Four New Records of the Orb-Weaver Spiders (Araneae: Araneidae) from Korea

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Abstract

The family Araneidae is a group of orb-weaving spiders and is one of the most diverse groups among the order Araneae. Eighty-one species belonging to 25 genera have been recorded in Korea to date. In this study, four araneid spiders in three genera, viz., Araneus mayumiae, Araneus ogatai, Cyclosa onoi, and Plebs baotianmanensis, were discovered for the first time in Korea. Additionally, Plebs yeongsanensis is removed from synonymy of Plebs sachalinensis, and treated as a new junior synonym of P. baotianmanensis, based on a morphological comparison of females of three Plebs species. Detailed descriptions of four species are provided with accompanying photographs.

Keywords: Araneus, Cyclosa, Plebs, synonymy, taxonomy, unrecorded species

Introduction

The family Araneidae Clerck, 1757 is one of the most diverse group of spiders, including 3,090 species worldwide, and currently 81 species belonging to 25 genera have been recorded in Korea (World Spider Catalog, 2022). After a taxonomic review of Araneidae from Korea (Kim and Lee, 2012), eleven species were discovered newly, including three new species (Arantielma robusta Lee, Yoo and Kim 2021; Neoscona flaviuda Kim, Lee and Yoo, 2019; and Neoscona jindoensis Kim, Lee and Ji, 2016) and three species which were recorded as a result of correcting errors in previous literatures: Bijoaraneus komachi Tanikawa, 2001; Araneus ogatai Tanikawa, 2001; Cyclosa onoi Tanikawa, 1992 and Plebs baotianmanensis (Hu, Wang and Wang, 1991). Previously, A. mayumiae and A. ogatai were recorded only in Japan, P. baotianmanensis in China, and C. onoi in both China and Japan (World Spider Catalog, 2022). Detailed descriptions of four newly recorded species and a new synonym of P. baotianmanensis are provided.

Materials and Methods

Specimens used in this study were collected by hands or Malaise traps and fixed in 80% ethanol. Color description was based on specimens preserved in 80% ethanol. For male specimens, the palp was detached from the prosoma and expanded in 10% KOH in 75°C for 15 min to examine morphological details. External morphology and copulatory organs were examined and photographed using a stereomicroscope (SZX10; Olympus, Tokyo, Japan) and a digital camera (α6000; Sony, Tokyo, Japan) mounted on the microscope. For detailed examination of genitalia, a compound microscope (BX53; Olympus) with a CMOS camera (HK 6E3; Koptic, Yongin, Korea) were used. Pho-
toptographs were taken in different focal planes and stacked using Helicon Focus 7 software (Helicon Soft Ltd., Kharkiv, Ukraine). Specimens were measured under a stereomicroscope (SZX10) using HK Basic (Koptic) analytical software. All measurements are in millimeters. Measurements for legs are given as: total length (femur + patella + tibia + metatarsus + tarsus), and ratios of each leg segment to the patella are provided (in case of palps, metatarsi are not included). Morphological terminology followed Levi (1971, 1977) and Framenau et al. (2021). Specimens used in this study are deposited at the arthropod collections of the Applied Biology Program, Division of Bio-resource Science, Kangwon National University, Chuncheon (KNU) and the National Institute of Biological Resources, Incheon (NIBR), Republic of Korea.

Abbreviations are as follows: ALE, anterior lateral eye; AME, anterior median eye; PLE, posterior lateral eye; PME, posterior median eye.

**SYSTEMATIC ACCOUNTS**

**Order Araneae Clerck, 1757**

**Family Araneidae Clerck, 1757**

**Genus Araneus Clerck, 1757**


1* Araneus mayumiae Tanikawa, 2001 (Figs. 1, 2, 7A–D)


**Material examined.** Korea: 1♀, Gangwon-do: Pyeongchang-gun, Jibun-myeon, Mt. Odaesan, 37°44′31″N, 128°35′03″E, 18 Sep 2020, Kim SK (NIBR); 2♂♂, Pyeongchang-gun, Yongpyeong-myeon, Gyebangsan Mountain Auto Campsite, 37°41′59″N, 128°28′34″E, 16 Aug 2021, Lee JG et al. (KNU).

