



Until dirt do us apart: On the unremarkable palp morphology of the spider *Sternospina concretipalpis* Schmidt & Krause, 1993, with comments on the genus *Prionolaema* Simon, 1894 (Araneae, Tetragnathidae)

DIMITAR DIMITROV¹, FERNANDO ÁLVAREZ-PADILLA^{1,2} & GUSTAVO HORMIGA¹

¹ Department of Biological Sciences, The George Washington University, Washington, D.C. 20052, USA.

E-mail: dimitard@gwu.edu, hormiga@gwu.edu

² Schlinger Chair of Arachnology Postdoctoral Fellow, California Academy of Sciences, Department of Entomology, 875 Howard Street, San Francisco, CA 94103, USA. E-mail: falvarezpadilla@calacademy.org

Abstract

Examination of the holotype of the tetragnathid spider *Sternospina concretipalpis* Schmidt & Krause, 1993 demonstrates that the extraordinary claim by the authors of the original description of this species that the male palps are fused is unfounded. The monotypic genus *Sternospina* Schmidt & Krause, 1993 is a junior synonym of *Tylorida* Simon, 1894 and *S. concretipalpis* is a junior synonym of the common species *Tylorida striata* (Thorell, 1877). The genus *Prionolaema* Simon, 1894 is a junior synonym of *Tetragnatha* Latreille, 1804, resulting in two new combinations, *Tetragnatha aetherea* (Simon, 1894) and *T. gracilis* (Bryant, 1923). *Tetragnatha earmra* Levi, 1981 is a junior synonym of *Tetragnatha gracilis* (Bryant, 1923).

Key words: spiders, Tetragnathidae, systematics, Antigua, Comoros Islands

Introduction

The family Tetragnathidae is a lineage of orb weaving spiders whose members are often found in vegetation near bodies of fresh water, such as lakes, small streams and rivers. Currently there are 51 valid genera of tetragnathids listed in Platnick's catalog (2008). Most of the species diversity of the family is concentrated in the tropics, although some genera, like *Leucauge* and *Tetragnatha*, are widely distributed. Despite recent efforts to elucidate tetragnathid systematics (e.g., Álvarez-Padilla, 2007; Dimitrov and Hormiga, in press; Tanikawa, 2001) there are still many poorly known genera awaiting systematic revision. This paper deals with two such genera, *Sternospina* Schmidt & Krause, 1993 and *Prionolaema* Simon, 1894. The case of *Sternospina* is rather exceptional, as according to the authors of the original description the only species of this genus, *Sternospina concretipalpis* Schmidt & Krause, 1993, is unique among spiders in having both palps fused together (Schmidt and Krause, 1993). Presumably the left and right male palps are fused in the area of the tibia and only one of them develops the rest of the palpal structures (cymbium, tegular and embolic divisions). Although palpal asymmetry is rare in spiders, it has been described in some pholcid species belonging to the genus *Metagonia* (Huber, 2004), in which both palps develop but they differ in size and probably in function. In contrast, "palpal fusion," as described by Schmidt and Krause (1993) for *S. concretipalpis*, has never been documented in the scientific literature. The genus *Prionolaema* was described by Simon (1894) based on a subadult male specimen from Venezuela (Fig. 2A–B); this practice alone invites skepticism about the validity of the genus as now we know that characters, such as eye pattern, which at the time were considered very

important, can actually be quite variable. Furthermore, the somatic morphology of this specimen is consistent with *Tetragnatha* providing arguments to transfer it to the latter.

Materials and methods

All specimens used for this study come from the museum collections listed at the end of this section. Digital photographs of the Paris museum specimens were taken by one of us (FAP) with a Nikon Coolpix 995 camera while visiting collections. Morphological methods of study follow those previously described in Hormiga (1994, 2000). Specimens were examined and illustrated using Leica MZ16 and Leica MZ16A stereoscopic microscopes with a camera lucida. A Leica DMRM compound microscope with a drawing tube was also used to examine and illustrate morphological structures. Drawings were done with graphite pencils on an acid-free cotton paper. Hairs and macrosetae are not depicted in the final drawings. For male palp illustrations the left palp was used. All pencil drawings were scanned and further improved with the help of the Gimp 2.2.10 program. Digital images of the specimens on loan were taken using a Leica MZ16A stereoscopic microscope with a Nikon DXM1200F digital camera. A Z-series of partially focused images were processed with the Auto-Montage 4.02.0014 program to produce final images with enhanced quality.

