidentate, sexually dimorphic spiders. Carapace profile sloping down directly behind the eyes in a straight line. Chelicerae in males simple, elongated and sometimes divergent, in females parallel. In males, leg I dark and longer than the others, other legs pale, in females all legs pale and leg I proportional; both sexes with some black rings on leg IV. Spination of legs: femur I-IV with 1-1-1d, tibia I and II with 2-2-2 v or 2–2-2-1 v, metatarsus I and II with 2-2 v in both sexes; in *C. lauta* ventral spines on tibia I and II very strong, in other *Chrysilla species* front legs usually not so strongly armed. Abdomen in males about 1½ – 2 times longer than carapace, in female shorter and more rounded. The dorsal pattern is variable between species.

Diagnosis

Chrysilla can be distinguished from other chrysillines by the following set of characters: **1)** – body colour: live specimens are conspicuously coloured in patterns of white, black, red, iridescent blue or green; in specimens kept in alcohol, the red colour rapidly disappears. Similar colours are also found in *Siler* Simon, 1889; **2)** – clypeus: *Chrysilla lauta* Thorell, 1887, *C. volupe* (Karsch, 1879), *C. deelemani* Prószyński & Deeleman-Reinhold, 2010, and *Proszynskia* Kanesharatnam & Benjamin, 2019 lack a bunch of long white setae and have only dark metallic scales on the clypeus (in life), whereas a white bunch on the clypeus is characteristic for *Phintelloides.* However, the description of *Chrysilla acerosa* Wang & Zhang, 2012 is provided with numerous colour photos, one of which clearly shows bundles of white flattened setae in front of the AME; **3)** – thorax margins: in *Chrysill*a and *Siler semiglaucus,* both sexes have the thorax sides lined by a narrow strip of iridescent scales (Kanesharatnam and Benjamin 2019, fig. 21A; Yamasaki et al. 2018, fig. 11), whereas *Phintelloides* and *Phintella* have a wide band of white flattened setae along the margin of the thorax in both sexes; **4)** – abdomen: in all known *Chrysilla* species, males have a long, cylindrical abdomen, about three times longer than wide and

clearly narrower than the carapace, sometimes with a dorsal scutum covered with colourful iridescent scales. In the field, the species can be recognized by their colour pattern. In females, the abdomen is notably shorter. By contrast, the male abdomen in *Phintella* and *Phintelloides* is shorter and more rounded, occasionally with something like a scutum; **5)** – cymbium length: in *Chrysilla* and *Phintelloides* the slender palp has a long cymbium cap (cc) with parallel sides, measuring more than half the bulbus length. This contrasts with *Phintella*, which has a cc of less than half the bulbus length, and *Siler*, which has a short cc that protrudes only barely beyond the tip of the embolus; **6)** – embolus: in *Chrysilla* the embolus proper (ep) is thin and filiform as in *Phintelloides*; in *Phintella* and *Proszynskia* the ep is short and sclerotized, rigid and conical or acuminate, never filiform; in *Siler* the embolus is conical; **7)** – embolar tegular branch (etb) is present in males of *Chrysilla* and in *Phintelloides scandens* and most probably also in the *Phintelloides* species from India and Sri Lanka; it is long, slender and flexible; the tegulum is like a fingerless glove with movable thumb; in *Phintella*, *Proszynskia* and *Siler*, the etb is absent, the embolus-bearing part not separate, the tegulum is rigid like a trowel **8)** – tegular lobe (pl) and tegular bump: in *Chrysilla* and *Phintelloides* the lobe is broad and rounded (Fig. 1), or shallow as in *P. scandens* (Fig. 14a, b, c, d, e); in *Phintella* and *Siler* it is triangular/funnel-shaped; in *Proszynkia* it is expanded and broadly rounded; all species have a bump on the tegulum, traditionally present in all chrysillines, usually in the middle or in the proximal half of the tegulum; **9)** – palpal colour: in *Chrysilla*, palp segments are contrasting, with different segments exhibiting different combinations of dark and white. The dark segments look iridescent blue or black in photos of live specimens; this seems to be a reliable character for species identification. In *Phintella* and *Phintelloide*s, palps are uniformly coloured, or all pale with dark cymbium; in *Siler semiglaucus* specimens, the femur, patella and tibia have various shades of buff or grey (in life probably blue or green), the cymbium is pure white as in *Chrysilla*; **10)** – epigynal structure: *Chrysilla* and *Phintelloides* have a similar structure, deviating from all related genera: the lateral copulatory opening is vaguely defined (except in *C. deelemani*), the entrance section to the copulatory ducts is a large atrium, usually funnel-shaped like an opened birds beak, leading through a conspicuous, U-turn section with swollen parietal walls (bnc) (not swollen in *C. deelemani* and *C. scandens*) in transition to the vertical section of the copulatory ducts (cd) which are tubular and rigid. In *Phintella*, the copulatory opening is normally marked with a rigid ring, usually but not always positioned anteriorly (Kanesharatnam and Benjamin 2019: figs 33F, 36C). In *Chrysilla*, the middle, U-shaped section is often described as a birds' neck (bnc), with a beak (atrium); spermathecae are situated near the posterior edge of the epigyne, they are round or reniform as in *Phintella* and relatively small; in *Phintella* the ducts are straight or curved and of various lengths; in *Siler* the copulatory opening is hidden in an anterior hood, the copulatory ducts are very short. The posterior epigynal margin is chitinized and provided with a pair of shallow pockets in most chrysilline genera.

Distribution

Seven *Chrysilla* species have been recorded from South and Southeast Asia with specimen records from the following countries: Sri Lanka, India, Pakistan, Nepal, Bhutan, Myanmar, Thailand, Vietnam, Malaysia, Singapore, Taiwan, Indonesia and southwest China. In addition, two species are recorded from tropical Africa, and one from Australia.

Taxon discussion

Chrysilla species are sexually dimorphic, and preserved specimens appear substantially different compared to living animals. This led to much confusion about the identity of the genus. It was more than a century after the first description of *Chrysilla* that males and females were associated (Caleb et al. 2018, Wang and Zhang 2012). Live animals of the different sexes exhibit different patterns and colours in both carapace and abdomen (Fig. 2; Caleb et al. 2018, Koh et al. 2022, Wang and Zhang 2012). Ten species are currently catalogued (World Spider Catalog 2024); with the description herein of the previously unknown female of *C. deelemani* Prószyński & Deeleman-Reinhold, 2010, five *Chrysilla* species are known from only one sex. *Chrysilla doriae* Thorell, 1890 (male, Sumatra), has a palp which is typical for *Phintella* species and the species probably is a synonym (CDR personal observation of holotype). The holotype of *Chrysilla delicata* Thorell 1892 (female, Sumatra; not Myanmar, contra World Spider Catalog 2024) was very recognisably illustrated (Prószyński 1984: 69), together with the palp of a syntopic male "*Icius glaucochira* Thorell, 1890." Later, the male *Phintella conradi* Prószyński and Deeleman-Reinhold 2012 was described from another (but likely conspecific) male specimen from Sumatra. Recently, Kanesharatnam and Benjamin (2019) established *Chrysilla jesudasi* Caleb & Mathai, 2014 as the type species of the new genus *Phintelloides*.

Chrysilla in many ways resembles and has been repeatedly confused with *Phintella* Strand, 1906 (Żabka 1985). A series of phylogenetic analyses of chrysilline salticids found *Phintella* and *Phintelloides* to be closely related, possibly in a clade with *Proszynskia* and *Icius*; *Chrysilla* is somewhat distantly related from these genera, and more closely related to *Siler* (Kanesharatnam and Benjamin 2019). Conflict within the Kanesharatnam and Benjamin (2019) study derives from analytical permutations of morphological and DNA sequence data under parsimony and likelihood optimality criteria. The absence of conspicuous bright colours makes species of *Phintelloides* look superficially like *Phintella* species. Nevertheless, the morphological and functional copulatory characters are substantially similar in *Chrysilla* and *Phintelloides*, and distinct from those in genera such as *Phintella* and *Proszynskia.*

Our diagnosis can be expressed in simple words: genus *Chrysilla* and *Phintelloides* share their reproductive engine (copulatory organs) but are enveloped in a different coat; black, white and yellow setae in *Phintelloides*, red body colour in life and iridescent scales with black and white in *Chrysilla*. Involving more chrysilline genera: the “*Chrysilla* coat” is more widespread and also is characteristic for other chrysilline

genera, such as *Siler*, *Cosmophasis* and *Orsima*, whereas the specialised "*Chrysilla* engine" is shared between *Chrysilla* and *Phintelloides*, but remarkably is also present in the genus *Bristowia,* a genus Maddison (2015) provisionally placed in the *Hasariini* .

Chrysilla lauta Thorell, 1887

- Catalogue of Life https://www.checklistbank.org/dataset/288943/taxon/5YKJJ

Nomenclature

World Spider Catalog: urn:lsid:nmbe.ch:spidersp:032753

Chrysilla lauta Thorell, 1887 - Thorell 1887: 378 (spider catalogue of Roewer 1955 erroneously cites p. 387) (m), type locality: Bhamo, Myanmar; Prószyński 1976: 154, fig. 237 (m); Prószyński 1983a: 44, figs 4-6 (m); Żabka 1985: 210, figs 81-82 (m) Vietnam (synonymy with *Cosmophasis longiventris*); Koh 1989: 103 (m, photo) Singapore; Song and Chai 1991: 14, fig. 2 (m) Hainan; Song et al. 1999: 507, fig. 290N-O (m) Hainan, Myanmar, Vietnam; *Prószyński and Deeleman-Reinhold 2010*: figs 36-37 (m); Koh and Ming 2013: 180 (m, photo); Prószyński 2018: fig. 5G (m); Yamasaki et al. 2018: 27, figs 2-24 (mf) Taiwan; Kanesharatnam and Benjamin 2019: 46, figs. 19A-E, 20A, B (mf) Sri Lanka; Koh and Bay 2019: 216 (m, photo); Peng 2020: 75 fig. 35a-b (m); Koh et al. 2022: 347 (mf) Singapore.

Cosmophasis longiventris Simon, 1903 - Simon 1903a: 732 (m) Sri Lanka (Ceylon), Philippines.

Materials

a. scientificName: *Chrysilla lauta*; country: Singapore; locality: Kent Ridge; verbatimCoordinates: 1°17'N 103°47'E; decimalLatitude: 1.2833333333333; decimalLongitude: 103.78333333333; eventDate: 1986-07-06; habitat: garden; individualCount: 1; sex: male; lifeStage: adult; catalogNumber: MMUE G7572.5441; occurrenceRemarks: labeled "blue and red"; recordedBy: F. & J. A. Murphy; otherCatalogNumbers: https://doi.org/10.3535/G0G-G7D-N5J; institutionID: https://ror.org/027m9bs27; institutionCode: MMUE; basisOfRecord: PreservedSpecimen; occurrenceID: 52F7782C-1297-59F2-95B3-032DD4842E7A

b. scientificName: *Chrysilla lauta*; country: Singapore; locality: Pulau Ubin; verbatimCoordinates: 1°25'N 103°57'E; decimalLatitude: 1.4166666666667; decimalLongitude: 103.95; eventDate: 1991-01-27; habitat: roadside; individualCount: 1; sex: male; lifeStage: adult; catalogNumber: MMUE G7572.6430; recordNumber: DSC 6285-6591; recordedBy: F. & J. A. Murphy; otherCatalogNumbers: https://doi.org/10.3535/PER-LNE-HEW; institutionID: https://ror.org/027m9bs27; institutionCode: MMUE; basisOfRecord: PreservedSpecimen; occurrenceID: EA93CB0B-5889-5F48-A7F4-8DF6D466C5A9

c. scientificName: *Chrysilla lauta*; country: Malaysia; stateProvince: Selangor; locality: Banting; verbatimElevation: 100 m; verbatimCoordinates: 2°48'04"N 101°30'46"E; decimalLatitude: 2.8011111111111; decimalLongitude: 101.51277777778; eventDate: 1982-12-17; individualCount: 1; sex: male; lifeStage: adult; catalogNumber: MMUE

G7572.6440; recordNumber: DSC 3727-36; recordedBy: F. & J. A. Murphy; otherCatalogNumbers: https://doi.org/10.3535/HS2-8W8-F23; institutionID: https://ror.org/027m9bs27; institutionCode: MMUE; basisOfRecord: PreservedSpecimen; occurrenceID: 5C4F929A-3E03-5EE2-8D8A-513EBF473EA3

d. scientificName: *Chrysilla lauta*; country: Malaysia; stateProvince: Pahang; locality: Genting; verbatimCoordinates: 3°24'N 101°46'E; decimalLatitude: 3.4; decimalLongitude: 101.76666666667; eventDate: 1990-12-08; individualCount: 1; sex: female; lifeStage: adult; recordNumber: CM 19182; recordedBy: F. & J. A. Murphy; otherCatalogNumbers: https://doi.org/10.3535/SGZ-EFZ-VRK; institutionID: https://ror.org/027m9bs27; institutionCode: MMUE; basisOfRecord: PreservedSpecimen; occurrenceID: 8DF23168-B93F-546A-AE23-EF2321DE0C54