**Diagnosis.** This species can be distinguished from congeners by the combination of following characteristics: Female—scape long and wrinkled, with triangular terminal pocket; outer margin of lateral plate of epigynal base not expanded laterally; median plate of epigynal base with medi ally narrowed longitudinal septum. Male—terminal apophysis long, slender, and strongly curved; stipites retrolaterally with wide serrated keel; embolus ovoid, dorsal half heavily sclerotized, prolaterally with horizontal ridge, distally blunt and flattened, slightly extended ventrally; dorso-subdistal portion of embolus with small and round notch between proximal pointed process and embolus tip pointing dorsally, sometimes with embolus cap small and twisted (modified after Tanikawa, 2001).

**Description. Female (1♀ from Pyeongchang):** Total length 20.25. Prosoma 8.90 long, 7.46 wide, cephalic area 3.48 wide; carapace (Fig. 1A) dark brown, cephalic area brighter. Diameter of AME 0.33, ALE 0.22, PME 0.25, PLE 0.20. Median ocular area 0.77 long, anteriorly 0.68 wide, posteriorly 0.59 wide. Labium (Fig. 1B) 0.99 long, 1.66 wide, blackish brown. Sternum (Fig. 1B) 3.77 long, 3.23 wide, blackish brown. Opisthosoma (Fig. 1A, B) 13.56 long, 12.54 wide; oval, with pair of small shoulder humps; dorsally dark brown but laterally greyish brown, with white longitudinal mark anteromedially and black wavy line laterally, folium with several pairs of black horizontal lines, ventrally dark brown with pair of white marks posteromedially. Leg (Fig. 1A, B) dark brown, distally darker, tibia I and II with two ivory annulations proximally and medially, tibia III, IV and all metatarsi with one ivory annulation proximally, palp dark brown; leg I 31.06 (9.08 + 4.20 + 7.80 + 7.38 + 2.60), leg II 29.11 (8.67 + 3.85 + 7.22 + 6.96 + 2.41), leg III 19.61 (6.26 + 2.81 + 4.41 + 4.28 + 1.85), leg IV 28.58 (8.91 + 3.52 + 6.80 + 7.41 + 1.94), palp 9.56 (2.64 + 1.34 + 2.08 + 3.50); ratio of leg I (2.2 : 1.0 : 1.9 : 1.8 : 0.6), leg II (2.3 : 1.0 : 1.9 : 1.8 : 0.6), leg III (2.2 : 1.0 : 1.6 : 1.5 : 0.7), leg IV (2.5 : 1.0 : 1.9 : 2.1 : 0.6), palp (2.0 : 1.0 : 1.6 : 2.6); leg formula 1243. Epigyne (Fig. 1C–F) longer than wide; scape (Fig. 1C, D) approximately three times as long as epigynal base length, slender and wrinkled, proximally sclerotized, directed anteriorly and folded posteriorly, distally with triangular terminal pocket; base (Fig. 1E) anterior margin yellowish brown, elsewhere blackish brown, laterally with sinuated longitudinal groove; basal lamella (Fig. 1E) sclerotized, extended posteriorly; lateral plate (Fig. 1E, F) longer than wide, strongly protracted ventrally, outer margin not expanded laterally; median plate (Fig. 1E, F) wider than long, median portion with medi ally narrowed longitudinal septum in ventral view, grooved posteriorly, with slight longitudinal groove in posterior view.

**Male (1♂ from Pyeongchang):** Total length 13.25. Prosoma 7.55 long, 5.86 wide, cephalic area 2.49 wide; carapace (Fig. 1G) reddish brown, lateral margin of thoracic area broadly darker, with distinct median groove and radial grooves. Diameter of AME 0.27, ALE 0.23, PME 0.22, PLE 0.23. Median ocular area 0.52 long, anteriorly 0.83 wide, posteriorly 0.70 wide. Chelicerae with four promarginal teeth and three retrormarginal teeth. Labium (Fig. 1H) 0.64 long, 0.98 wide, blackish brown and anteriorly ivory. Sternum

Korean name: 1*신칭용왕개미 (신칭)
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(Fig. 1H) 3.31 long, 2.33 wide, dark brown. Opisthosoma (Fig. 1G, H) 6.23 long, 4.57 wide, overall shape and coloration similar to female but without lateral greyish area. Leg (Fig. 1G, H) reddish brown, patterns same as female; coxa I (Fig. 1H) with knob-like retrolateral process distally, coxa II (Fig. 1H) with triangular retrolateral process proximally, tibia II (Fig. 1I) with 21 stout spines prolaterally, arranged in three rows; leg I 28.49 (8.52 + 3.54 + 7.83 + 6.50 + 2.10), leg II 25.41 (7.63 + 3.66 + 6.51 + 5.58 + 2.03), leg III 17.79 (5.76 + 2.57 + 4.03 + 3.83 + 1.54), leg IV 24.66