Abbreviations used in text and figures:

C	conductor
CB	cymbium
CD	copulatory duct
E	embolus
P	paracymbium
S	spermatheca
ST	subtegulum
T	tegulum

Museum collections

MNHM	Muséum National d'Histoire Naturelle, Paris, France
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, USA
RMCA	Royal Museum for Central Africa, Tervuren, Belgium

Results

Taxonomy

Genus *Tylorida* Simon, 1894

Type species: *Tylorida striata* (Thorell, 1877)

Sternospina Schmidt & Krause, 1993 **new synonymy**

The type species of the monotypic genus *Sternospina* is a junior synonym of the common species *Tylorida striata* (Thorell, 1877), which renders the former genus a junior synonym of *Tylorida* (see below).

***Tylorida striata* (Thorell, 1877)**

(Fig. 1 A–D)

Meta striata Thorell, 1877b: 427

Meta striata Hasselt, 1882: 25.

Argyropeira bigibba Thorell, 1887: 140.

Argyropeira s. Thorell, 1887: 142.

T. striata Simon, 1894a: 737, f. 809.

Argyropeira s. Workman & Workman, 1894: 19, pl. 19.

T. magniventer Bösenberg & Strand, 1906: 187, pl. 15, f. 397.

T. striata Bösenberg & Strand, 1906: 187, pl. 15, f. 420.

Sternospina concretipalpis Schmidt and Krause, 1993: 7, f. 1. **New synonymy**

N.B. See Platnick (2008) for complete list of citations.

Types. *Tylorida striata*: The location of the Thorell's type is uncertain but most likely it is deposited in the Natural History Museum of the city of Geneva (Levi, unpublished notes) – not examined. *Sternospina concretipalpis*: male holotype from the Comoros Islands, Grande Comore, Boboni, 625 m, 28.xi.1983, R. Jocqué (RMCA 160.838, examined).

Justification of the transfer: Detailed study of the *S. concretipalpis* type shows that this specimen has all diagnostic characteristics of *T. striata*, including the shape of the conductor and embolus, the spermatic duct path, the shape of the paracymbium and the cymbium dorso-basal process (Fig. 1A–B). Although we did not examine the type of *T. striata*, there are numerous good illustrations of this species available in the literature to facilitate identification (e.g., Chrysanthus, 1963; 1975; Davies, 1998; Tanikawa, 2004). The palpal fusion mentioned by Schmidt and Krause (1993) proved to be a misinterpretation, probably as a result of the bad condition of the specimen. The two palps are not fused, but one of them lacks the cymbium together with the tegular and embolic divisions (see below). Based on these observations, we transfer *S. concretipalpis* to *Tylorida* and as a consequence the former genus becomes a junior synonym of *Tylorida*.

Another three species of *Tylorida* have distribution ranges close (or including) the Comoro Islands: *T. ventralis* (Thorell, 1877), *T. culta* (O. P.-Cambridge, 1869) and *T. mornensis* (Benoit, 1978). The three of them, however, have very different spermatic duct paths. Additionally, *T. culta* differs in having an elongated and mostly cylindrical abdomen while *T. mornensis* has a distinctive dark marking on the abdomen.