Description

Male. Total length from Singapore 7.1 mm and 4.2 mm, from Banting 4.3 mm. For differences with *C. volupe*, see under that species. Colouring of carapace, abdomen and palps see chapter "coloration in various chrysilline species". Carapace with all red areas in live specimens bare and lacking setae and scales, remains of small iridescent particles visible on the anterior transverse bars. Chelicerae slanting, divergent in the large male, parallel in both smaller males (Fig. 3b). Legs I longest, dark with white contrasting band apically on tibia, other legs pale, femur I dorsally with some long thin white setae in alcohol, violet in life, leg IV with some dark rings. Abdomen long, thin and shiny and gradually tapering. In all 3 available males, dorsum black and shiny, central band with round iridescent scales uninterrupted all through, at 2/3 of the length with a bell-shaped area with small round white iridescent scales; sides with a pair of narrow strips bearing small round green reflecting scales; venter pale brown, a median pale band bordered by a pair of dark bands. Coxae dorsally with white flattened setae. Palps (Fig. 1), tibia and cymbium pale, strongly contrasting with dark femur and patella (blue in life). Proximal part of tegulum with ventral bulge (Fig. 1a: tb) and a tegular bump (Fig. 1a: tbu) as in *C. volupe*. Embolar tegular branch (Fig. 1a: etb) narrow and elongate, flexible, proximally articulating at basal, hidden part of tegulum (cf. Fig. 1c: beb), partly running alongside tegulum and projecting distally beyond retrolateral part of tegulum containing the sperm duct loop over distance p (Fig. 1a: p); embolus filiform, slightly flexed at base, length same as p.

Measurements (Singapore: Kent Ridge). Body length 7.10. Carapace 2.70 long, 1.80 wide, 1.15 high. Abdomen 4.30 long, 1.20 wide. Leg I 7.70 (2.50 [0.70 wide] – 1.10 – 1.90 – 1.50 – 0.70), leg II 5.20 (1.60 [0.45 wide] – 0.80 – 1.20 – 1.00 – 0.60) leg III 5.00 (1.50 – 0.70 – 1.00 – 1.30 – 0.50) leg IV 6.60 (1.80– 0.70 – 1.60 – 1.70 – 0.80). Palp 0.9 – 0.5 – 0.5 – 0.7 width cymbium 0.3.

Female (Genting). Colour photos of live females (Yamasaki et al. 2018: fig. 16, Koh et al. 2022: 347) show parts of carapace covered with white setae and abdomen with pattern of red, white, black and iridescent greenish spots with considerable variation between specimens. In the only female specimen available to us (Fig. 3c), iridescent scales as seen on carapace of males are lacking and green colour is lost. Chelicerae with parallel sides, promargin with one distal tooth, retromargin with two distal teeth.

Legs all pale. Abdomen with few iridescent scales suggesting a vague dorsal pattern, lateral patch consisting of reddish procumbent hair, posteriorly a pattern of dark areas covered with simple black setae as in males, these are visible in several reversed V-arranged bars on posterior half of abdomen; venter as in males. Epigyne similar to that in *Phintelloides jesudasi*, except spermathecae not touching and halfway twist in copulatory ducts as in *P. jesudasi,* absent in *C. lauta*.

Measurements. Body length 5.0. Carapace 1.90 long, 1.30 wide, 0.95 high. Abdomen 3.00 long, 2.00 wide, 0.80 high. Measurements of legs: I 4.05 [1.40 (0.40 wide]– 0.60 – 1,00 - 0.65 – 0.40) leg II 3.00 (1.00 [0.30 wide]– 0.50 – 0.70 – 0.50 -0.30), leg III 3.30 (0.90 – 0.50 – 0.70 – 0.50 – 0.70) leg IV 4.20 (1.20 – 0.50 – 1.00 – 0.90– 0.60).

Distribution

The species has been cited from Myanmar, Vietnam, Singapore, Thailand, Borneo, Taiwan, China and Sri Lanka (Fig. 6). The type locality Bhamo, Myanmar is situated close to the western border of southern Yunnan in a large mountain massive/complex across the Burmese - Chinese border, about 60 km from the Xishuangbanna tropical Botanical garden. This area has been extensively explored for spiders in the first decade of the 21th century in primary and various kinds of disturbed forest. Unfortunately, no *Chrysilla* species have been reported from that project.

Ecology

In forests and gardens, usually by beating/sweeping shrub and trees, from lowland up to 600 m.

Notes

The contrasting colouring of the male palps: dark femur and patella, pale tibia and cymbium was already mentioned by Thorell, 1887 in the description of the type specimen from Bhamo in northeastern Myanmar. It is consistently present in the material studied for the present paper.

Chrysilla volupe (Karsch, 1879)

- Catalogue of Life https://www.checklistbank.org/dataset/288943/taxon/5YKJD

Nomenclature

World Spider Catalog: urn:lsid:nmbe.ch:spidersp:035559

Attus volupe Karsch, 1879 - Karsch 1879: 552 (m) Sri Lanka (Ceylon).

Chrysilla sp. - Prószyński 1984: 19 (m) Bhutan (according to Żabka 1988: 465).

Siler semiglaucus (Simon, 1901) - Prószyński 1985: 73, figs 16-17 (f, misidentified according to Caleb et al. 2018: 144) Sri Lanka (Ceylon).

Phintella volupe (Karsch, 1879) - Żabka 1988: 465, figs 122-125 (m); Caleb and Mathai 2014: 64, figs 15-23 (m) India.

Chrysilla volupe (Karsch, 1879) - Caleb 2016: 271, India; Thumar and Dholakia 2018: 2, figs 1-6 (m) India; Caleb et al. 2018: 144, figs 1-25 (mf) India; Kanesharatnam and Benjamin 2019: 49, figs 20C-F, 21A-E, 22A-D (mf) Sri Lanka; Magar et al. 2020: 4, figs 4-6 (mf) Nepal.

Materials

a. scientificName: *Chrysilla volupe*; country: Sri Lanka; locality: Peradeniya, Leersia; verbatimElevation: 500 m; verbatimCoordinates: 7°16'01"N 80°35'44"E; decimalLatitude: 7.2669444444444; decimalLongitude: 80.595555555556; eventDate: 1986-11-25; individualCount: 1; sex: male; lifeStage: adult; catalogNumber: MMUE 7572.6434; recordNumber: CM 15916; recordedBy: F. & J. A. Murphy; otherCatalogNumbers: https://doi.org/10.3535/67X-9R9-YCM; institutionID: https://ror.org/027m9bs27; institutionCode: MMUE; basisOfRecord: PreservedSpecimen; occurrenceID: 01C98BCA-9D5C-5E2A-B63A-6417E1E0562B

b. scientificName: *Chrysilla volupe*; country: Sri Lanka; locality: Kataragama Peak (Tissamaharama); verbatimCoordinates: 6°23'35"N 81°20'17"E; decimalLatitude: 26.393055555556; decimalLongitude: 81.338055555556; eventDate: 1981-08-18; habitat: dry bush litter; individualCount: 1; sex: male; lifeStage: adult; catalogNumber: RMNH.ARA.18249; recordedBy: P. R. & C. L. Deeleman; otherCatalogNumbers: https://doi.org/10.3535/6H9-R1R-330; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: 1F561749-E7FA-5747-AA7A-FF9401CC24C8

c. scientificName: *Chrysilla volupe*; country: Sri Lanka; locality: Kataragama Peak (Tissamaharama); verbatimCoordinates: 6°23'35"N 81°20'17"E; decimalLatitude: 26.393055555556; decimalLongitude: 81.338055555556; eventDate: 1981-08-18; habitat: dry bush litter; individualCount: 1; sex: female; lifeStage: adult; catalogNumber: RMNH.ARA.18259; recordedBy: P. R. & C. L. Deeleman; otherCatalogNumbers: https://doi.org/10.3535/WL8-0R1-42B; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: C37E9FA4-7FA4-59B4-BF7A-7F5A705DC44B

Description

Additions to the description of the male (Leersia). Abdomen in alcohol with middle band slightly paler than lateral areas, as in *lauta* ornamented with some gold reflecting scales and anteriorly areas with black setae; venter as in *lauta*. All legs dark, tarsi mostly light. Male palp (Fig. 7): femur, patella and tibia and basal half of cymbium brown (blue in life), distal half of cymbium white. Measurements. Body length 3.40 (smaller then described specimens from India), carapace length 1.40, width 1.00, height 0.60. Abdomen length 2.00 width 0.55. Palp femur 0.60, patella 0.20, tibia 0.15, cymbium length 0,60, width 0.20. Chelicerae not diverging. Leg I 3.70

(1.10 [width 0.35] – 0.40 – 0.80 - 1.10 – 0.30), legs II lost, leg III 2.60 (0.70 – 0.40 - 0.50 – 0.60 – 0.40), leg IV 3.30 (1.00 - 0.30 – 0.70 – 0.90 – 0.40).

Female (Tissamaharama). No abdominal pattern distinguishable in preserved specimen (Fig. 8c; Kanesharatnam and Benjamin 2019: fig 22A). Live animals with mottled black, red, and iridescent blue (Kanesharatnam and Benjamin 2019: fig 22A; Caleb et al. 2018: figs 2, 4, 6, 8, 10, 12). Copulatory ducts longer than in *C. lauta*, length 1½ x diameter of spermatheca, in anterior half running adjacent and parallel to each other (Kanesharatnam and Benjamin 2019: fig. 20E, F); in *C. lauta* ducts length not much more than 1 diameter of spermathecae and curved over whole length (Fig. 4b, c, d).

Diagnosis

This species is similar to *C. lauta*. The carapace as in *C. lauta,* the dorsal abdomen pattern is distinctive, in life with an anterior iridescent green band followed by a wide M-shaped band in red, behind which another red band with green in between, distally an iridescent black/violet tail (Fig. 2, Caleb et al. 2018: figs 1-12); this pattern may be preserved or lost in alcohol. Male palp with several features that can be used for identification. In *C. volupe* (Fig. 7)*,* the palpal tibia and basal part of cymbium are darkish, (blue in life), white in *C. lauta*; the dorsal margin of rta is more slender and smoothly curved, in *C. lauta* it is somewhat wider and dorsally slightly undulating. This latter key character agrees with drawings of a palp of the type specimen of *C. volupe* from Sri Lanka by Żabka 1988 (figs 122, 124), but not when comparing with Prószyński's palp drawing of "*Chrysilla*" sp. from Bhutan (Prószyński 1984: 19), which was interpreted as this species by Żabka 1988: 466). In female *C. lauta* all legs are uniform pale, in female *C. volupe* legs are pale with a few black rings on leg IV.

Distribution

Sri Lanka, India, Bhutan, Nepal. Caleb and Mathai 2014 (p. 64) erroneously cite Burma among the distribution records (Caleb et al. 2018). In addition, the online biodiversity monitoring community iNaturalist.org has research grade records from Bangladesh and Myanmar.

Ecology

Foliage and dry leaf litter.

Biology

Male *C. volupe* spiders have been seen moving their palps up and down continuously and waving their long thin abdomen in circles up in the air, exhibiting large white light-reflecting spots.

Chrysilla deelemani Prószyński & Deeleman-Reinhold, 2010

- Catalogue of Life https://www.checklistbank.org/dataset/288943/taxon/5YKK7

Nomenclature

World Spider Catalog: urn:lsid:nmbe.ch:spidersp:043594

Chrysilla deelemani Prószyński & Deeleman-Reinhold 2010 - Prószyński and Deeleman-Reinhold 2010: 159, figs 30-35 (m) Indonesia.

