A new species of *Tekellina* (Araneae, Araneoidea) from the Russian Far East

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A new species, *Tekellina yoshidai* **sp. n.**, is described based on the holotype female from the Maritime Province of Russia. It is the first record of the genus in Russia and the northernmost record in the entire range. The new species is most similar to *T. sadamotoi* Yoshida & Ogata, 2016 from Japan. Figures are provided for both species. The male palp of *T. sadamotoi* was studied with a SEM. It was found that palpal sclerites in *T. sadamotoi* and other *Tekellina* species are incorrectly homologized. Judging from the structure of the male palp and the female palpal claw, *Tekellina* seems to be misplaced in Theridiidae and belongs elsewhere.

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1. Introduction

Tekellina Levi, 1957 is a small genus of araneoid spiders with eight named species (World Spider Catalog 2017) that are currently placed in Theridiidae. The genus has a rather unusual geographic distribution: Florida (1 species), Brazil (5), China (1) and Japan (1). All species are well illustrated, but *Tekellina* has never been revised, and the species from different biogeographical realms have never been compared with one another. Judging from the shape of the copulatory organs (i.e. medio-lateral or even basal but not anterior position of "paracymbium" with a pit or furrow in "paracymbium", lack of copulatory ducts in Asian and two Brazilian species, etc.) and the distribution, the genus is most likely not monophyletic, and at least some species may not belong to Theridiidae.

While studying spiders from the Russian Far East we faced difficulties identifying a small, theridiid-like spider with an epigyne resembling *Howaia* Lehtinen & Saaristo, 1980, a genus belonging to Nesticidae. A recent publication by Yoshida and Ogata (2016) with a well-illustrated *Tekellina sadamotoi* Yoshida et Ogata, 2016 allowed us to identify our specimen as *Tekellina sensu lato*, a genus previously unknown in Russia. Comparison of the epigyne of our specimen to the figures in Yoshida and Ogata (2016) led us to conclude that we have an undescribed species, the description of which is given below.