In the original description of *S. concretipalpis*, the authors claim that both palps are fused; if true this would be unique among spiders, as such a remarkable morphological feature has never been described for a spider (or any other arachnid, for that matter). Detailed study of the only available specimen indicates that this statement was a misinterpretation. The right palp of the specimen is broken and is missing all sclerites distal to the tibia (Fig. 1C–D). The left palp is slightly damaged (the tegulum is partially broken) but all structures can be observed (Fig. 1A–D). Several cotton fibers were holding the remains of the right palp to the cymbium of the left one, thus superficially giving the impression that both are connected, but careful examination of the specimen after removing the cotton fibers demonstrated that the two palps are not more fused together than they are in any other spider species.

The record of *T. striata* on the Comoro Islands broadens considerably westwards the known distribution range for this species which is known from China to Australia. This distribution is quite unusual considering the fact that there are no records of this species from the Indian peninsula. The disjunction may be an artifact resulting from fragmentary knowledge of the real geographic distribution of *T. striata*.

Genus *Tetragnatha* Latreille, 1804

Type species: *Tetragnatha extensa* (Linnaeus, 1758)

Prionolaema Simon, 1894 **new synonymy**

The genus *Prionolaema* Simon, 1894 is a junior synonym of *Tetragnatha* Latreille, 1804 as the only two species in the genus are members of *Tetragnatha*. This synonymy has resulted in two new combinations (see below).

