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OKILEUCAUGE SASAKII, A NEW GENUS AND SPECIES OF SPIDER FROM OKINAWAJIMA ISLAND, SOUTHWEST JAPAN (ARANEAE, TETRAGNATHIDAE)

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ABSTRACT. Several specimens of a unique spider were collected in Okinawajima Island, Southwestern Japan. They resemble the spiders of the genus *Leucauge* and its related genera. Phylogenetic analysis was performed to clarify the taxonomic position of the spider, which showed that the focal spider is a sister of a monophyletic group consisting of *Tylorida* and *Mesida.* Therefore it is described as a new genus and species under the name *Okileucauge sasakii* new species. This species lacks the rows of trichobothria on femur IV, which is the synapomorphy of the genera *Tylorida* and *Mesida.*

Keywords: *Okileucauge sasakii*, new genus, new species, Tetragnathidae

In the spring of 1997, I collected several specimens of a unique spider in Okinawajima Island, Southwestern Japan. This spider, hereafter called Okinawa spider, looked like a member of the genus *Leucauge* because it was hanging at the center of a horizontal orb-web and had a silver colored abdomen. The features of the male palpal organ, female epigynum and internal genitalia as well as general appearance show that the Okinawa spider is related to the genus *Leucauge*. However, the Okinawa spider lacks the rows of trichobothria on femur IV which is a conspicuous feature of the genus *Leucauge* and its related genera *Tylorida* and *Mesida*. On the other hand, American spiders of the genus *Metabus,* another related genus, also lack the rows of trichobothria on femur IV. I performed a phylogenetic analysis to clarify the relationship among these spiders. The cladogram shows that the Okinawa spider is a sister of a monophyletic group consisting of the genera *Tylorida* and *Mesida.* The cladogram also shows that *Leucauge* is a sister of the clade Okinawa + *Tylorida* + *Mesida* and that *Metabus* is a sister of the clade Okinawa + *Tylorida* + *Mesida* + *Leucauge.* These results led me to describe the new genus, though it is monotypic.

All the type specimens designated in this paper are deposited in the collection of the Zoological Department of National Science Museum, Tokyo (NSMT).

PHYLOGENETIC ANALYSIS

Methods.—*Taxa used in the analysis:* Spider in question from Okinawajima Island, *Tylorida striata* (Thorell 1877), *Mesida* sp. from Taiwan, *M. argentiopunctata* (Rainbow 1916), *Metabus gravidus* (O. Pickard-Cambridge 1899), *Leucauge subblanda* Bösenberg & Strand 1906, *L. argentina* (Hasselt 1882), *L. granulata* (Walckenaer 1841), *L.* sp. from New Guinea Island, *Metleucauge chikunii* Tanikawa 1992, *Meta nigridorsalis* Tanikawa 1994, *M. reticuroides* Yaginuma 1958, and *Nephila clavata* L. Koch 1878.

Nephila clavata was used as an out group judging from the cladogram made by Hormiga *et al.* (1995). Due to lack of the male specimen of *M. argentiopunctata,* the male characters of the species were judged from the figures made by Davies (1987) as far as possible.

Characters and character states: 1. Trichobothria on femur IV of female: none (0); less than 10 pairs (1); 10 pairs and over (2). 2. Depth of the thoracic groove of female: shallow, bottom visible from above (0); deep, bottom invisible from above (1). 3. Cheliceral teeth on posterior margin of fang furrow of female: 4 (0); 5 (1). 4. Booklung cover of female: partly grooved (0); smooth (1). 5. Color of abdomen of female: without silver color (0); with silver color (1). 6. Seminal receptacles of female: sclerotized (0); not sclerotized (1). 7. Clypeus height: smaller than one AME diameter (0); equal or larger than one AME

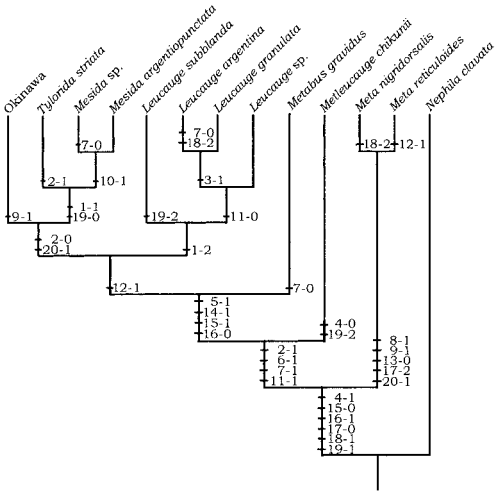


Figure 1.—Minimal length cladogram for the data matrix in Table 1. Length: 39; consistency index: 0.615; retention index: 0.712; rescaled consistency index: 0.438.