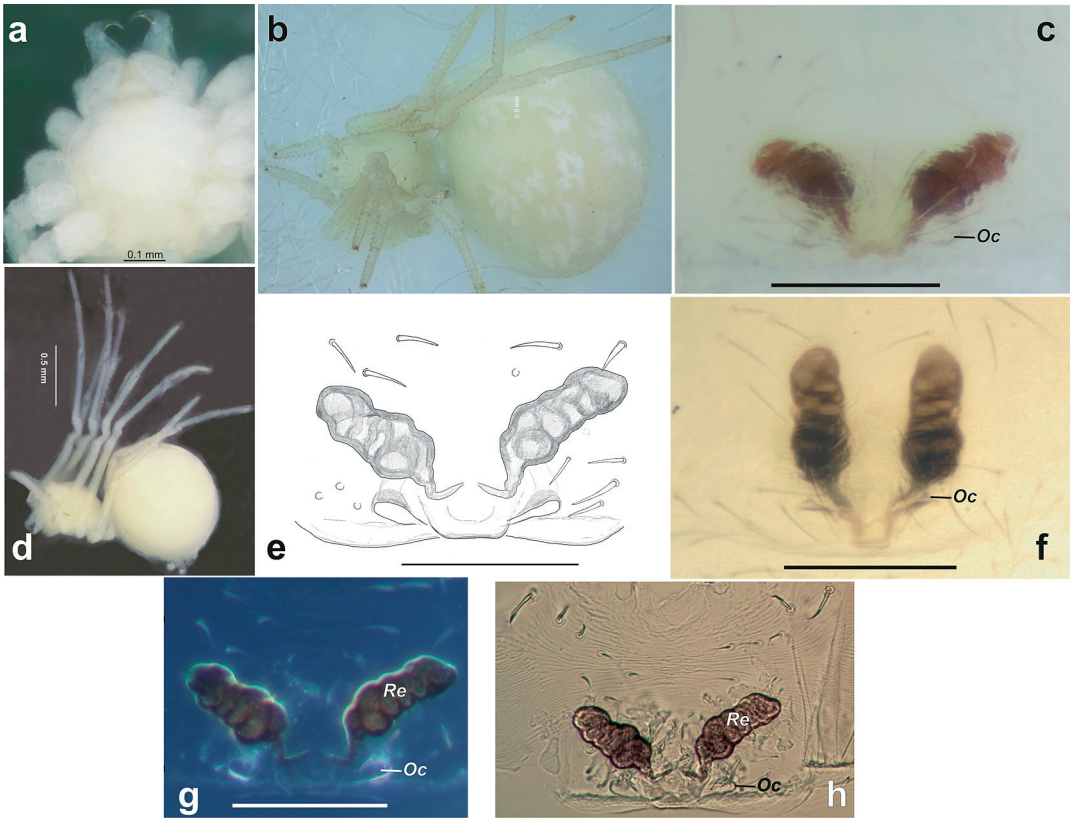

Fig. 1. Habitus and epigyne of *Tekellina yoshidai* **sp. n.** (a–e, g–h) and *T. sadatamoi* (f). – a. Prosoma, ventral, showing toothless chelicera and shape of sternum and mouthparts. – b. Habitus, dorsal. – c, f. Intact epigyne, ventral. – d. Habitus, lateral. – e, g, h. Macerated epigyne, ventral. Scale = 0.1 mm if not otherwise indicated. Abbreviations: *Re*, receptacle; *Oc*, copulatory opening.

2. Materials and methods

Specimens were photographed with a Canon EOS 7D camera attached to an Olympus SZX16 stereomicroscope, Pro-Microscan camera attached to the Olympus BH-2 and with a SEM JEOL JSM-5200 scanning microscope at the Zoological Museum, University of Turku, Finland. Digital images were montaged using CombineZP and Helicon focus 3.10 image stacking software. Epigynes were cleared in a KOH/water solution until soft tissues were dissolved.

Standard abbreviations are used for leg segments: Fe femur, Pa patella, Ti tibia, Mt metatarsus, Ta tarsus. The measurements are in mm. The holotype and comparative material will be deposited in the Zoological Museum of Moscow State University (ZMMU).

3. Taxonomy

3.1. Description of *Tekellina yoshidai* sp. n. (Figs 1a–e, g–h, 2e–f, 3)

Type material. Holotype ♀ (ZMMU), Russia, Maritime Prov., some 30 km E of Ussuriysk, Kamenushka Vill., 43°36.45'N 132°13.60'E, 29.VIII.2001, Y. M. Marusik leg.

Diagnosis. The new species is most similar to *T. sadamotoi*, from which it can be distinguished by its large size (carapace 0.57 long *vs* 0.45) and the shape of the epigyne. The receptacles of *T. yoshidai* **sp. n.** are strongly divergent (Fig. 1c, e, g–h) *vs*. parallel in *T. sadamotoi* (Fig. 1f). *Tekellina yoshidai* **sp. n.** is well differentiated from another Asian congener, *T. helixicis* Gao et Li, 2014, by having much shorter receptacles with