Fig. 1. Araneus mayumiae Tanikawa, 2001, female (A–F) and male (G–L). A, G, Habitus, dorsal view; B, H, Ditto, ventral view; C, Epigyne, ventral view; D, Ditto, KOH treated; E, Epigynal base, ventral view; F, Ditto, posterior view; I, Male tibia II, prolateral view; J-L, Male left palp (J, prolateral view, K, distal view, L, retrolateral view). CO, conductor; EM, embolus; LP, lateral plate of epigynal base; MA, median apophysis; MP, median plate of epigynal base; PC, paracymbium; SC, scape; TA, terminal apophysis. Scale bars: A, B, G, H = 5 mm, I = 2 mm, J-L = 1 mm, C-F = 0.5 mm.
(7.84 + 2.96 + 6.07 + 6.06 + 1.73); ratio of leg I (2.4 : 1.0 : 2.2 : 1.8 : 0.6), leg II (2.1 : 1.0 : 1.8 : 1.5 : 0.6), leg III (2.2 : 1.0 : 1.6 : 1.5 : 0.6), leg IV (2.6 : 1.0 : 2.1 : 2.0 : 0.6); leg formula 1243. Palp (Figs. 1J–L, 2). Patella with two long macrosetae; tibia with round sclerotized process prolaterally; paracymbium (Figs. 1L, 2B) hooked, distally blunt; terminal apophysis (Figs. 1J, K, 2A, B) heavily sclerotized, long, slender, and strongly curved; subterminal apophysis (Fig. 2A, D) well-sclerotized, long and stout, distally blunt triangular, proximal portion with blunt projection; conductor (Figs. 1K, 2A–C) heavily sclerotized, plate-shaped, retrolateral portion gradually folded horizontally, prolateral margin serrated, pro-

latero-ventral margin with digitiform process; median apophysis (Figs. 1J, K, 2A, C) transverse, well-sclerotized, slightly curved inwardly, proximal portion with pointed spur pointing prolaterally, distal portion widened and flattened, with dorsal triangular extension; stipes (Fig. 2D, E) long and thick, ventral half heavily sclerotized, retrolaterally with wide serrated keel (arrowed 2 in Fig. 2E), dorsally with distal haematodocha connected to subterminal apophysis and terminal apophysis; embolus (Figs. 1J, 2D, E) ovoid, dorsal half heavily sclerotized, prolaterally with horizontal ridge, distally blunt and flattened, slightly extended ventrally; dorso-subdistal portion of embolus with small and round notch between proximal

Fig. 2. Araneus mayumiae Tanikawa, 2001, male right palp (flipped). A, Expanded genital bulb, prolateral view; B, Ditto, retrolateral view; C, Conductor and median apophysis, distal view; D, Embolus and subterminal apophysis, prolateral view, arrow 1 indicates embolus tip; E, Ditto, retrolateral view, arrow 2 indicates serrated keel. CO, conductor; DH, distal haematodocha; EM, embolus; MA, median apophysis; PC, paracymbium; RA, radix; SA, subterminal apophysis; ST, stipes; TA, terminal apophysis. Scale bars: A, B = 1 mm, C–E = 0.5 mm.
pointed process and conical embolus tip pointing dorsally (arrowed 1 in Fig. 2D, without embolus cap).

**Coloration in live materials.** Female (Fig. 7A, B) cephalic area and dorsolateral portion of opisthosoma covered with ivory pubescence. Male (Fig. 7C, D) carapace and opisthosoma covered with bright yellow pubescence. Overall body patterns of both sexes same as preserved materials, but more distinct in live materials.

**Variation.** Male (n = 2) total length 13.25–13.74, body coloration dark brown or reddish brown (Fig. 7C, D). There is a slight difference in the shape of epigynal scape between the Korean female specimen and the Japanese female in the original description: The proximal portion of the epigynal scape is not strongly curved in Korean specimen (Fig. 1C) whereas it is strongly curved laterally in Japanese specimen (Tanikawa, 2001: fig. 62). The other characteristics are largely congruent between them. Such variation is observed also in that of *Araneus saevus* (L., Koch, 1872), which is the most similar species of *A. mayumiae* (Levi, 1971: figs. 42, 45, 48).