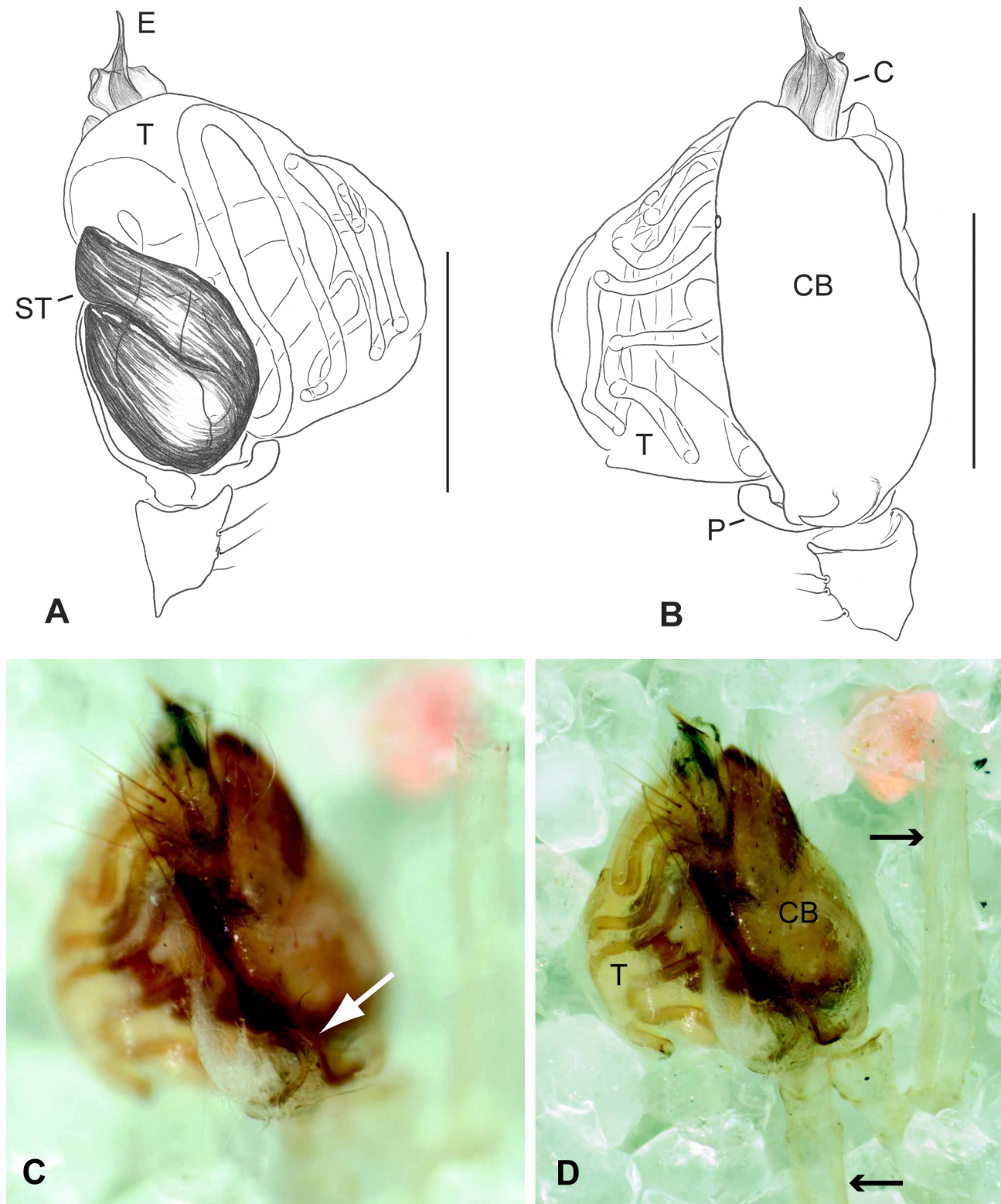


FIGURE 1. *Tylorida striata* (Thorell, 1877), male palps (Schmidt and Krause's *S. concretipalpis* holotype): A, left, ventral. B, left palp before separating it from the remains of the right palp, retrolateral. C, close up of right palp tibia, retrolateral (arrow points to the distal edge of the right tibia missing the cymbium). D, left palp, retrolateral (left femur labeled by right pointing arrow; femur of incomplete right palp labeled by left pointing arrow). Scale bars 0.5.