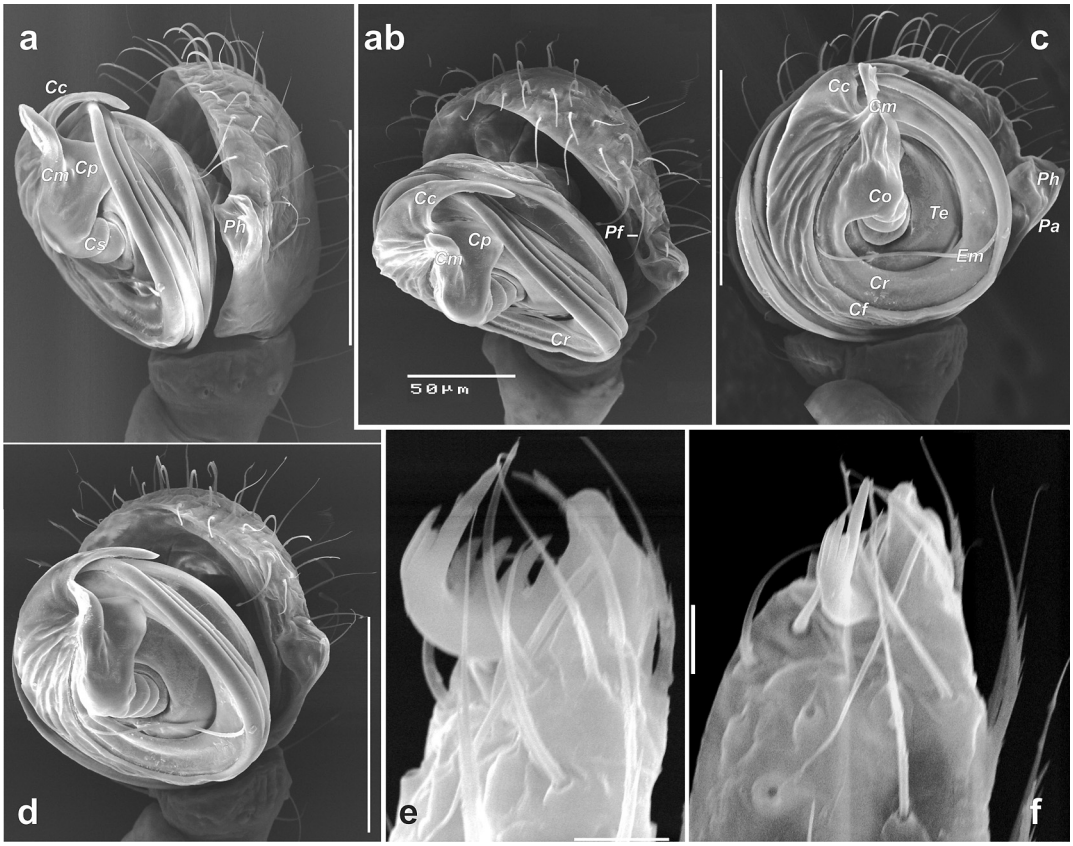

Fig. 2. Male palp of *Tekellina sadatamoi* (a–d) and female palp of *T. yoshidai* **sp. n.** (e–f). – a. Male palp, retrolateral. – b, c. Same, anterior and ventral. – d. Same, antero-ventral. – e, f. Palpal tarsus, lateral and dorsal. Scale = 0.1 mm if not otherwise indicated. Abbreviations: *Cc*, terminal claw like arm; *Cm*, mesal arm; *Co*, conductor; *Cp*, plate-like arm; *Cr*, coiled ribbon shaped arm; *Cs*, stem of conductor; *Em*, embolus; *Pa*, paracymbium; *Ph,* paracymbium hollow; *Te*, tegulum.

fewer loops (about 20 in *T. helixicis*, *cf.* figs 71c,d, 73a,b in Gao et Li 2014).

Description. Female. Total length 1.5. Carapace 0.57 long, 0.45 wide, whitish, pale, without pattern. Chelicerae toothless (Fig. 1a). Claws on legs and palps dark, distinct on the background of whitish, pale legs. Palpal claw bent, uniseriate, with 7 teeth, 6 teeth lateral and 1 dorsal (Fig. 2e–f). Leg and palp measurements in Table 1. Abdomen wider (1.14) and higher (1.0) than long (0.94), with almost indistinct pattern, composed of white guanine spots. Epigyne as in Fig. 1c, e, g–h: Copulatory openings (*Oc*) slit like, separated by more than their length. Receptacles (*Re*) easily visible through integument, heavily sclerotized, about 3 times longer than wide, strongly divergent, twisted around axis and forming about 4 coils.

Etymology. The species is named after the late Hajime Yoshida (Yamagata, Japan) for his great contribution in the study of East Asian Theridiidae.

Distribution. Type locality only (Fig. 3).

3.2. Description of the male palp of *Tekellina sadamotoi* Yoshida et Ogata, 2016 (Figs 1f, 2a–d, 3a)

Tekellina sadamotoi Yoshida & Ogata, 2016: 15, f. 1–13 (♂♀).

Material examined. 2♂ 2♀ (ZMMU), Japan, Tokyo, Musasashi-murrayama-shi, Kishi, 26.XII. 2016, Takeaki Ichikawa leg.

Diagnosis. See the diagnosis for *T. yoshidai* **sp. n.**

Table 1. Leg and palp measurements (mm) of *Tekellina yoshidai* **sp. n.** (holotype female). Abbreviations: Fe, femur; Pa+Ti, patella + tibia; Mt, metatarsus; Ta, tarsus.