diameter. 8. Cheliceral size of the male versus that of the female: same (0); larger (1); smaller (2). 9. Large tooth or modified tooth on fang furrow of male chelicera: absent (0); present (1). 10. Spur on anterior surface of male chelicera: absent (0); present (1). 11. Projection of cymbium of male palp other than paracymbium: absent (0); present (1). 12. Lateral eyes of the male: separate (0); touching (1). 13. Course of reservoir within tegulum of male palp in ventral view: without switchback (0); with switchback (1). 14. Conductor of male palp: well sclerotized, black or dark brown (0); less sclerotized, almost colorless (1). 15. Conductor wraps embolus: absent (0); present (1). 16. Metine embolic apophysis: absent (0); present (1). 17. Paracymbium of male palp: small and finger shaped (0); small and flattened (1); large and modified (2). 18. Macrosetae on patella of male palp: 2 (0); 1 (1); none (2). 19. Length of tibia of male palp: short, tibia/patella less than 1.2 (0); long, tibia/patella 1.2 to 2.0 (1); very long, tibia/patella more than 2.0 (2). 20. Epigynum: well sclerotized (0); weakly sclerotized (1). The data matrix is shown in Table 1.

When Hormiga *et al.* (1995) made a phylogenetic analysis of tetragnathid spiders, 60 characters were used. Of these, 10 characters were also used in the present study (1, 4, 7, 8, 12, 13, 15, 16, 17, 18). The remaining characters were not used because no data were available on the specimens used in the present study or they were uninformative.

Figure 2.—*Okileucauge sasakii* new species, female on a leaf.

Analysis: I used PAUP version. 3.1.1 (Swofford 1993) for the analysis. I used the branch and bound search method. I chose the ACCTRAN, accelerated transformation, for the character optimization. Multistate characters were treated as unordered.

Results.—As a result I obtained the cladogram shown in Fig. 1 (tree length 39; consistency index 0.615; retention index 0.712; rescaled consistency index 0.438). The cladogram shows that *Tylorida* is a sister of *Mesida,* the Okinawa spider is a sister of *Tylorida* + *Mesida,* and *Leucauge* is a sister of Okinawa + *Tylorida* + *Mesida,* and *Metabus* is a sister of Okinawa + *Tylorida* + *Mesida* + *Leucauge.* If the Okinawa spider were placed in any of these genera, that genus would not be a monophyletic group. Thus, I conclude that the new genus should be described for this spider.