Materials

Holotype:

a. scientificName: ***Chrysilla deelemani***; island: Lesser Sunda Islands; country: Indonesia; locality: Lombok Island, Kuta; verbatimCoordinates: 8°52'S 116°17'E; decimalLatitude: -7.1333333333333; decimalLongitude: 116.28333333333; eventDate: 1990-01-08/09; habitat: secondary forest, from foliage; individualCount: 1; sex: male; lifeStage: adult; catalogNumber: RMNH.ARA.18264; recordedBy: S. Djojosudharmo; otherCatalogNumbers: https://doi.org/10.3535/VYQ-YW1-AGE; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: F26693C8-F659-5D7C-BDCB-A4CBDDEB6EEB

Other material:

a. scientificName: ***Chrysilla deelemani***; island: Lesser Sunda Islands; country: Indonesia; locality: Lombok Island, Kuta; verbatimCoordinates: 8°52'S 116°17'E; decimalLatitude: -7.1333333333333; decimalLongitude: 116.28333333333; eventDate: 1990-01-08/09; habitat: secondary forest, from foliage; individualCount: 3; sex: female; lifeStage: adult; catalogNumber: RMNH.ARA.18265; recordedBy: S. Djojosudharmo; otherCatalogNumbers: https://doi.org/10.3535/Z2J-WMP-FDH; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: FA85005B-DC87-537F-A347-F1C0ADB2F377

Description

Male. No photo exists of a live specimen. The ornamentation of the abdomen with bands and stripes of coloured scales in alcohol is basically similar as in the other *Chrysilla*. The species can be diagnosed by the long thin abdomen with dark dorsum with thin pale undulating strip in the middle, somewhat similar as in *lauta* and also present in females (Fig. 8d; Prószyński and Deeleman-Reinhold 2010: fig. 31), and the broad distally rounded tegulum. Carapace all brown, whole ocular area and rear part of thorax with small round bluish iridescent scales in both male and females, across anterior eye row and around AME a transverse band of white flattened setae and a patch of similar setae behind AME; white moustache below the AME lacking in both male and female, marginal strip on thorax thin, marked with iridescent scales. Chelicerae in male slightly diverging distally. Leg I dark, leg II – III pale, leg IV pale with dark metatarsus. Abdomen thin and elongate, shiny and dark with a brown area on sort of dorsal scutum; central dorsal band and a pair of narrow lateral strips covered with green-violet iridescent scales, as in *Chrysilla lauta*. Venter covered all

over with greenish scales. Palp white except dark base of femur, origin of ep from etb obliquely prolateral (Fig. 9a).

Female. Total lengths 3.20 - 3.40 mm. Dorsal pattern on carapace (Fig. 8d) with white flattened setae and tiny round green iridescent dots, predominantly on rear slope of thorax. Legs I-IV uniform pale. Abdomen brown with interrupted pale central band and a pair of parallel lateral strips (Fig. 8d) covered with elongate golden iridescent setae, rest of dorsum with dispersed white flattened setae; venter with short white hair. Epigyne (Fig. 9d) with slender copulatory ducts distally curved ventralwards showing copulatory openings; atrium short and wide, crescent-shaped, parallel to the anterior epigyneal margin.

Measurements. Male carapace 1.80 long, 1. 20 wide, abdomen 2.7 long, 0.95 wide. Legs lost. Palp femur 0.85, patella 0.24, tibia 0.26, cymbium 0.70, width cymbium. 0.20. Female, total body length 3.20, carapace 1.30 long, 1.0 wide, 0.6 high. Abdomen 1.5 long, 1.0 wide, epigyne 0.25 wide 0.25 high. Legs: femur I 0.8, femur II 0.7, femur III, 0.7 femur IV 0.9.

Phintelloides Kanesharatnam & Benjamin, 2019

- Catalogue of Life https://www.checklistbank.org/dataset/288943/taxon/6NMB

Nomenclature

World Spider Catalog: urn:lsid:nmbe.ch:spidergen:04527

Phintelloides Kanesharatnam & Benjamin, 2019 - Kanesharatnam and Benjamin 2019: 20.

Type species

Chrysilla jesudasi (Caleb & Mathai, 2014) - Kanesharatnam and Benjamin 2019 [20].

Diagnosis

Kanesharatnam and Benjamin 2019 (p. 22) diagnose the genus as follows: male with white tuft of flattened setae on the clypeus; white diamond-shaped mark behind the eye field; prosoma with pale yellow/white transverse band behind AME; abdomen with blackish or brownish grey, longitudinal median band bordered by pale yellow bands (or devoid of markings). In addition, they noted the presence of a comparatively long embolus in males; the apical portion of the bulbus with a lamellar process (although this is absent in some including *P. jesudasi*, *P. brunne*, and *P. scandens*, CLD); and the bird's-neck-shaped diverging curves at anterior margin of epigynum. Furthermore, *Phintelloides* have white belt markings on the lateral prosoma, the leg I slightly robust in males, and male pedipalps featuring a small posterior lobe and a long RTA with a bent tip. Females have black patches on the eye field and surrounding PME, behind PLE, and on the posterior slope of the prosoma. In

the female genitalia, CO oriented laterally outwards; CD medium-to-very long and bent or twisted; spermatheca pyriform or spherical.

We consider the above diagnosis difficult to interpret from a defining point of view. Several of the listed character states are not compared to that in related genera and some are not valid for all species. Diagnostic somatic characters for the genera involved can be found above in the diagnosis section for the genus *Chrysilla*, where different states of 10 main cognitive characters between *Chrysilla* and related genera are summarized. Here we restrict ourselves to adding a few aspects we consider useful. In female *Phintelloides* species, carapace pattern allegedly is distinctive viz. black and white pattern with 3 pairs of black eye spots (Fig. 10a, c). Indeed this character is found in females of *P. jesudasi*, *P. arborea* and *P. flavumi* but not in *P. brunne*, *P. flavoviri* or *P. orbisa,* or the species described below, *P. scandens* sp. nov. A similar pattern is also found in females of *Phintella piatensis* Barrion and Litsinger 1995, and it possible that this species fits in the genus *Phintelloides.* In males, the basal part of etb seems to be attached dorsally and is hidden underneath the tegulum; this can only be ascertained by probing the palp manually. Epigyna with a bird's neck curve (bnc) are, unlike any other salticid genus except *Chrysilla,* suggestive of a specialised copulatory system.

A "white moustache" turns up seemingly at random in various chrysilline genera and is inconvenient as a tool when identifying genera. In *Phintelloides scandens* sp. nov. males it is lacking (Fig. 15a), although females have a tuft of white setae in front of the AME (Fig. 15b).

Phintelloides versicolor and *P. munita* are morphologically at the edge of the genus because the copulatory organs deviate from all other species by the following characters: the tegulum is undivided and distally bulgy and rigid, the prolateral margin is concave in ventral view; the tegular proximal lobe (pl) is broad and round, the filiform embolus is shorter than that in all known species of *Phintelloides* and at the base curved over 90°. Females of >*versicolor* and *munita* are distinct from other related species by the pair of characteristic black curled marks on white background on the rear part of the carapace (Fig. 17b, e). Furthermore, these females are quite distinct from those of *Phintelloides* and *Phintella* by the straight copulatory ducts directed anteriorly and, the absence of the bird's-neck-shaped curves the absence of the atrium; the opening is connected to a single pair of transverse, horizontal hood-like folds running parallel to the anterior edge of the epigyne.

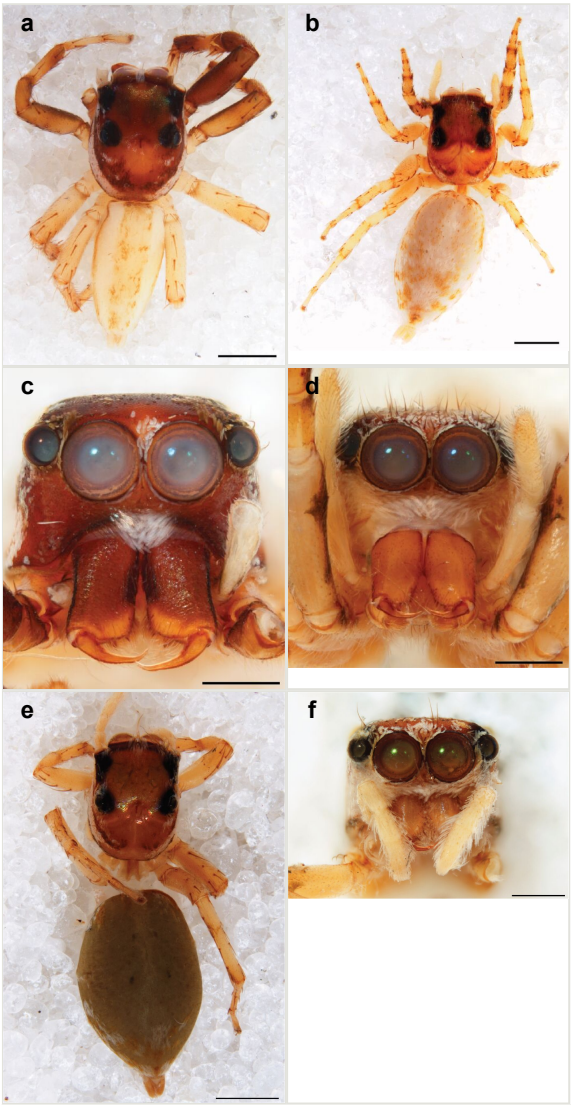

Figure 17.

Phintelloides versicolor (C. L. Koch, 1846) and *Phintelloides munita* (Bösenberg & Strand, 1906), photographs of preserved male and female specimens

a: *Phintelloides versicolor* (C. L. Koch, 1846), male habitus, dorsal view, RMNH.ARA.18261 doi

b: *Phintelloides versicolor* (C. L. Koch, 1846), female habitus, dorsal view, CM 19264 doi

c: *Phintelloides versicolor* (C. L. Koch, 1846), male face, RMNH.ARA.18261 doi

d: *Phintelloides versicolor* (C. L. Koch, 1846), female face, CM 19264 doi

e: *Phintelloides munita* (Bösenberg & Strand, 1906), female habitus, dorsal view, CM 15605 doi

f: *Phintelloides munita* (Bösenberg & Strand, 1906), female face, CM 15605 doi

Phintelloides flavumi Kanesharatnam & Benjamin, 2019

- Catalogue of Life https://www.checklistbank.org/dataset/288943/taxon/76YQL

Nomenclature

World Spider Catalog: urn:lsid:nmbe.ch:spidersp:051095

Phintelloides flavumi Kanesharatnam & Benjamin, 2019 - Kanesharatnam and Benjamin 2019: 35, figs 3, 10A-D, 14A-F, 15A-E, 16A-D (mf) Sri Lanka.

Material

a. scientificName: ***Phintelloides flavumi***; country: Sri Lanka; locality: Rathnapura; verbatimCoordinates: 6°42'N 80°23'E; decimalLatitude: 6.7; decimalLongitude: 80.383333333333; eventDate: 1981-08-22/23; habitat: forest below tennis club; individualCount: 1; sex: female; lifeStage: adult; catalogNumber: RMNH.ARA.18250; recordedBy: P. R. & C. L. Deeleman; otherCatalogNumbers: https://doi.org/10.3535/B59-03B-FWV; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: 3E2FBFE3-4F1C-54E0-AC09-B662B82EFF44

Description

Additions to the description. Female. The total length of our female is similar to that given for the type specimen, however the legs in our specimen are 50% shorter than the legs measured in the type specimen; the posterior legs are longer than the anterior legs unlike the type material. The underside of the abdomen has small iridescent scales, like *scandens*. Fig. 11a, c shows the vulva, cleared in clove oil, viewed from ventral and ventrolateral. The bird's neck-shaped curve tilts in ventral direction. The funnel-shaped openings (Fig. 11c) are the atrium (a), the copulatory opening is at the bottom of the funnel. As in *Chrysilla*. the atrium is delineated by an upper and a lower projection of the duct wall suggesting an opened birds' beak. In male *P. flavumi*, according the description the embolar tegular branch is shorter than the adjacent tegulum; this would agree with the concept that during copulation, the bird's beak (the atrium) lodges the tip of the etb and swallows the embolus through the copulatory opening whereas the more anteriorly situated cavity on the inner birds' neck curve (Fig. 11d: ibc) is spatially correctly situated to receive the tegular tip and at the same time fix the base on the posterior pocket (see sketch of *P. scandens*, Fig. 1c). Measurements. Total length 4.50, Carapace 2.0 long, 1.65 wide, 1.00 high. Abdomen 2.50 long. Legs: I 3.75 (1.15– 0.65 – 0.85 - 0.60 – 0.50), leg II 3.70 (1.15– 0.60 – 0.90 – 0.55 -0.50), leg III 4.30 (1.40 – 0.60 – 0.90 – 1.00 – 0.40), Leg IV 4.30 (1.50 – 0.55 – 0.85 – 0.90 – 0.50), palp 0.70 – 0.60 – 0.30 - 0.35. Epigyne 0.25 wide, 0.30 long.

Phintelloides jesudasi (Caleb & Mathai, 2014)

- Catalogue of Life https://www.checklistbank.org/dataset/288943/taxon/76Z2L

Nomenclature

World Spider Catalog: urn:lsid:nmbe.ch:spidersp:047200

Chrysilla jesudasi Caleb & Mathai, 2014 - Caleb and Mathai 2014: 63, figs 1-14 (mf) India.