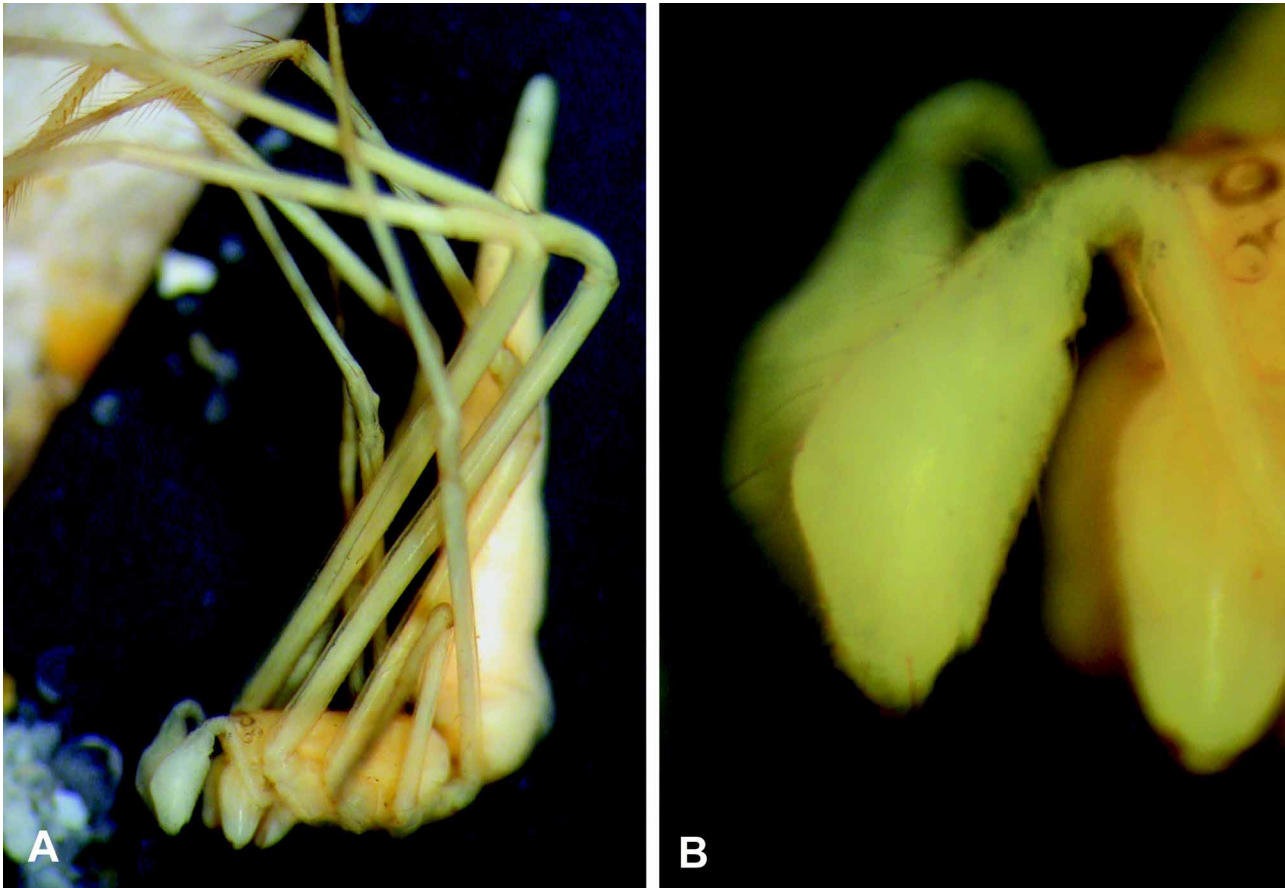


FIGURE 2. *Tetragnatha aetherea* (Simon, 1894), subadult male (holotype). A, habitus, lateral. B, palp, prolateral.

Justification of the synonymy: The original description of *Prionolaema* is based on a subadult male specimen that, unfortunately, does not allow the examination of palpal morphology. As a result several somatic characters are cited in the diagnosis to differentiate this genus from *Tetragnatha*. The first and most important diagnostic character refers to the eye pattern of *Prionolaema* which has contiguous lateral eyes. Contiguous lateral eyes, however, are also observed in several *Tetragnatha* species. For example, the Hawaiian species *Tetragnatha maka* Gillespie, 1994 and *Tetragnatha kea* Gillespie, 1994 have the same eye pattern. The wider than longer labium with laminar portion of *Prionolaema* is not different from the morphology of the labium of *Tetragnatha*. The same is true for the other characters listed as diagnostic for *Prionolaema* such as the long and slender palp and the shape of the abdomen. Many *Tetragnatha* species are known to have elongated conical abdomens as the one observed in *Prionolaema*. Based on these observations we consider the decision to regard *Prionolaema* as a junior synonym of *Tetragnatha* fully justified.

***Tetragnatha aetherea* (Simon, 1894) new combination**
(Fig. 2 A–B)

Prionolaema aetherea Simon, 1894a: 725.

P. a. Simon, 1895g: 150.

Types. Subadult male holotype from Venezuela, collected in Tovar (MNHN 10128, examined).

Justification of the transfer: The type specimen of this species is a subadult male which makes impossible the study of the adult palpal morphology (Fig. 2A–B). However, based on general somatic morphology (eyes dis-

tribution, abdomen shape, cheliceral shape and lack of feathered trichobothria on femora IV) this specimen should be placed in the genus *Tetragnatha*.