DESCRIPTION

Family Tetragnathidae

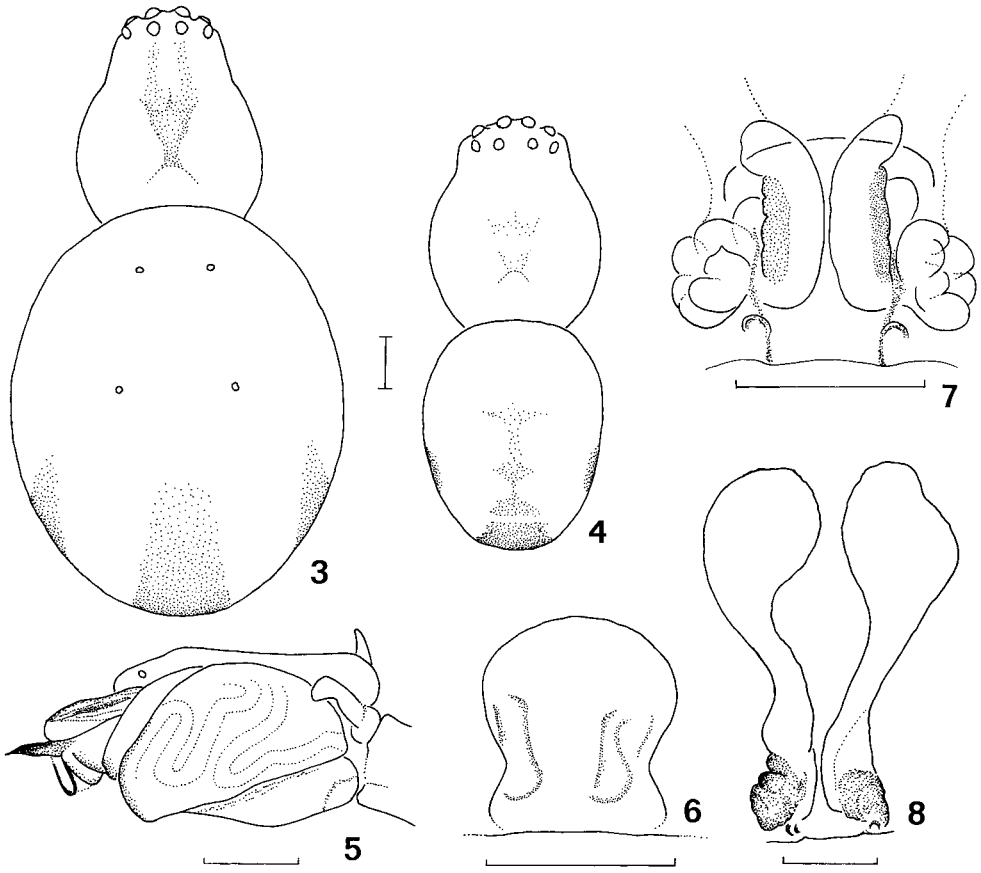
Genus ***Okileucauge*** new genus

Type species.—*Okileucauge sasakii* new species by monotypy.

Diagnosis.—*Okileucauge* is a sister of the group consisting of genera *Tylorida* and *Mesida.* The synapomorphy of the latter group is the presence of rows of trichobothria on femur IV. That is, *Okileucauge* can be separated from the genera *Tylorida* and *Mesida* by the absence of rows of trichobothria on femur IV. The group *Okileucauge* + *Tylorida* + *Mesida* is a sister of *Leucauge.* The synapomorphies

Table 1.—Data matrix (Ok: spider in question from Okinawajima, Ty: *Tylorida striata*, Me1: *Mesida* sp., Me2: *Mesida argentiopunctata*, Mb: *Metabus gravidus*, Le1: *Leucauge subblanda*, Le2: *Leucauge argentina*, Le3: *Leucauge granulata*, Le4: *Leucauge* sp., Ml: *Metleucauge chikunii*, Mt1: *Meta nigridorsalis*, Mt2: *Meta leticuloides*, Ne: *Nephila vlavata*).

Character	Ok	Ty	Me1	Me2	Mb	Le1	Le2	Le3	Le4	Ml	Mt1	Mt2	Ne	States	Step	CI	RI	RC
1	0	1	1	1	0	2	2	2	2	0	0	0	0	3	2	1.00	1.00	1.00
2	0	1	0	0	1	1	1	1	1	1	0	0	0	2	3	0.33	0.60	0.20
3	0	0	0	0	0	0	1	1	0	0	0	0	0	2	1	1.00	1.00	1.00
4	1	1	1	1	1	1	1	1	1	0	1	1	0	2	2	0.50	0.00	0.00
5	1	1	1	1	1	1	1	1	1	0	0	0	0	2	1	1.00	1.00	1.00
6	1	1	1	1	?	1	?	1	1	1	0	0	0	2	1	1.00	1.00	1.00
7	1	1	0	1	0	1	0	1	1	1	0	0	0	2	4	0.25	0.40	0.10
8	0	0	0	0	0	0	0	0	0	0	1	1	0	2	1	1.00	1.00	1.00
9	1	0	0	0	0	0	0	0	0	0	1	1	0	2	2	0.50	0.50	0.25
10	0	0	1	1	0	0	0	0	0	0	0	0	0	2	1	1.00	1.00	1.00
11	1	1	1	1	1	1	0	0	0	1	0	0	0	2	2	0.50	0.80	0.40
12	1	1	1	?	0	1	1	1	1	0	0	1	0	2	2	0.50	0.67	0.33
13	1	1	1	1	1	1	1	1	1	1	0	0	1	2	1	1.00	1.00	1.00
14	1	1	1	1	1	1	1	1	1	0	0	0	0	2	1	1.00	1.00	1.00
15	1	1	1	1	1	1	1	1	1	0	0	0	1	2	2	0.50	0.50	0.25
16	0	0	0	0	0	0	0	0	0	1	1	1	0	2	2	0.50	0.50	0.25
17	0	0	0	0	0	0	0	0	0	0	2	2	1	3	2	1.00	1.00	1.00
18	1	1	1	1	1	1	2	1	1	1	2	1	0	3	3	0.67	0.00	0.00
19	1	0	0	?	1	2	1	1	1	2	1	1	0	3	4	0.50	0.33	0.17
20	1	1	1	1	0	0	0	0	0	0	1	1	0	2	2	0.50	0.80	0.40



Figures. 3–8.—3, Female carapace and abdomen, dorsal view (holotype: NSMT—Ar 4301); 4, Male carapace and abdomen, dorsal view (paratype: NSMT—Ar 4305); 5, Male left palp, lateral view (paratype: NSMT—Ar 4305); 6, Epigynum (holotype: NSMT—Ar 4301); 7, Female genitalia, dorsal view; 8, Same, seminal receptacle expanded. (Scales: 0.25mm.)

of the former group are 1) shallow thoracic groove of female, 2) weakly sclerotized epigynum. The genera, *Okileucauge*, *Tylorida*, *Mesida*, *Leucauge*, and *Metabus* make a monophyletic group. The synapomorphies of the group are 1) abdomen having silver color; 2) conductor of male palp being weakly sclerotized, 3) conductor wraps embolus, 4) male palp lacks metine embolic apophysis.