Phintelloides jesudasi (Caleb & Mathai, 2014) - Kanesharatnam and Benjamin 2019: 41, figs 3, 6E-H, 17A-E, 18A-D (mf) Sri Lanka; Caleb 2020: 15739, figs 17E-G, 29B (mf) India.

Material

a. scientificName: ***Phintelloides jesudasi***; country: Sri Lanka; locality: Tissamaharama, Kataragama Peak; verbatimCoordinates: 6°42'N 80°23'E; decimalLatitude: 6.3930555555556; decimalLongitude: 81.338055555556; eventDate: 1981-08-18; habitat: dry bush litter; individualCount: 1; sex: female; lifeStage: adult; catalogNumber: RMNH.ARA.18258; recordedBy: P. R. & C. L. Deeleman; otherCatalogNumbers: https://doi.org/10.3535/SVV-BR5-KGE; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: EB5E12DA-2878-544A-BE8C-3B5C783FD0CE

Taxon discussion

Originally described by Caleb and Mathai (2014) as a species of *Chrysilla*, Kanesharatnam and Benjamin (2019) established the genus *Phintelloides* for this and a few simliar species with *jesudasi* as the type species. Phylogenetic analysis based on both morphological and molecular data generally supported the monophyly of this group, with the exception that *Phintelloides versicolor* did not always cluster with the rest of the genus (see treatment of *Phintelloides versicolor*).

Phintelloides scandens Deeleman-Reinhold, Addink & Miller, sp. nov.

- ZooBank urn:lsid:zoobank.org:act:34E30429-650A-413C-A6B3-6313C14C5F5B

Materials

Holotype:

a. scientificName: ***Phintelloides scandens***; island: Borneo; country: Malaysia; stateProvince: Sabah; locality: Mt. Kinabalu N. P., Sorinsim; verbatimElevation: 500-700 m; verbatimCoordinates: 6°5'N 116°50'E; decimalLatitude: 6.0833333333333; decimalLongitude: 116.83333333333; samplingProtocol: fogging canopy Vitex pinnata (Verbenacae); eventDate: 1997-03-05/14; habitat: 40 year old secondary forest; fieldNotes: (Loc 57); individualCount: 1; sex: male; lifeStage: adult; catalogNumber: RMNH.ARA.18251; recordedBy: A. Floren; otherCatalogNumbers: https://doi.org/

10.3535/5SG-PLB-MHT; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: CE2C0B1A-7A8D-5384-9A1F-59AC87EE29EA

Paratypes:

a. scientificName: ***Phintelloides scandens***; island: Borneo; country: Malaysia; stateProvince: Sabah; locality: Mt. Kinabalu N. P., Sorinsim; verbatimElevation: 500-700 m; verbatimCoordinates: 6°5'N 116°50'E; decimalLatitude: 6.0833333333333; decimalLongitude: 116.83333333333; samplingProtocol: canopy fogging tree 8 Vitex pinnata (Verb.); eventDate: 1997-03-10; habitat: 15 year old secondary forest; fieldNotes: (Loc 46), refog 1 after 8 days; individualCount: 1; sex: female; lifeStage: adult; catalogNumber: RMNH.ARA.18252; recordedBy: A. Floren; otherCatalogNumbers: https://doi.org/10.3535/85R-G3E-4M0; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: 2177F899-9F22-50D9-867C-50C57D8C6544

b. scientificName: ***Phintelloides scandens***; island: Borneo; country: Malaysia; stateProvince: Sabah; locality: Mt. Kinabalu N. P., Sorinsim; verbatimElevation: 500-700 m; verbatimCoordinates: 6°5'N 116°50'E; decimalLatitude: 6.0833333333333; decimalLongitude: 116.83333333333; samplingProtocol: canopy fogging Vitex pinnata (Verb.); eventDate: 1997-02-26; habitat: 15 year old secondary forest; fieldNotes: (Loc 38, tree code Vp267); individualCount: 1; sex: female; lifeStage: adult; catalogNumber: RMNH.ARA.18253; recordedBy: A. Floren; otherCatalogNumbers: https://doi.org/10.3535/7WH-VHP-M1K; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: 1128E2B4-04D3-55A3-BB15-62B1C402FEA2

Other materials:

a. scientificName: ***Phintelloides scandens***; island: Borneo; country: Malaysia; stateProvince: Sabah; locality: Crocker Range, near Keningau; verbatimCoordinates: 5°26'N 116°08'E; decimalLatitude: 5.4333333333333; decimalLongitude: 116.13333333333; samplingProtocol: fogging canopy Melanopis (Euphorbiaceae); eventDate: 2001-02-19; habitat: 10 year old isolated secondary forest; fieldNotes: (CRI.9, tree code Me305, DSC 2286-88); individualCount: 1; sex: male; lifeStage: adult; catalogNumber: RMNH.ARA.18254; recordedBy: A. Floren; otherCatalogNumbers: https://doi.org/10.3535/1CE-SXA-2BC; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: 59A912D4-409B-50F8-B622-3F4579A0536F

b. scientificName: ***Phintelloides scandens***; island: Borneo; country: Malaysia; stateProvince: Sabah; locality: Crocker Range, near Keningau; verbatimCoordinates: 5°26'N 116°08'E; decimalLatitude: 5.4333333333333; decimalLongitude: 116.13333333333; samplingProtocol: fogging canopy Melanopis (Euphorbiaceae); eventDate: 2001-02-18; habitat: 20 year old isolated secondary forest; fieldNotes: (CRII.4, tree code Me310); individualCount: 1; sex: male; lifeStage: adult; catalogNumber: RMNH.ARA.18255; recordedBy: A. Floren; otherCatalogNumbers: https://doi.org/10.3535/0RA-FVV-2DL; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: 2E93698A-6195-532B-B995-C54B919B114F

c. scientificName: ***Phintelloides scandens***; island: Borneo; country: Malaysia; stateProvince: Sabah; locality: Crocker Range, near Keningau; verbatimCoordinates: 5°26'N 116°08'E; decimalLatitude: 5.4333333333333; decimalLongitude: 116.13333333333; samplingProtocol: fogging canopy Melanopis (Euphorbiaceae); eventDate: 2001-02-18; habitat: 20 year old isolated secondary forest; fieldNotes: (CR II.3, DSC 1142-52, tree

code Me309); individualCount: 1; sex: male; lifeStage: adult; catalogNumber: RMNH.ARA.18256; recordedBy: A. Floren; otherCatalogNumbers: https://doi.org/10.3535/SZV-FJV-MRM; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: EDE8AAB1-77E1-5BC6-914F-ACBAF994BA57

d. scientificName: *Phintelloides scandens*; island: Borneo; country: Malaysia; stateProvince: Sabah; locality: Crocker Range, near Keningau; verbatimCoordinates: 5°26'N 116°08'E; decimalLatitude: 5.4333333333333; decimalLongitude: 116.13333333333; samplingProtocol: fogging canopy Melanopis (Euphorbiaceae); eventDate: 2001-02-18; habitat: 20 year old isolated secondary forest; fieldNotes: (CRII.5, DSC 1178-1185, treecode Me311); individualCount: 1; sex: female; lifeStage: adult; catalogNumber: RMNH.ARA.18257; recordedBy: A. Floren; otherCatalogNumbers: https://doi.org/10.3535/FEE-JQY-GA4; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: 768B340C-2DCC-5A68-928E-685939849112

Description

MALE. Total length males 4.30 - 5.40 mm. Holotype*:* carapace dark brown with white tuft between and behind AME eyes and black protruding setae hooding AM eyes (Fig. 15a), area between and behind PME and between AME and ALE covered with short white setae, intermitted with protruding brown setae; in posterior half of thorax centre a pale narrow longitudinal stripe (Fig. 12a) instead of a diamond-shaped white area in other known species. Posterior margin of thorax with appressed black setae, opposite front edge of abdomen bearing brushes of dark erect hair in the middle, white on sides as in females (Fig. 12a, c), reduced or lost in some specimens. Chelicerae long, divergent (Fig. 12b), medially slanting. Maxillae distally widened with angular tip and a toothlike sub-tip. Leg I with dark femur, tibia and metatarsus dark with one or more pale rings; legs II-IV pale with narrow dark rings around the joints and femora with prolateral dark lengthwise stripes, tibia I and II with 2 pairs of ventral spines, metatarsi I and II with one pair at base (Fig. 12a). Abdomen gradually tapering, dorsally with wide buff coloured central band (colour in live specimens unknown), covered with very small scales, on either side a wide lateral band covered with white scales (Fig. 12a); venter covered with big round to triangular buff to brown scales and flanked by a pale area with some sparce very small iridescent scales (Fig. 12b). Pedipalp with base of palpal femur dark, rest light, patella and tibia white, cymbium dorsally dark except base and tip (Fig. 14b). Tip of etb extends slightly beyond tip of sperm duct loop (Fig. 14a, c). Embolus relatively short (e.g., compared to *P. jesudasi, Kanesharatnam and Benjamin 2019*: fig. 18A).

Measurements. Total length 4.80. Carapace 2.20 long, 1.50 wide, 1.10 high, chelicerae 0.8 long, abdomen 2.50 long, 1.10 wide. Legs: I 4.90 (1.50 long [0.40 wide] – 0.70 – 1.20 – 0.90 – 0.60, leg II 3.80 (1.10 [0.30 wide] – 0.50 – 0.80 – 1.00 – 0.40) leg III 4.00 (1.20 [0.30 wide] – 0.50 – 0.80 – 0.90 – 0.60 leg IV 4.40 (1.40 [0.35 wide)]– 0.50 – 0.90 – 1.10 – 0.50. Palp -0.7 – 0.3 – 0.25 – 0.6, width cymbium 0.25.

FEMALE. Paratype. Carapace paler than that of male, head pale, lacking white area in eye region, but with bunch of white setae on clypeus. Anterior eyes surrounded with white hair, a white moustache is present below the front eyes (Fig. 13c). present. Femur I with a prolateral and retrolateral dark longitudinal stripe, a prolateral one on leg II and III and none on femur IV (Fig. 13a). All legs with black rings at base and tip of the patella and tibia. Abdomen pale, dispersed with brownish scales, mostly on the sides (Fig. 13d). Venter uniform pale, very small iridescent scales (Fig. 13b). Palps uniform pale. Epigyne (Fig. 13) similar to *C. lauta* and *C. volupe*, spermathecae considerably larger, touching, "bird's neck" short and thin and lacking a twist; outer margin (ora) of bird's beak reaching down till 2/3 of spermathecae. In dorsal view, upturned fertilization ducts pointing to each other with acute tip behind are visible behind spermathecae (Fig. 13d). For hypothetical illustration of copulatory mechanics, see Fig. 16.

Measurements. Paratype. Total length 4.50. Carapace 1.90 long, 1.30 wide, 1.10 high, abdomen 2.75 long, 1.72 wide. 1.42 high. Legs*:* I 2.90 (0.90 [0.35 wide]– 0.50 – 0.60 - 0.50 – 0.40*)* leg II 2.55 (0.80 ([0.25 wide] – 0.35 – 0.55 – 0.45 – 0.40), leg III 3.00 (0.95 – 0.40 – 0.60 – 0.70 – 0.35) leg IV 3.80 (1.15 – 0.50 – 0.75 – 0.90 – 0.50).

Diagnosis

Males of *P. scandens* differ from most *Phintelloides* species by the absence of a white tuft on the clypeus in front of the AME in males (Fig. 15a). The thorax in males has a narrow white V-shaped strip in the middle instead of a diamond-shaped white area in other species. The female carapace (Fig. 12c) has markings similar to the male and unlike the characteristic pattern of *P. jesudasi*. The male abdomen (Fig. 12a), has a wide dark median band on the abdomen between a pair of yellow lateral bands as in *P. jesudasi* and in *P. versicolor*. The female abdomen pattern is the reverse of that in males (Fig. 12c). The structure of the male and female reproductive organs are generally similar to those of *C. lauta* and *P. jesudasi.* The male can be distinguished by differences in the colour of palpal segments, and by the form of the etb, which is longer and more slender than in *P. jesudasi* and fairly uniform in width, running alongside the tegulum over most of its length (Fig. 14c); the embolus has the same length as that in *jesudasi*, the proximal tegular lobe is smaller. The female wears a narrow bunch of white setae on the clypeus (Fig. 15b); epigyne lacks the widening of the bird's-neck, the atrium is smaller and narrow, the ora (outer rim) is clearly longer; the spermathecae are round and larger than in any other species of the genus, with a diameter equal to the length of the ducts (Fig. 13).

Etymology

From the Latin word *scandere*, to climb, referring to the fact that all known specimens were collected by fogging tree canopies.