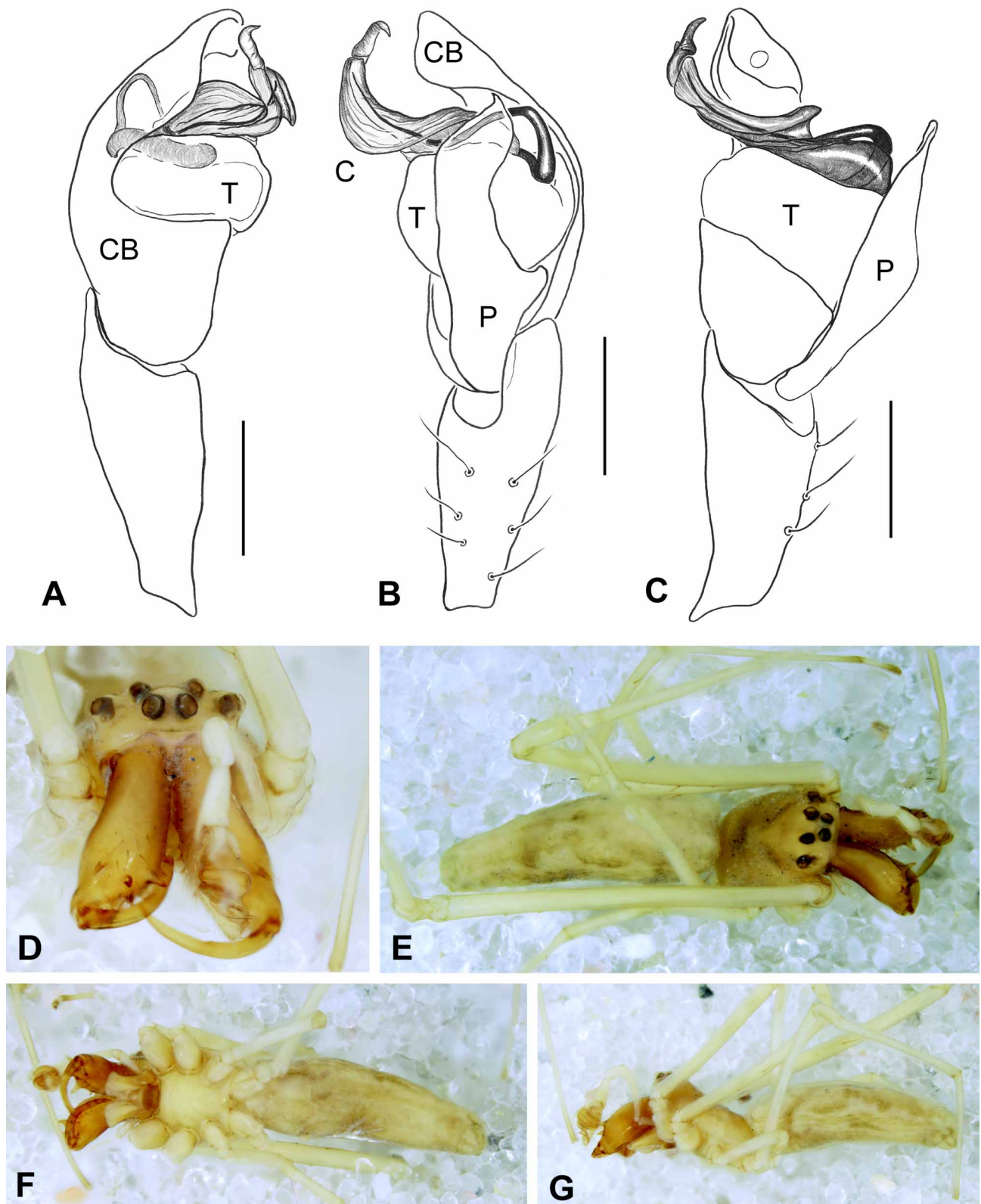


FIGURE 3. *Tetragnatha gracilis* (Bryant, 1923), male (syntype). A, left palp, ventral. B, retrolateral. C, prolateral. D, chelicerae, frontal view. E, habitus, dorsal. F, ventral. G, lateral. Scale bars 0.2.

***Tetragnatha gracilis* (Bryant, 1923) new combination**
(Fig. 3 A–G; Fig. 4 A–C)

Prionolaema gracilis Bryant, 1923: 11, pl. 1, f. 3

T. earmra Levi, 1981: 294, f. 35–45, pl. 5c. **New synonymy**

Types. *Prionolaema gracilis*: four syntypes from Antigua and Barbuda, Antigua, University of Iowa Expedition vi.1918 (MCZ 21481, examined). *Tetragnatha earmra*: male holotype from USA, Florida, Dade Co., Everglades Natl. Park, Earmra, SE Island. 28.i.1973, (MCZ 21149, examined).