**Distribution.** Korea (new record), Japan.

**Remarks.** The embolus caps were broken off in all male individuals used in this study. This species resembles *Araneus saevus* (Levi, 1971: figs. 42–51, 55–60; Tanikawa, 2001: figs. 67, 68), sharing similar body patterns, the shape of epigynal scape, and the shape of terminal apophysis, conductor and median apophysis in male palp. However, *A. mayumiae* can be distinguished from the latter by the combination of following characteristics: median plate of epigynal base with longitudinal septum (vs. absent in *A. saevus*); lateral margin of epigynal base not expanded (vs. expanded roundly in *A. saevus*); embolus ovoid, prolaterally with horizontal ridge, dorso-subdistal portion with round notch between proximal pointed process and conical embolus tip (vs. smooth triangular, without horizontal ridge and round notch in *A. saevus*); embolus cap small, conical and twisted (vs. large, flat and triangular in *A. saevus*).

**Diagnosis.** The female of this species can be distinguished from conegers by the combination of following characteristics: Opisthosoma smooth rhomboid, with two small round humps caudally; epigynal scape longer than wide, proximally wrinkled, distally with obtuse terminal pocket; posterior portion of lateral plate of epigynal base with blunt projection pointing posteriorly (modified after Tanikawa, 2001).

**Description.** Female (1♀ from Pocheon): Total length 4.87. Prosoma 2.25 long, 1.51 wide, cephalic area 0.96 wide; carapace (Fig. 3A, C) dark brown, cephalic area brighter, posterior portion of cephalic area distinctly bulged. Diameter of AME 0.11, ALE 0.10, PME 0.12, PLE 0.08. Median ocular area 0.26 long, anteriorly 0.44 wide, posteriorly 0.48 wide. Chelicerae with six promarginal teeth and three retromarginal teeth. Labium (Fig. 3B) 0.29 long, 0.42 wide, blackish brown and anteriorly yellowish brown. Sternum (Fig. 3B) 0.87 long, 0.87 wide, brown. Opisthosoma (Fig. 3A–C) 3.87 long, 3.25 wide; smooth rhomboid, with two small round humps caudally (arrowed in Fig. 3C); dorsally dark brown but medially yellowish brown, ventrally ivory; entirely with granular patterns. Leg (Fig. 3A, B) coxae to proximal half of femora yellowish brown, elsewhere dark brown with indistinct annulations, palp dark brown; leg I 5.97 (1.70 + 0.93 + 1.45 + 1.30 + 0.59), leg II 5.41 (1.52 + 0.88 + 1.23 + 1.22 + 0.56), leg III 3.76 (1.17 + 0.67 + 0.73 + 0.77 + 0.42), leg IV 5.15 (1.60 + 0.81 + 1.07 + 1.17 + 0.50), palp 2.02 (0.54 + 0.36 + 0.53 + 0.59); ratio of leg I (1.8 : 1.0 : 1.6 : 1.4 : 0.6), leg II (1.7 : 1.0 : 1.4 : 1.4 : 0.6), leg III (1.7 : 1.0 : 1.1 : 1.1 : 0.6), leg IV (2.0 : 1.0 : 1.3 : 1.4 : 0.6), palp (1.5 : 1.0 : 1.5 : 1.6); leg formula 1243. Epigyne (Fig. 3D, E). Scape (Fig. 3D) approximately twice as long as epigynal base length, thick and slightly wavy, proximally wrinkled, distally with wide and obtuse terminal pocket; base (Fig. 3D, E) dark brown, laterally expanded roundly; lateral plate strongly protruded ventrally and positioned parallel in posterior view (Fig. 3E), posterior portion with blunt projection pointing posteriorly (Fig. 3D); median plate (Fig. 3E) with indistinct longitudinal groove mediially.

**Male:** Unknown in Korea.

**Coloration in live material.** Female (Fig. 7E) overall body covered with white pubescence. Granular patterns on the opisthosoma and leg annulations indistinct.