Distribution

Known from two locations in Sabah Province, northern Borneo. In the Kinabalu area, recorded from secondary forests near Sorinsim adjacent to primary forest. At Keningau, in isolated disturbed young secondary forest patches 10 and 20 years old.

Phintelloides versicolor (C. L. Koch, 1846)

- Catalogue of Life https://www.checklistbank.org/dataset/288943/taxon/76Z2N

Nomenclature

World Spider Catalog: urn:lsid:nmbe.ch:spidersp:035557

Plexippus versicolor C. L. Koch, 1846 - Koch 1846: vol. 13: 103, fig. 1165 (m) Bintan [Bintang] Island, Indonesia.

Attus versicolor (C. L. Koch, 1846) - Walckenaer 1847: 426.

Maevia picta C. L. Koch, 1848 - Koch 1848: vol 14: 72, fig. 1328 (f; juv m according to Thorell 1891) Bintan [Bintang] Island, Indonesia.

Chrysilla versicolor (C. L. Koch, 1846) - Thorell 1891: 117 (mf; synonymy with *Mevia picta*) Indonesia (Bintang, Sumatra), Malaysia (Pinang), Singapore; Workman and Workman 1894: 10, pl. 10 (mf) Indonesia (Pinang, Sumatra, Bintang), Singapore; Simon 1901: 544; Żabka 1985: 211, figs 83-96 (mf) Vietnam.

Telamonia leucaspis Simon, 1903 - Simon 1903b: 307 (m) Sumatra. **syn. nov.**; Prószyński 1978: 336, fig. 11 (m).

Phintella leucaspis (Simon, 1903) - Bohdanowicz and Prószyński 1987: 112, figs 214-215 (m).

Phintella versicolor (C. L. Koch, 1846) - Prószyński 1987: 152, 161 (in part).

Phintelloides versicolor (C. L. Koch, 1846) - Kanesharatnam and Benjamin 2019: 22.

Materials

a. scientificName: ***Phintelloides versicolor***; country: Malaysia; stateProvince: Selangor; locality: Banting; verbatimElevation: 100 m; verbatimCoordinates: 2°48'04"N 101°30'46"E; decimalLatitude: 2.8011111111111; decimalLongitude: 10.512777777778; eventDate: 1983-01-28; fieldNotes: CM 21848, DSC 6302-6327; individualCount: 2; sex: male; lifeStage: adult; recordedBy: W. Corley; otherCatalogNumbers: https://doi.org/10.3535/C69-M7K-VWC; institutionID: https://ror.org/027m9bs27; institutionCode: MMUE; basisOfRecord: PreservedSpecimen; occurrenceID: 451E13DE-7042-5932-A295-646E928CEC1F

b. scientificName: ***Phintelloides versicolor***; country: Singapore; locality: Lim Chu Kang; verbatimCoordinates: 1°26'N 103° 43'E; decimalLatitude: 1.4333333333333; decimalLongitude: 103.71666666667; eventDate: 1991-01-28/29; fieldNotes: CM19264;

individualCount: 1; sex: female; lifeStage: adult; catalogNumber: MMUE G7572.6413; recordedBy: F. & J. A. Murphy; otherCatalogNumbers: https://doi.org/10.3535/3NW-1BX-8BK; institutionID: https://ror.org/027m9bs27; institutionCode: MMUE; basisOfRecord: PreservedSpecimen; occurrenceID: A0A5233F-918E-5755-AB82-D3EE60952018

c. scientificName: ***Phintelloides versicolor***; country: Thailand; stateProvince: Kanchanaburi Province; locality: Erawan waterfalls N. P.; verbatimCoordinates: 14°22'N 99°08'E; decimalLatitude: 14.366666666667; decimalLongitude: 99.133333333333; eventDate: 1987-11; individualCount: 1; sex: female; lifeStage: adult; catalogNumber: RMNH.ARA.18260; recordedBy: P. R. & C. L. Deeleman; otherCatalogNumbers: https://doi.org/10.3535/M42-Z4P-DRD; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: DE44414C-2104-59CD-9533-5324F9DABE02

d. scientificName: ***Phintelloides versicolor***; country: Thailand; stateProvince: Prachuap Khiri Kan Province; locality: Sam Roi Yot National Park; verbatimCoordinates: 12°14'N 99°56'E; decimalLatitude: 12.233333333333; decimalLongitude: 99.933333333333; eventDate: 1988-12-31; habitat: forest on limestone; individualCount: 1; sex: male; lifeStage: adult; catalogNumber: RMNH.ARA.18261; recordedBy: P. R. & C. L. Deeleman; otherCatalogNumbers: https://doi.org/10.3535/5MR-J6N-26M; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: 41A8211A-6F67-5ED3-9CA4-3F4C6ECADB9D

e. scientificName: ***Phintelloides versicolor***; country: Thailand; locality: Chiang Mai; verbatimElevation: 300 m; verbatimCoordinates: 18°47'N 98°57'E; decimalLatitude: 18.783333333333; decimalLongitude: 98.95; eventDate: 1987-07-01; individualCount: 1; sex: male; lifeStage: adult; catalogNumber: RMNH.ARA.18262; recordedBy: P. Schwendinger; otherCatalogNumbers: https://doi.org/10.3535/Q6C-91C-BS5; institutionID: https://ror.org/0566bfb96; institutionCode: RMNH; basisOfRecord: PreservedSpecimen; occurrenceID: 5EEB6839-2EC9-54A3-96FA-70DE59BC8142

Description

Both male and female with flattened white hair on clypeus, in males just a small moustache below AME (Fig. 17c), in females with frontal strip of thick white flattened setae over whole carapace width (Fig. 17d); anterior eye region with patch covered with white setae, thorax with wide broad submarginal band with dark edge (Fig. 17a), in live specimens black with 2 white central patches and several small ones (Koh et al. 2022: 437). In alcohol tiny greenish iridescent pits on head in male and female. In males, legs I dark, with a light ring on tibia, metatarsus and tarsus, other legs pale; in females, legs and palps pale (all these features are also mentioned in the original description of *leucaspis* by Simon 1903b, here synonymized with *versicolor*). Abdomen dorsally with elongate black and white scales, side all white, venter in both sexes partly covered with white appressed flattened setae. Male palp pigmented on trochanter and base of femur, rest white; female palps all white. Epigyne of female (from Thailand) with slender, almost straight ducts (Fig. 18c, e).

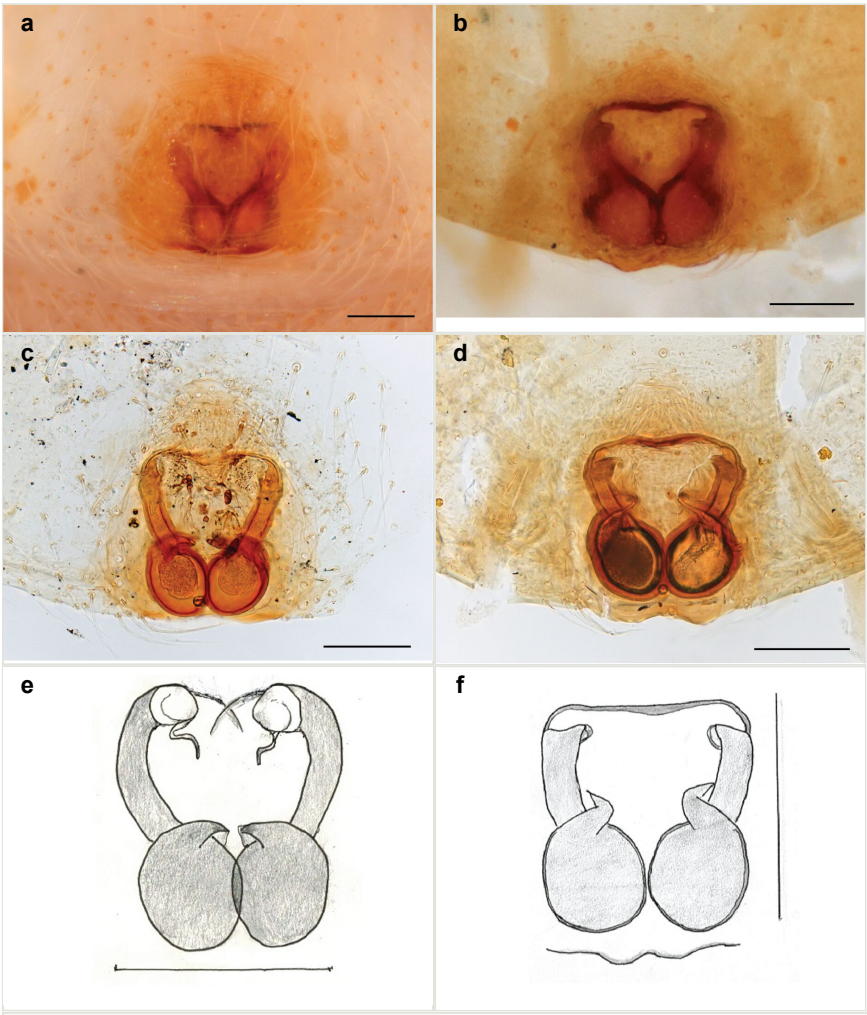

Figure 18.

Phintelloides versicolor (C. L. Koch, 1846) and *Phintelloides munita* (Bösenberg & Strand, 1906), photographs and illustrations of female reproductive structures

a: *Phintelloides versicolor* (C. L. Koch, 1846), female epigynum, ventral view, CM 19264, scale bar 0.1 mm doi

b: *Phintelloides munita* (Bösenberg & Strand, 1906), female epigynum, ventral view, CM 15605, scale bar 0.1 mm doi

c: *Phintelloides versicolor* (C. L. Koch, 1846), female vulva, dorsal view, RMNH.ARA.18260, scale bar 0.1 mm doi

d: *Phintelloides munita* (Bösenberg & Strand, 1906), female vulva, dorsal view, CM 15605, scale bar 0.1 mm doi

e: *Phintelloides versicolor* (C. L. Koch, 1846), female epigynum, dorsal view, illustration, scale bar 0.2 mm doi

f: *Phintelloides munita* (Bösenberg & Strand, 1906), female epigynum, dorsal view, illustration, scale bar 0.2 mm doi

Measurements. Total length: males Banting 6.30 and 4.40, males (Sam Roi Yot N. P.) 4.70 in mm, , Chiang Mai 5.00. Male Sam Roi Yot: total length 4.70, carapace 2.30 long, 1.80 wide 1.30 high, abdomen 2.30 long, 1.20 wide; palp 0.80 – 0.35 – 0.30 - 0.60, width cymbium 0.23.

Diagnosis

The abdomen in males is easily recognizable by the dark central band flanked by a pair of lateral white bands (yellow in life; Fig. 17a, Koh et al. 2022: 437), in reverse to that in most *Chrysilla* and *Phintella* species and similar to *Phintelloides scandens*; this is a reliable character also valid in material preserved in alcohol. This feature apparently is expressed in the latin name: reversal of pale and dark. The shape of the white central area on the thorax is variable in shape and width (compare Fig. 17a from Thailand with Koh et al. 2022: 437 from Singapore). Just like in representatives of *Chrysilla* and *Phintelloides*, the embolus is filiform and relatively short, straight and then slightly curved and bent near the base at an angle of 90° with the retrolateral distal edge of the tegulum (Fig. 19a). For a difference in tegulum see diagnosis of *munita.* Females differ from males by the different carapace, having a pair of black semi-rings on a light background on the posterior part of the thorax; they differ in abdomen pattern which is dorsally pale with irregular cinnamon-brown blotches and a central white band (Fig. 17b; Koh et al. 2022: 437). Epigyne (Fig. 18a, c, e): the copulatory duct is uniform in diameter, parallel, at the anterior end the ring-like copulatory opening in a 90° inward bend, the outer edge is prolonged as a fold or rim; the left and righthand folds are directed mesally, relatively short, the tips crossing. See *P. munita* for differences with that species.

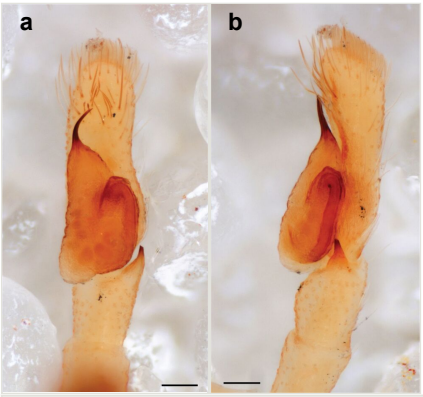

Figure 19.

Phintelloides versicolor (C. L. Koch, 1846), photographs of male pedipalp

a: *Phintelloides versicolor* (C. L. Koch, 1846), male pedipalp, ventral view, RMNH.ARA. 18262 doi

b: *Phintelloides versicolor* (C. L. Koch, 1846), male pedipalp, retrolateral view, RMNH.ARA. 18262 doi

Distribution

Sumatra, Bintang Island, Singapore, Malaysia, Thailand, Brunei, Vietnam.