Justification of the transfer: Detailed examination of syntypes of *P. gracilis* (Fig. 3 A–G) suggests that these animals belong to the genus *Tetragnatha*. Further comparison of male palpal morphology (Fig. 3 A–C) with drawings and the type material of *T. earmra* confirmed that these specimens belong to the same species. The female genital morphology is also as in *T. earmra* (Fig. 4 A–C). Based on these observations we consider the transfer of *P. gracilis* fully justified. The species *T. earmra* should be regarded as a junior synonym of *P. gracilis*.

Despite its relatively smaller chelicerae, compared to other *Tetragnatha* species, all other characters clearly place this species in the genus *Tetragnatha*. Not surprisingly, Bryant (1923) was uncertain of the generic placement of *gracilis*: “I am not quite satisfied as to the generic position of this species.” The finding of *T. gracilis* on the island of Antigua broadens southward the known distribution of this species, which before this study was known only from Florida.

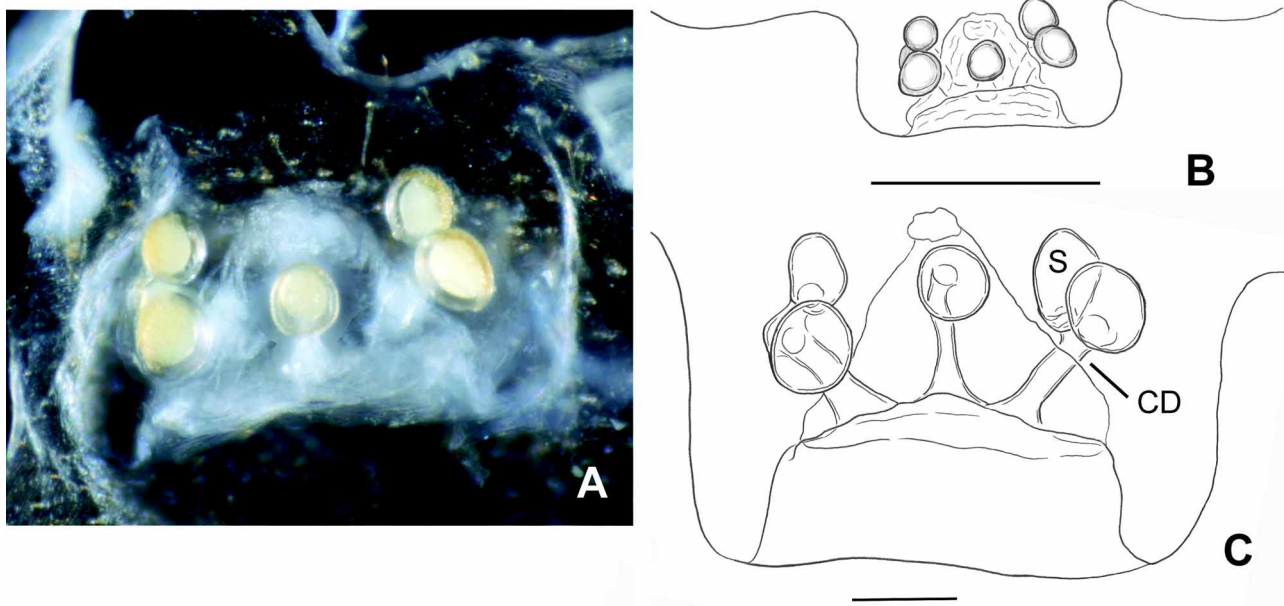


FIGURE 4. *Tetragnatha gracilis* (Bryant, 1923), female (syntype). A, B, vulva dorsal. C, vulva, schematic drawing in dorsal view. Scale bars: B, 0.5; C, 0.1.