	Fe	Pa+Ti	Mt	Ta	Total
Palp	0.2	0.19		0.19	0.58
I	0.73	0.71	0.39	0.24	2.07
II	0.73	0.71	0.39	0.25	2.08
III	0.64	0.43	0.31	0.24	1.62
IV	0.73	0.64	0.36	0.24	1.97

Description. Described by Yoshida and Ogata (2016). Here we provide a description of the male palp examined with a scanning electron microscope. Male palp as in Fig. 2a–d, with an almost round cymbium; cymbium with semicircular paracymbium (*Pa*) in mid part of retrolateral margin, paracymbium with shallow hollow (*Ph*) and prolateral furrow (*Pf*); bulb discoid, ventral part of tegulum flat, most of tegular (*Te*) surface covered with coiled ribbon-shaped conductor (*Co*) originating from centre of tegulum; stem of conductor (*Cs*) corkscrew in shape, with at least 3 loops; conductor with 4 arms: coiled ribbon-shaped arm (*Cr*) directed counter-clockwise, terminal claw like arm (*Cc*) directed clockwise, mesal arm (*Cm*) directed ventro-anteriorly, and a plate like arm (*Cp*) lying on the ribbon-shaped arm; embolus (*Em*) filamentous, coiling several times, hidden by fold of conductor (*Cf*); fold of conductor serves as a sheath.

Distribution. Known only from Japan (Fig. 3a).

Note. In addition to the description of the male palp, Fig. 1f of the female epigyne is provided for comparison with *T. yoshidai* **sp. n.**

4. Discussion

There are certain doubts whether *Tekellina*, even its type species *T. archboldi* Levi, 1957 from Florida, belongs to Theridiidae. *Tekellina* species lack cheliceral teeth, a character known only in *Latrodectus* and Hadrotarsinae (see Agnarsson

Fig. 3. – a. Distribution records of *Tekellina* species. – b. Type locality of *T. yoshidai* **sp. n.**

2004), have the "paracymbium" located medially (Fig. 2a–d) or even basally, but not anteriorly as in all Theridiidae. Additionally, the "paracymbium" has a pit (cf. fig. 7 in Levi 1957 and figs 1, 7, 9, 13 in Marques & Buckup 1993) or furrow (Fig. 2b).

It appears that the palpal sclerites in *Tekellina* have been incorrectly homologized due to its very small size. The present study of the male palp of *T. sadatamoi* by SEM microscopy revealed that the sclerites previously designated as the embolus (E), conductor (C) and theridiid tegular apophysis are in fact three different arms of the conductor: ribbon-shaped arm (*Cr*), mesal arm (*Cm*) and claw like arm (*Cc*). Levi (1957) indicated a palpal radix (R) and median apophysis (M) on *T. archboldi*, which we refer to as the mesal arm (*Cm*) and ribbon-shaped arm (*Cr*), respectively.

The three Asian *Tekellina* species, including the one described here, have the receptacles twisted about the axis and lack tube like sclerotized copulatory ducts that are well separated from the receptacles, a conformation known in the two New World species (cf. fig. 11 in Levi 1957 and figs 11–12 in Marques and Buckup 1993).

The shape of the conductor in the Asian *Tekellina* species is similar to that in Nesticiellini (Nesticidae), and particularly *Hamus* Ballarin et Li, 2015 and *Nescina* Ballarin et Li, 2015 (see Lin *et al*. 2016). Nesticellini also have a conductor with three arms, but the ribbon-shaped arm (or prolateral arm) is much shorter than in *Tekellina* and the embolus is not hidden by the conductor. Although the two groups are similar in the shape of the conductor, other characters are very different. Nesticidae have an elongated paracymbium at the base of the cymbium with at least two processes (not elongated, not basal, and no processes of paracymbium in *Tekellina* Fig. 2a–d), strong, and almost straight and symmetrical palpal claw in the female (bent and asymmetrical in *Tekellina*, Fig. 2e–f). In Nesticidae, the epigyne has a median plate, which is lacking in *Tekellina* (Figs 1c–h).

Currently, we cannot clarify the position of *Tekellina* among other Araneoidea, but only doubt its position within any described subfamilies of Theridiidae.

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