Taxon discussion

The previous generic assignment to *Phintella* of this species is doubtful, as the embolus does not conform to the definition of that genus (see for example Żabka 1985: fig. 403), nor of *Phintelloides* (see for example Kanesharatnam and Benjamin 2019: fig. 18A). But despite the generic ambiguity, *Phintelloides versicolor* is difficult to distinguish from its close relative *Phintelloides minuta,* particularly based on the male copulatory organ. *Phintelloides minuta* was removed from synonymy with *P. versicolor* without argumentation (Prószyński 2016; https://salticidae.pl/salticidae.php?adres=specimen.php?id=12129), and in lieu of justification this has not been adopted by World Spider Catalog (2024). However, we agree with the validity of both species and shall try to provide the missing arguments.

This species complex is a taxonomic snake in the grass. In the various papers listed, the identity of this species is full of contradictions. Prószyński (2017), in his pragmatic classification, used this species as the representative of the genus *Phintella*; this is misleading. The World Spider Catalog (2024) cites 62 taxonomic treatments of *P. versicolor*. The species including its synonyms has been placed in 11 different genera over nearly 175 years. Recently, it was assigned to *Phintelloide*s (Kanesharatnam and Benjamin 2019, p. 22). The genus assignment of *versicolor* through 130 years has commuted between *Chrysilla* or *Phintella* by authors with authority (Simon, Zabka, Song, Prószyński) which suggests that the species fits in neither of them satisfactorily.

Koch's description of the male from a small islant between Singapore and Sumatra is mostly an enumeration of colours of the various body parts: black, white, and yellow, and the central abdominal band rusty red, which also fits our specimens. He mentioned that the female is unknown, but described one two years later as *Maevia picta* from the same locality. Then, starting in the 1970s, records attributed to this poorly known tropical species stated to appear from Japanese localities on the latitude of southern Europe (Yaginuma 1977, Prószyński 1973). Prószyński (1973) was the first to provide detailed drawings of the male's genital organs, in a paper on salticid type specimens from Japan present in the Berlin Museum. He stated that he found the male type specimen of Koch's *"Plexippus" versicolor* from Bintang Island as well as male and female specimens labeled *Hasarius versicolor* Koch from Japan (the latter name combination does not appear elsewhere in the taxononmic literature; World Spider Catalog 2024). In the description, Prószyński (1973) focused on the colouration and the abdomen pattern and apparently decided for some reason that the specimens from Sumatra and Japan are conspecific. No female was available from Bintang. Genitals, male and female, he drew from Japanese specimens only (Prószyński 1973, figs 1-7).

Twelve years later, in the magnificent work by Żabka (1985) on Salticidae from Vietnam appear excellent drawings of a male palp by Prószyński of the alleged holotype of *versicolor* (Żabka 1985, figs 91, 92) side by side with Zabka's drawings of *versicolor* from the same specimen, but apparently opposite pedipalp; Żabka 1985, figs 88-90) along with a specimen from Vietnam (Żabka 1985, figs 83-86). Prószyński's 1973 identification of *versicolor* from Japan was followed by Yaginuma (1977) and since then a number of authors cited, re-described and illustrated males and females of *versicolo*r from various material from Japan and China. It has to be admitted that the morphology of palps from the Malay and Japanese specimens is very similar, and warrants further comparative study. However, as is the case also in certain other chrysilloid genera, it is the females that express their identity more clearly than do males by differences in structure in the epigyne. The drawings of the epigyne from Vietnam (Żabka 1985, figs 93-95) differ consistently from those from the Japanese specimens, and better agree with that from specimens we collected in Malaysia and Thailand, representing *versicolor*. In Bohdanowicz and Prószyński (1987), the latter author presented illustrations of the palp of *Phintella leucaspis* (Simon) from Sumatra (figs 214, 215), which looks identical to drawings of tropical Southeast Asian *versicolor* specimens and apparently *leucaspis* is a new synonym of *versicolor*. Although Japanese specimens according to drawings of palpal structure can hardly be distinguished from that of specimens from Bintang Island, Sumatra, Malaysia, Thailand and Vietnam, the epigynes drawn from Japan, China and Hong Kong (e.g., Fig. 18b, d, f; Zhu and Zhang 2011, fig. 362a, b; Prószyński 1973, figs 6, 7) are incompatible with female specimens from the Malay Region, which have not been figured in detail previously (Fig. 18a, c, e). The population represented in Japan and China cannot be maintained in *versicolor*; the oldest name available is *munitus* Boesenberg & Strand 1906, which name we propose to remove from synonymy.

Notes

The World Spider Catalog (2024) erroneously lists *Maevia picta* as *Maevia picta* C. L. Koch 1846: 72; it should be C. L. Koch 1848: 72 (Brignoli 1985).

Phintelloides minuta (Bösenberg & Strand, 1906)

- ZooBank zoobank.org/NomenclaturalActs/34E30429-650A-413C-A6B3-6313C14C5F5B

Nomenclature

Removed from synonymy with *Phintelloides versicolor*

Jotus munitus Bösenberg & Strand, 1906 - Bösenberg and Strand 1906: 334, pl. 14 fig. 374 (f) Japan; (m, plate 14 fig. 392, see *Phintella linea* (Karsch, 1879), Prószyński 1987: 161); Yaginuma 1955: 14; Yaginuma 1960: 107, fig. 89.5 (f) Japan; Lee 1966: 55, fig. 28d-f (f) Taiwan; Yaginuma 1971: 107, fig. 89.5 (f) Japan; Yin and Wang 1979: 32, fig. 13A-E; Hu 1984: 370, fig. 386.1-6.

Chira albiocciput Bösenberg & Strand, 1906 - Bösenberg and Strand 1906: 366, pl. 13, fig. 311 (m) Japan.

Aelurillus dimorphus Dönitz & Strand, in Bösenberg and Strand 1906: 398, pl. 9, figs 125-126 (mf) Japan; Saitō 1959: 147. fig 203a-e.

Jotus munitus chinesicus Strand, 1907 - Strand 1907: 569 (f) China.

Dexippus davidi Schenkel, 1963 - Schenkel 1963: 446, fig. 255a-e (m) China.

Dexippus tschekiangensis Schenkel, 1963 - Schenkel 1963: 449, fig. 256a-e (f) China.

Chrysilla versicolor (C. L. Koch, 1846) - Prószyński 1973: 98, figs 1-7 (mf) Japan; Yaginuma 1977: 398, Japan (synonymy with *Jotus munitus*); Song 1982: 102 (synonymy with *Dexippus davidi*).

Icius munitus (Bösenberg & Strand, 1906) - Wesołowska 1981a: 59, figs 34-36 (f) North Korea.

Icius tschekiangensis (Schenkel, 1963) - Wesołowska 1981b: 135, figs 27-30 (f) China.

Phintella davidi (Schenkel, 1963) - Prószyński 1983b: 6.

Phintella tschekiangensis (Schenkel, 1963) -*Prószyński 1983b*: 7.

Phintella versicolor (C. L. Koch, 1846) - *Prószyński 1983a*: 44, fig. 3 (m) Japan; Prószyński 1983b: 6; : 231, f. 129.1 (mf); Yaginuma 1986: 161; Song 1987: 288 (mf); Maddison 1987: 103, figs 7-8; Prószyński 1987: 152, 161 (in part); Bohdanowicz and Prószyński 1987: 113, figs 210-213, 216-221 (mf) (partim); Matsumoto 1989: 125, fig. 1E, J (m); Chikuni 1989: 149, fig. 12 (mf); Feng 1990: 202, fig. 177.1-4; Chen and Gao 1990: 191, fig. 243a-b (mf); Chen and Zhang 1991: 290, fig 303 (mf); Peng et al. 1993: 162, figs 569-576 (mf); Zhao 1993: 411, fig. 212a-c (mf); Zhao 1995: 1128, fig. 553a-c (mf); Maddison 1996: 330, fig. 17 (m); Song et al. 1997: 1738, fig. 50a-c (f); Song et al. 1999: 539, figs 308O-P, 309F-G, 328E-F (mf); Hu 2001: 403, fig. 256.1-3 (m; correction, see notes below); Namkung 2002: 616, fig. 43.60a-c (mf) South Korea; Cho and Kim 2002: 120, figs 58, 163-164, 272-273 (mf); Namkung 2003: 620, fig. 43.60 (mf); Ono et al. 2009: 572, figs 140-143 (mf); Zhu and Zhang 2011: 497, fig. 362A-D (mf); Yin et al. 2012: 1429, fig. 779a-h (mf); Kim and Lee 2014: 113, fig. 81A-E (mf); Prószyński 2017: 15, figs 4B, 5C-D (mf); Prószyński 2018: 26, fig. 5H (mf); Peng 2020: 308, fig. 221a-h; Chen et al. 2021: 295, fig. 6A-C.

Phintella paminta Barrion, Barrion-Dupo & Heong, in Barrion et al. 2013: 25, fig. 27A-C (f).

Phintelloides versicolor (C. L. Koch, 1846) - Lin et al. 2023: 513 (synonymy with *Phintella paminta*).

Material

a. scientificName: *Phintelloides minuta*; country: Hong Kong; locality: Mai Po mangrove; verbatimCoordinates: 22°29'N 114°02'E; decimalLatitude: 22.483333333333; decimalLongitude: 114.03333333333; eventDate: 1988-02-27; fieldNumber: CM15605; fieldNotes: DSC 5976-5983; individualCount: 1; sex: female; lifeStage: adult; catalogNumber: MMUE G7572.6412; recordedBy: F. & J. A. Murphy; otherCatalogNumbers: https://doi.org/10.3535/MDR-6FG-49E; institutionID: https://ror.org/027m9bs27; institutionCode: MMUE; basisOfRecord: PreservedSpecimen; occurrenceID: 12EAA5CD-517E-599F-98D5-C0A3F615F096

Diagnosis

Tentatively, judging from drawings of Prószyński and Zabka, the rta seems less slender at the base in *munita* than in *versicolor*; furthermore, there could be a difference in shape of the retrolateral lobe of the tegulum, which arises retrolaterally alongside the down-turned branch of the U-bend of the sperm duct, versus from the distalmost tip of the U in *versicolor;* also the embolus is slightly stouter and bent directly at the base. The single female examined has a carapace ornamentation similar to that in *versicolor*; the abdomen wears ventrally numerous elongate iridescent setae. In live specimens, differences in carapace and abdomen decoration pattern probably do exist, including local variations. The epigyne is distinctive: copulatory ducts are stouter than in *versicolo*r (Fig. 18c, e) and diverging (Fig. 18d, f), the transverse folds running from the outer edge of the copulatory openings continue as an uninterrupted fold or bar all across the anterior edge of the epigyne (Fig. 18d, f). We have not been able to examine a male of this species.

Distribution

Japan, China, Hong Kong, Vietnam, North Korea, South Korea.

Notes

The World Spider Catalog (2024) erroneously indicates that the treatment of this species in Hu (2001) is based on the female; it is in fact based on the male.

Acknowledgements

We sincerely thank Joseph Koh, Melvyn Yeo, and Paul Y.C. Ng for granting permission to reproduce their photos of live animals. Andreas Floren confided us the spider material of his canopy fogging arthropods project in North Borneo. This enabled us to discover an unexpected spider fauna, several of them taxonomically isolated from relatives from the understorey. We are grateful to Dmitri Logunov for making available material from the Murphy collection, and to Hannco Bakker for support with the Naturalis collection. The late Otto Krauss was so kind to send special drawing paper which proved to be most useful. Thanks to Tobias Kuhn, Rich Pyle, Teodor Georgiev, and Lyubomir Penev for

much technical advice and support, especially with identifiers and nanopublications. Thanks to reviewers Tamás Szűts and Suresh Benjamin, and editor Pedro Cardoso for their time, attention, and advice, which improved the manuscript.