Description.—Carapace longer than wide, median fovea shallow or bottom visible from above. Median ocular area almost as long as wide; slightly narrower in front than behind. Female chelicera with 3 promarginal and 4 retromarginal teeth on fang furrow; male chelicera with a big tooth at the innermost part of posterior margin of fang furrow. Male palp: course of reservoir within the tegulum switchbacked; weakly sclerotized conductor wraps embolus. Labium wider than long. Sternum almost as long as wide. Abdomen longer than wide, with silver scales. Seminal receptacle not sclerotized. Booklung cover smooth.

Etymology.—Generic name is a coined word made from Okinawa, native island of the type species, and *Leucauge*. The name is feminine.

Okileucauge sasakii new species
(Figs. 2–8)

Specimens examined.—*Type series:* Holotype female, Kunigami-son, Okinawajima Island, Okinawa Pref., Japan, 1 April 1997, A. Tanikawa leg. (NSMT—Ar 4301). Paratypes: 2♀, same data except 30 March 1997 (NSMT—Ar 4302–4303), 1♀ 1♂, same data

except 1 April 1997 (NSMT—Ar 4304–4305), 2♀, same data except 2 April 1997 (NSMT—Ar 4306).

Other specimens examined: 3♀, Kunigamison, Okinawajima Is., Okinawa Pref., Japan, 1 April 1997, A. Tanikawa leg. 1♀, same data except 2 April 1997.

Description.—[Based on the female holotype and the male paratype; variations among the specimens examined are given in the parentheses.] *Measurement* (in mm): Total length ♀ 3.10 (2.77–3.10), ♂ 2.18; carapace length ♀ 1.15 (1.08–1.16), ♂ 1.07; width ♀ 0.94 (0.92–0.96), ♂ 0.88; abdomen length ♀ 2.16 (1.61–2.16), ♂ 1.18, width ♀ 1.64 (1.27–1.64), ♂ 0.90. Length of legs (tarsus + metatarsus + tibia + patella + femur = total): ♀ holotype, I, 0.78 + 2.48 + 1.98 + 0.56 + 2.14 = 7.94, II, 0.65 + 1.83 + 1.48 + 0.51 + 1.75 = 6.22, III, 0.38 + 0.75 + 0.56 + 0.31 + 0.90 = 2.90, IV, 0.45 + 1.18 + 0.98 + 0.34 + 1.39 = 4.34. ♂ paratype, I, 0.74 + 2.40 + 2.09 + 0.51 + 2.11 = 7.85, II, 0.59 + 1.66 + 1.47 + 0.46 + 1.69 = 5.87, III, 0.34 + 0.64 + 0.53 + 0.27 + 0.80 = 2.58, IV, 0.40 + 1.03 + 0.87 + 0.27 + 1.23 = 3.80.

Female and male: Carapace length/width ♀ 1.22 (1.13–1.24), ♂ 1.22. Length of leg I/length of carapace ♀ 0.93 (0.88–1.00), ♂ 0.90. Male palp (Fig. 5): tibia with one macroseta; cymbium with a projection other than paracymbium; weakly sclerotized conductor wraps embolus; reservoir in tegulum switchbacked. Abdomen length/width ♀ 1.31 (1.12–1.31), ♂ 1.31. Female genitalia: epigynum simple and weakly sclerotized as in Fig. 6; seminal receptacles not sclerotized (Fig. 8).

Coloration and markings in alcohol: Female and male: Carapace yellow. Abdomen silver with black marking as in Figs. 2–4.

Range.—Japan (Northern part of Okinawajima Island).

Remarks.—The present new species looks like a small sized species of the genus *Leucauge* or its related genera *Tylorida* and *Mesida* in general appearance. However it can be easily separated from the latters by the absence of rows of trichobothria on femur IV.

Etymology.—The species is dedicated to Mr. Takeshi Sasaki, University Museum of the Ryukyus, who supported my field research in Okinawajima island.

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