Acknowledgements

Many thanks to Lara Lopardo for reading and discussing an earlier draft of this manuscript. For specimen loans we would like to thank the following curators and institutions: Gonzalo Giribet, Museum of Comparative Zoology, Harvard University (Cambridge); Christine Rollard, Musée National d'Histoire Naturelle (Paris) and Rudy Jocqué, Royal Museum for Central Africa (Tervuren). Norman Platnick and Lou Sorkin helped with some of the references. Nikolaj Scharff and two anonymous reviewers provided helpful comments and correc-

tions to an earlier version of this paper. Funding for this research has been provided by a PEET grant from the U.S. National Science Foundation (DEB-0328644 to G. Hormiga and G. Giribet) and by Research Enhancement Fund and Selective Excellence grants from The George Washington University to G. Hormiga.

References

- Álvarez-Padilla, F. (2007) Taxonomic revision of the spider genus *Metabus* (Araneae: Tetragnathidae) with comments on the tetragnathid fauna of Chile and the phylogeny of Tetragnathidae. *Zoological Journal of the Linnaean Society*, 151, 285–335.
- Bryant, E.B. (1923) Report on the spiders collected by the Barbados-Antigua Expedition from the University of Iowa in 1918. *University of Iowa Studies in natural History*, 10, 10–16.
- Chrysanthus, P. (1963) Spiders from south New Guinea V. *Nova Guinea* (N.S., Zool.), 24, 727–750.
- Chrysanthus, P. (1975) Further notes on the spiders of New Guinea II (Araneae, Tetragnathidae, Theridiidae). *Zoologische Verhandlungen Leiden*, 140, 1–50.
- Davies, V.T. (1988) An illustrated guide to the genera of orb-weaving spiders in Australia. *Memoirs of the Queensland Museum*, 25, 273–332.
- Dimitrov, D. & Hormiga, G. (In press) Revision and cladistic analysis of the orbweaving spider genus *Cyrtognatha* Keyserling, 1881 (Araneae, Tetragnathidae). *Bulletin of the American Museum of Natural History*.
- Hormiga, G. (1994) A revision and cladistic analysis of the spider family Pimoidae (Araneae: Araneoidea). *Smithsonian Contributions to Zoology*, 549, 1–105.
- Hormiga, G. (2000) Higher level phylogenetics of erigonine spiders (Araneae, Linyphiidae, Erigoninae). *Smithsonian Contributions to Zoology*, 609, 1–160.
- Huber, B.A. (2004) Evidence for functional segregation in the directionally asymmetric male genitalia of the spider *Metagonia mariguitarensis* (Gonzalez-Sponga) (Pholcidae: Araneae). *Journal of Zoology*, London, 262, 317–326.
- Levi, H.W. (1981) The American orb-weaver genera *Dolichognatha* and *Tetragnatha* north of Mexico (Araneae: Araneidae, Tetragnathinae). *Bulletin of the Museum of comparative Zoology Harvard*, 149, 271–318.
- Platnick, N.I. (2008) The world spider catalog, version 8.5. American Museum of Natural History, online at <http://research.amnh.org/entomology/spiders/catalog/index.html>
- Schmidt, G.E.W. & Krause, R.H. (1993) Spinnen von den Komoren III: Tetragnathinae und Metinae (Araneida: Araneidae). Teil I. *Arachnologisches Magazin*, 1, 4–9.
- Schmidt, G.E.W. & Krause, R.H. (1994) Spinnen von den Komoren III: Tetragnathinae und Metinae (Araneida: Araneidae). *Arachnologisches Magazin*, 2(Sonderausgabe 1), 3–25 (reprint of Schmidt & Krause, 1993).
- Simon, E. (1894) *Histoire naturelle des araignées*. Paris, 1, 489–760.
- Simon, E. (1895) Etudes arachnologiques. 26e. XLI. Descriptions d'espèces et de genres nouveaux de l'ordre des Araneae. *Annales de la Société Entomologique de France*, 64, 131–160.
- Tanikawa, A. (2004) Japanese spiders of the genus *Tylorida* (Araneae: Tetragnathidae). *Acta arachnologica*, Tokyo, 53, 151–154.
- Tanikawa, A. (2001) *Okileucauge sasakii*, a new genus and species of spider from Okinawajima Island, southwest Japan (Araneae, Tetragnathidae). *Journal of Arachnology*, 29, 16–20.