References

- Addink W, Theocharides S, Islam S (2023) A novel part in the Swiss Army Knife for linking biodiversity data: The digital specimen identifier service. Biodiversity Information Science and Standards 7: 112283. https://doi.org/10.3897/biss.7.112283
- Agosti D, Egloff W (2009) Taxonomic information exchange and copyright: the Plazi approach. BMC Research Notes 2 (53): 1-9. https://doi.org/10.1186/1756-0500-2-53
- Arzuza Buelvas D (2018) The Murphy spider collection at the Manchester Museum: a valuable research resource for arachnologists. Journal of Natural Science Collections 6: 48-59.
- Barrion AT, Barrion-Dupo ALA, Catindig JLA, Villareal M. O, Cai D, Yuan QH, Heong KL (2013) New species of spiders (Araneae) from Hainan Island, China. UPLB Museum Publications in Natural History 3: 1-103. https://doi.org/10.5281/zenodo.269136
- Bohdanowicz A, Prószyński J (1987) Systematic studies on East Palaearctic Salticidae (Araneae), IV. Salticidae of Japan. Annales Zoologici, Warszawa 41: 43-151.
- Bösenberg W, Strand E (1906) Japanische Spinnen. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft 30: 93-442.
- Brignoli PM (1985) On the correct dates of publication of the arachnid taxa described in some works by C. W. Hahn and C. L. Koch (Arachnida). Bulletin of the British Arachnological Society 6 (9): 414-416.
- Caleb JT, Sanap RV, Patel KG, Sudhin PP, Nafin KS, Sudhikumar AV (2018) First description of the female of *Chrysilla volupe* (Karsch, 1879) (Araneae: Salticidae: Chrysillini) from India, with notes on the species' distribution and life history. Arthropoda Selecta 27 https://doi.org/10.15298/arthsel.27.2.06
- Caleb JT (2020) Spider (Arachnida: Araneae) fauna of the scrub jungle in the Madras Christian College campus, Chennai, India. Journal of Threatened Taxa 12 (7): 15711-15766. https://doi.org/10.11609/jott.5758.12.7.15711-15766
- Caleb JTD, Mathai MT (2014) Description of some interesting jumping spiders (Araneae: Salticidae) from South India. Journal of Entomology and Zoology Studies 2 (5): 63-71.
- Caleb JTD (2016) New data on the jumping spiders (Araneae: Salticidae) from India. Arthropoda Selecta 25 (3): 271-277. https://doi.org/10.15298/arthsel.25.3.06
- Chen K-M, Lin T-Y, Ueng Y-T (2021) Three new species and six newly recorded species of jumping spiders (Araneae: Salticidae) in Taiwan. Natural Resources 12: 290-320. https://doi.org/10.4236/nr.2021.129021
- Chen XE, Gao JC (1990) The Sichuan farmland spiders in China. Sichuan Science and Technology Publishing House, Chengdu, 226 pp.
- Chen ZF, Zhang ZH (1991) Fauna of Zhejiang: Araneida. Zhejiang Science and Technology Publishing House, Hangzhou, 356 pp.
- Chikuni Y (1989) Pictorial encyclopedia of spiders in Japan. Kaisei-sha Publishing Co., Tokyo, 310 pp.
- Cho JH, Kim JP (2002) A revisional study of family Salticidae Blackwall, 1841 (Arachnida, Araneae) from Korea. Korean Arachnology 18: 85-169.

- Deeleman-Reinhold CL, Miller JA, Floren A (2016) *Depreissia decipiens*, an enigmatic canopy spider from Borneo revisited (Araneae, Salticidae), with remarks on the distribution and diversity of canopy spiders in Sabah, Borneo. ZooKeys 556: 1-17. https://doi.org/10.3897/zookeys.556.6174
- Fawcett S, Agosti D, Cole S, Wright D (2022) Digital accessible knowledge: Mobilizing legacy data and the future of taxonomic publishing. Bulletin of the Society of Systematic Biologists 1 (1): 8296. https://doi.org/10.18061/bssb.v1i1.8296
- Feng ZQ (1990) Spiders of China in colour. Hunan Science and Technology Publishing House, 256 pp.
- Floren A, Deeleman-Reinhold CL (2005) Diversity of arboreal spiders in primary and disturbed tropical forests. Journal of Arachnology 33: 323-333. https://doi.org/10.1636/05-22.1
- Hardisty A, Ellwood E, Nelson G, Zimkus B, Buschbom J, Addink W, Rabeler R, Bates J, Bentley A, Jos&eacute AB, Hansen S, Macklin J, Mast A, Miller J, Monfils A, Paul D, Wallis E, Webster M (2022) Digital Extended Specimens: Enabling an Extensible Network of Biodiversity Data Records as Integrated Digital Objects on the Internet. BioScience 72 (10). https://doi.org/10.1093/biosci/biac060
- Hu JL (1984) The Chinese spiders collected from the fields and the forests. Tianjin Science and Technology Press, 482 pp.
- Hu JL (2001) Spiders in Qinghai-Tibet Plateau of China. Henan Science and Technology Publishing House, 658 pp.
- Kanesharatnam N, Benjamin SP (2019) Multilocus genetic and morphological phylogenetic analysis reveals a radiation of shiny South Asian jumping spiders (Araneae, Salticidae). ZooKeys 839: 1-81. https://doi.org/10.3897/zookeys.839.283
- Karsch F (1879) Arachnologische Beiträge. Zeitschrift für die Gesammten Naturwissenschaften 52: 534-562.
- Kim ST, Lee SY (2014) Arthropoda: Arachnida: Araneae: Clubionidae, Corinnidae, Salticidae, Segestriidae. Spiders. Invertebrate Fauna of Korea 21 (31): 1-186.
- Koch CL (1846) Die Arachniden. Dreizehnter Band. J. L. Lotzbeck, Nürnberg, 234 pp. https://doi.org/10.5962/bhl.title.43744
- Koch CL (1848) Die Arachniden. Vierzehnter Band. J. L. Lotzbeck, Nürnberg, 88 pp. https://doi.org/10.5962/bhl.title.43744
- Koh JK (1989) A Guide to Common Singapore Spiders. Singapore Science Center, 160 pp.
- Koh JK, Ming LT (2013) Spiders of Brunei Darussalam. Biodiversity in the heart of Borneo. Natural History publications (Borneo), Kota Kinabalu.
- Koh JK, Bay N (2019) Borneo Spiders, A Photographic Field Guide. Sabah Forestry Department, Sandakan.
- Koh JK, Court DJ, Ang CS, Ng PY (2022) A Photographic Guide to Singapore Spiders. National Parks Board, Singapore.
- Kozub D, Shapoval J, Yatsenko S, Starikh V, Dobarskyi A (2000) Helicon Focus. 7.7.5. Helicon Soft Ltd..
- Lee CL (1966) Spiders of Formosa. Taichung Junior Teachers College, 84 pp.
- Lin YJ, Wu LB, Cai DC, Li SQ, Barrion AT, Heong KL (2023) Review of 43 spider species from Hainan Island, China (Arachnida, Araneae). *Zootaxa* 5351 (5): 501-533. https://doi.org/10.11646/zootaxa.5351.5.1

- Maddison W (1987) *Marchena* and other jumping spiders with an apparent leg-carapace stridulatory mechanism (Araneae: Salticidae: Heliophaninae and Thiodinae). Bulletin of the British Arachnological Society 7: 101-106.
- Maddison WP (1996) *Pelegrina* Franganillo and other jumping spiders formerly placed in the genus *Metaphidippus* (Araneae: Salticidae). Bulletin of the Museum of Comparative Zoology 154: 215-368.
- Maddison WP (2015) A phylogenetic classification of jumping spiders (Araneae: Salticidae). Journal of Arachnology 43: 231-292.
- Magar KT, Shrestha BR, Gurung TB, Bahadur R, Lamichhane BR, Hill DE, Thapa A (2020) New records of jumping spiders (Araneae: Salticidae) from Nepal. Peckhamia 220.1: 1-11.
- Matsumoto S (1989) Colour variation in the prolateral side of the carapace and appendages of the jumping spider of the genus *Phintella* (Araneida: Salticidae). In: Nishikawa Y, Ono H (Eds) Arachnological Papers Presented to Takeo Yaginuma on the Occasion of his Retirement. Osaka Arachnologists' Group, Osaka.
- Metzner H (1996-2020) Jumping spiders of the world (Arachnida, Araneae, Salticidae). online at: http://www.jumping-spiders.com.
- Miller J, Agosti D, Penev L, Sautter G, Georgiev T, Catapano T, Patterson D, King D, Pereira S, Vos R, Sierra S (2015) Integrating and visualizing primary data from prospective and legacy taxonomic literature. Biodiversity Data Journal 3: e5063. https://doi.org/10.3897/bdj.3.e5063
- Namkung J (2002) The spiders of Korea. Kyo-Hak Publishing Co., Seoul, 648 pp.
- Namkung J (2003) The Spiders of Korea. 2nd Edition. Kyo-Hak Publishing Co., Seoul, 648 pp.
- Ono H, Ikeda H, Kono R (2009) Salticidae. In: Ono H (Ed.) The spiders of Japan with keys to the families and genera and illustrations of the species. Tokai University Press, Kanagawa.
- Penev L, Erwin T, Miller J, Chavan V, Moritz T, Griswold C (2009) Publication and dissemination of datasets in taxonomy: ZooKeys working example. ZooKeys 11: 1-8. https://doi.org/10.3897/zookeys.11.210
- Penev L, Koureas D, Groom Q, Lanfear J, Agosti D, Casino A, Miller J, Arvanitidis C, Cochrane G, Hobern D, Banki O, Addink W, Kõljalg U, Copas K, Mergen P, Güntsch A, Benichou L, Lopez JBG, Ruch P, Martin C, Barov B, Demirova I, Hristova K (2022) Biodiversity Community Integrated Knowledge Library (BiCIKL). Research Ideas and Outcomes 8: e81136.
- Peng XJ, Xie LP, Xiao XQ, Yin CM (1993) Salticids in China (Arachnida: Araneae). Hunan Normal University Press, 270 pp.
- Peng XJ (2020) Fauna Sinica, Invertebrata 53, Arachnida: Araneae: Salticidae. Science Press, Beijing, 612 pp.
- Prószyński J (1973) Systematic studies on east Palaearctic Salticidae, II. Redescriptions of Japanese Salticidae of the Zoological Museum in Berlin. Annales Zoologici, Warszawa 30: 97-128.
- Prószyński J (1976) Studium systematyczno-zoogeograficzne nad rodziną Salticidae (Aranei) Regionów Palearktycznego i Nearktycznego. Wyższa Szkola Pedagogiczna Siedlcach 6: 1-260.
- Prószyński J (1978) Distributional patterns of the Palaearctic Salticidae (Araneae). Symposia of the Zoological Society of London 42: 335-343.

- Prószyński J (1983a) Position of genus *Phintella* (Araneae: Salticidae). Acta Arachnologica 31 (2): 43-48. https://doi.org/10.2476/asjaa.31.43
- Prószyński J (1983b) Redescriptions of *Phintella typica* and *Telamonia bifurcilinea* (Araneae: Salticidae). Acta Arachnologica 32 (1): 5-14. https://doi.org/10.2476/asjaa.32.5
- Prószyński J (1984) Atlas rysunków diagnostycznych mniej znanych Salticidae (Araneae). Zeszyty Naukowe Wyższej Szkoły Rolniczo-Pedagogicznej w Siedlcach 2: 1-177.
- Prószyński J (1985) On *Siler*, *Silerella*, *Cyllobelus* and *Natta* (Araneae, Salticidae). *Annales Zoologici, Warszawa* 39: 69-85.
- Prószyński J (1987) Atlas rysunków diagnostycznych mniej znanych Salticidae 2. Zeszyty Naukowe Wyższej Szkoły Rolniczo-Pedagogicznej, Siedlcach, 172 pp.
- Prószyński J, Deeleman-Reinhold CL (2010) Description of some Salticidae (Araneae) from the Malay Archipelago. I. Salticidae of the Lesser Sunda Islands, with comments on related species. *Arthropoda Selecta* 19 (3): 153-188. https://doi.org/10.15298/arthsel.19.3.05
- Prószyński J, Deeleman-Reinhold CL (2012) Description of some Salticidae (Aranei) from the Malay archipelago. II. Salticidae of Java and Sumatra, with comments on related species. Arthropoda Selecta 21: 29-60. https://doi.org/10.15298/arthsel.21.1.04
- Prószyński J (2016) Monograph of Salticidae (Araneae) of the World 1995-2015. Part II. Global Species Database of Salticidae (Araneae). Version October 30th, 2016. online at: http://www.salticidae.pl.
- 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
- Prószyński J (2018) Review of the genus *Hasarius* (Araneae: Salticidae) - a taxonomic fiasco. Ecologica Montenegrina 16: 16-31. https://doi.org/10.37828/em.2018.16.2
- Roewer CF (1955) Katalog der Araneae von 1758 bis 1940, bzw. 1954. 2. Band, Abt. a (Lycosaeformia, Dionycha [excl. Salticiformia]). 2. Band, Abt. b (Salticiformia, Cribellata) (Synonyma-Verzeichnis, Gesamtindex). Institut royal des Sciences naturelles de Belgique, Bruxelles, 1751 pp.
- Saitō S (1959) The Spider Book Illustrated in Colours. Hokuryukan, Tokyo, 194 pp.
- Schenkel E (1963) Ostasiatische Spinnen aus dem Muséum d'Histoire naturelle de Paris. Mémoires du Muséum National d'Histoire Naturelle de Paris (A, Zool.) 25: 1-481.
- Simon E (1901) Histoire naturelle des araignées. Deuxième édition, *tome second*. Roret, Paris, 381-668 pp. https://doi.org/10.5962/bhl.title.51973
- Simon E (1903a) Etudes arachnologiques. 33e Mémoire. LIII. Arachnides recueillis à Phuc-Son (Annam) par M. H. Fruhstorfer (nov-dec. 1899). Annales de la Société Entomologique de France 71 (4): 725-736.
- Simon E (1903b) Etudes arachnologiques. 34e Mémoire. LIV. Arachnides recueillis à Sumatra par M. J. Bouchard. Annales de la Société Entomologique de France 72: 301-310.
- Song DX (1982) Some new records and synonyms of Chinese spiders. Zoological Research 3: 101-102.
- Song DX (1987) Spiders from agricultural regions of China (Arachnida: Araneae). Agriculture Publishing House, Beijing, 376 pp.
- Song DX, Chai JY (1991) New species and new records of the family Salticidae from Hainan, China (Arachnida: Araneae). In: Qian YW, et al. (Ed.) Animal Science Research. China Forestry Publishing House, Beijing, 13-3 pp.

- Song DX, Chen J, Zhu MS (1997) Arachnida: Araneae. In: Yang XK (Ed.) Insects of the Three Gorge Reservoir area of Yangtze River. Vol.2. Chongqing Publishing House
- Song DX, Zhu MS, Chen J (1999) The spiders of China. Hebei Science and Technology Publishing House, Shijiazhuang, 640 pp.
- Strand E (1907) Vorläufige Diagnosen süd- und ostasiatischer Clubioniden, Ageleniden, Pisauriden, Lycosiden, Oxyopiden und Salticiden. Zoologischer Anzeiger 31: 558-570.
- Szüts T (2004) A revision of the genus *Bristowia* (Araneae: Salticidae). Folia Entomologica Hungarica 65: 25-31.
- Thorell T (1887) Viaggio di L. Fea in Birmania e regioni vicine. II. Primo saggio sui ragni birmani. Annali del Museo Civico di Storia Naturale di Genova 25: 5-417.
- Thorell T (1891) Spindlar från Nikobarerna och andra delar af södra Asien. Kongliga Svenska Vetenskaps-Akademiens Handlingar 24 (2): 1-149.
- Thumar RH, Dholakia AH (2018) First record of *Chrysilla volupe* Karsch, 1879 (Araneae: Salticidae) in agroecosystem of Navsari at Gujarat, India. Research Hub – International Multidisciplinary Research Journal 5 (2, 10): 1-4.
- van Dorp K (2020) A life of spiders: Christa Deeleman and her collection. Nieuwsbrief Spined 39: 9-13.
- Walckenaer CA (1847) Dernier Supplément (365-596). In: Walckenaer CA, Gervais P, et al. (Eds) Histoire naturelles des Insects. Aptères. Tome quatrième. Roret, Paris, 623 pp.
- Wang L, Zhang Z (2012) A new species of *Chrysilla* Thorell, 1887 from China (Araneae: Salticidae). Zootaxa 3243: 65-68. https://doi.org/10.11646/zootaxa.3243.1.5
- Wesołowska W (1981a) Salticidae (Aranei) from North Korea, China and Mongolia. Annales Zoologici, Warszawa 36: 45-83.
- Wesołowska W (1981b) Redescriptions of the E. Schenkel's East Asiatic Salticidae (Aranei). Annales Zoologici, Warszawa 36: 127-16.
- Workman T, Workman ME (1894) *Malaysian spider*. Published by the author, Belfast, 9-24 pp. https://doi.org/10.5962/bhl.title.101972
- World Spider Catalog (2024) World Spider Catalog. Version 25.0. Natural History Museum Bern, online at http://wsc.nmbe.ch, accessed on 01/03/2024. https://doi.org/10.24436/2
- Yaginuma T (1955) Revision of scientific names of Japanese spiders. Atypus 8: 13-16.
- Yaginuma T (1960) Spiders of Japan in colour. Hoikusha, Osaka, 186 pp.
- Yaginuma T (1971) Spiders of Japan in colour. Enlarged and revised edition. Hoikusha, Osaka, 197 pp.
- Yaginuma T (1977) A list of Japanese spiders (revised in 1977). Acta Arachnologica 27 (Spec. No.): 367-406. https://doi.org/10.2476/asjaa.27.Specialnumber_367
- Yaginuma T (1986) Spiders of Japan in color. New Edition. Hoikusha Publishing Co., Osaka, 305 pp.
- Yamasaki T, Yamaguchi M, Phung LTH, Huang PS, Tso IM (2018) Redescription of *Chrysilla lauta* Thorell 1887 (Araneae: Salticidae) based on the comparison with the holotype, and DNA barcoding. Acta Arachnologica 27: 23-29. https://doi.org/10.2476/asjaa.67.23
- Yin CM, Wang JF (1979) A classification of the jumping spiders (Araneae, Salticidae) collected from the agricultural fields and other habitats. Journal of Hunan Teachers College (nat. Sci. Ed.) 1979 (1): 27-63.
- Yin CM, Peng XJ, Yan HM, Bao YH, Xu X, Tang G, Zhou QS, Liu P (2012) Fauna Hunan: Araneae in Hunan, China. Hunan Science and Technology Press, Changsha, 1590 pp.

- Żabka M (1985) Systematic and zoogeographic study on the family Salticidae (Araneae) from Viet-Nam. Annales Zoologici, Warszawa 39: 197-485.
- Żabka M (1988) Salticidae (Araneae) of Oriental, Australian and Pacific regions, III. Annales Zoologici, Warszawa 41 (14): 421-479.
- Zhao JZ (1993) Spiders in the cotton fields in China. Wuhan Publishing House, Wuhan.
- Zhao JZ (1995) Natural enemies of cotton pests in China. Wuhan Publishing House
- Zhu MS, Zhang BS (2011) Spider fauna of Henan: Arachnida: Araneae. Science Press, Beijing, 558 pp.

Nanopublications

Nanopublication	Creator	Date
G0G-G7D-N5J is identified as Chrysilla lauta Thorell, 1887	Jeremy Miller	03-09-2024 07:27:47
PER-LNE-HEW is identified as Chrysilla lauta Thorell, 1887	Jeremy Miller	03-09-2024 07:31:24
HS2-8W8-F23 is identified as Chrysilla lauta Thorell, 1887	Jeremy Miller	03-09-2024 07:33:21
SGZ-EFZ-VRK is identified as Chrysilla lauta Thorell, 1887	Jeremy Miller	03-09-2024 09:15:47
67X-9R9-YCM is identified as Chrysilla volupe (Karsch, 1879)	Jeremy Miller	03-09-2024 07:39:18
6H9-R1R-330 is identified as Chrysilla volupe (Karsch, 1879)	Jeremy Miller	03-09-2024 07:41:16
WL8-0R1-42B is identified as Chrysilla volupe (Karsch, 1879)	Jeremy Miller	03-09-2024 07:44:18
VYQ-YW1-AGE is identified as Chrysilla deelemani Prószynski & Deeleman-Reinhold, 2010	Jeremy Miller	03-09-2024 07:46:58
Z2J-WMP-FDH is identified as Chrysilla deelemani Prószynski & Deeleman-Reinhold, 2010	Jeremy Miller	03-09-2024 07:48:54
B59-03B-FWV is identified as Phintelloides flavumi Kanesharatnam & Benjamin, 2019	Jeremy Miller	03-09-2024 07:51:00
SVV-BR5-KGE is identified as Phintelloides jesudasi (Caleb & Mathai, 2014)	Jeremy Miller	03-09-2024 07:53:04
5SG-PLB-MHT is identified as Phintelloides scandens Deeleman-Reinhold, Addink & Miller, 2024	Jeremy Miller	03-09-2024 07:55:06
85R-G3E-4M0 is identified as Phintelloides scandens Deeleman-Reinhold, Addink & Miller, 2024	Jeremy Miller	03-09-2024 07:57:08

7WH-VHP-M1K is identified as Phintelloides scandens Deeleman-Reinhold, Addink & Miller, 2024	Jeremy Miller	03-09-2024 07:59:42
1CE-SXA-2BC is identified as Phintelloides scandens Deeleman-Reinhold, Addink & Miller, 2024	Jeremy Miller	03-09-2024 08:01:28
0RA-FVV-2DL is identified as Phintelloides scandens Deeleman-Reinhold, Addink & Miller, 2024	Jeremy Miller	03-09-2024 08:03:22
SZV-FJV-MRM is identified as Phintelloides scandens Deeleman-Reinhold, Addink & Miller, 2024	Jeremy Miller	03-09-2024 08:05:10
FEE-JQY-GA4 is identified as Phintelloides scandens Deeleman-Reinhold, Addink & Miller, 2024	Jeremy Miller	03-09-2024 08:07:08
C69-M7K-VWC is identified as Phintelloides versicolor (C. L. Koch, 1846)	Jeremy Miller	03-09-2024 08:17:42
3NW-1BX-8BK is identified as Phintelloides versicolor (C. L. Koch, 1846)	Jeremy Miller	03-09-2024 08:19:38
M42-Z4P-DRD is identified as Phintelloides versicolor (C. L. Koch, 1846)	Jeremy Miller	03-09-2024 08:21:09
5MR-J6N-26M is identified as Phintelloides versicolor (C. L. Koch, 1846)	Jeremy Miller	03-09-2024 08:22:53
Q6C-91C-BS5 is identified as Phintelloides versicolor (C. L. Koch, 1846)	Jeremy Miller	03-09-2024 08:24:26
BDJ.12.e129438 cites G0G-G7D-N5J	Jeremy Miller	03-09-2024 08:28:02
BDJ.12.e129438 cites PER-LNE-HEW	Jeremy Miller	03-09-2024 08:29:54
BDJ.12.e129438 cites HS2-8W8-F23	Jeremy Miller	03-09-2024 08:31:53
BDJ.12.e129438 cites SGZ-EFZ-VRK	Jeremy Miller	03-09-2024 08:34:09
BDJ.12.e129438 cites 67X-9R9-YCM	Jeremy Miller	03-09-2024 08:35:51
BDJ.12.e129438 cites 6H9-R1R-330	Jeremy Miller	03-09-2024 08:37:25
BDJ.12.e129438 cites WL8-0R1-42B	Jeremy Miller	03-09-2024 08:39:22
BDJ.12.e129438 cites VYQ-YW1-AGE	Jeremy Miller	03-09-2024 08:41:07

BDJ.12.e129438 cites Z2J-WMP-FDH	Jeremy Miller	03-09-2024 08:42:33
BDJ.12.e129438 cites B59-03B-FWV	Jeremy Miller	03-09-2024 08:44:16
BDJ.12.e129438 cites SVV-BR5-KGE	Jeremy Miller	03-09-2024 08:45:49
BDJ.12.e129438 cites 5SG-PLB-MHT	Jeremy Miller	03-09-2024 08:47:36
BDJ.12.e129438 cites 85R-G3E-4M0	Jeremy Miller	03-09-2024 08:49:16
BDJ.12.e129438 cites 85R-G3E-4M0	Jeremy Miller	03-09-2024 08:49:16
BDJ.12.e129438 cites 1CE-SXA-2BC	Jeremy Miller	03-09-2024 08:52:59
BDJ.12.e129438 cites 0RA-FVV-2DL	Jeremy Miller	03-09-2024 08:54:22
BDJ.12.e129438 cites SZV-FJV-MRM	Jeremy Miller	03-09-2024 08:55:51
BDJ.12.e129438 cites FEE-JQY-GA4	Jeremy Miller	03-09-2024 08:57:24
BDJ.12.e129438 cites C69-M7K-VWC	Jeremy Miller	03-09-2024 08:59:12
BDJ.12.e129438 cites 3NW-1BX-8BK	Jeremy Miller	03-09-2024 09:01:22
BDJ.12.e129438 cites M42-Z4P-DRD	Jeremy Miller	03-09-2024 09:02:50
BDJ.12.e129438 cites 5MR-J6N-26M	Jeremy Miller	03-09-2024 09:04:14
BDJ.12.e129438 cites Q6C-91C-BS5	Jeremy Miller	03-09-2024 09:06:45
MDR-6FG-49E is identified as Phintelloides minuta (Bösenberg & Strand, 1906) sec. Deeleman-Reinhold, Addink & Miller 2024	Jeremy Miller	03-09-2024 09:09:34
BDJ.12.e129438 cites MDR-6FG-49E	Jeremy Miller	03-09-2024 09:11:10