**Distribution.** Korea (new record), Japan.

**Remarks.** The female of this species is similar to that of *Araneus komi* Tanikawa, 2001: figs. 42, 49, 50) sharing rhomboid opisthosoma and distally obtuse and pocketed epigynal scape in common, but can be distinguished by the combination of following characteristics: opisthosoma caudally with two blunt humps (vs. without hump in *A. komi*); epigynal scape longer than wide, proximally wrinkled, distally with obtuse terminal pocket; posterior portion of lateral plate of epigynal base with blunt projection pointing posteriorly (modified after Tanikawa, 2001).
mally wrinkled (vs. almost as long as wide, proximally not wrinkled in *A. komi*); posterior portion of lateral plate of epigynal base with blunt projection pointing posteriorly (vs. without projection in *A. komi*). Female also resembles that of *Araneus yuanminensis* Yin, Wang, Xie and Peng, 1990 (Yin et al., 1990: figs. 64–68), which have similar opisthosoma, epigynal scape and posterior projection on the lateral plate of epigynal base, but differs from the latter in the following features: opisthosoma caudally with two humps (vs. without humps in *A. yuanminensis*); proximal wrinkled portion of epigynal scape slightly narrower than terminal pocket of epigynal scape (vs. distinctly narrower than terminal pocket of epigynal scape in *A. yuanminensis*); lateral plates of epigynal base positioned parallel in posterior view (vs. positioned as V-shape in posterior view in *A. yuanminensis*).

**Genus Cyclosa** Menge, 1866  
*Cyclosa* Menge, 1866: 73. Type species: *Aranea conica* Pallas, 1772 (by monotypy).

1* Cyclosa onoi Tanikawa, 1992 (Fig. 4)  
*Cyclosa onoi* Tanikawa, 1992a: 28, figs. 39–42 (type locality: Honshu and Kyushu, Japan); 1992b: 199, figs. 1–6 (first description of male); 2007: 58, figs. 95, 501–502; 2009: 435, figs. 83–84; Yin et al., 1997: 249, fig. 161a–k; Song et al., 1999: 271, figs. 157N–P, 159N, O, 161M; Yin

Korean name: 1*작은혹먼지거미 (신칭)
et al., 2012: 659, figs. 324a–k, 3-21a–c; Sato, 2012: 67, unnumbered figs.

**Material examined.** Korea: 1♂, Chungcheongnam-do: Seocheon-gun, Janghang-eup, seaside bush near Janghang Recreational Pine Forest, 36°01′05″N, 126°39′53″E, 4 Aug 2018, Lee JG and Lee JH (KNU).

**Diagnosis.** The male of this species can be distinguished from congeners by the combination of following characteristics: Opisthosoma with pair of small shoulder humps anteriorly and four small conical protuberances caudally; basal lamella of median apophysis strongly curved, distally blunt; conductor lingulate, distally with small acute notch (modified after Tanikawa, 1992b).

**Description.** Male (1♂ from Seocheon): Total length 4.71. Prosoma 1.94 long, 1.47 wide, cephalic area 0.82 wide; carapace (Fig. 4A) yellowish brown, both cephalic area and median and marginal portion of thoracic area covered with numerous dark brown spots. Diameter of AME 0.14, ALE 0.10, PME 0.10, PLE 0.11. Median ocular area 0.21 long, anteriorly 0.36 wide, posteriorly 0.23 wide. Chelicerae with three promarginal teeth and three retromarginal teeth. Labium (Fig. 4B) 0.11 long, 0.29 wide, blackish brown, anteriorly yellowish brown. Sternum (Fig. 4B) 0.82 long, 0.68 wide, yellowish brown with dark brown marks, two–three pairs of ivory granular marks on lateral margin, and long ivory granular marks caudally. Opisthosoma (Fig. 4A–C) 2.67 long, 1.53 wide; oval, with pair of small shoulder humps anteriorly and four small conical protuberances caudally; basally greyish yellow, anterodorsally with ivory granular marks, shoulder hump area with large dark brown mark, cardiac pattern dark brown, posterodor-
sally with dark brown folium; ventrally blackish brown, with three pairs of ivory granular marks on lateral margin. Leg (Fig. 4A, B) ivory, subdiscal portion of femora and both proximal and distal portion of patellae with broad dark brown annulation, tibiae to metatarsi with three dark brown annulations proximally, medially and distally; tibia II (Fig. 4D) with 14 short spines arranged in three rows prolaterally; leg I 6.37 (1.95 + 0.72 + 1.57 + 1.38 + 0.75), leg II 5.58 (1.71 + 0.71 + 1.28 + 1.22 + 0.66), leg III 3.62 (1.19 + 0.67 + 0.57 + 0.71 + 0.48), leg IV 5.28 (1.75 + 0.66 + 1.13 + 1.16 + 0.58); ratio of leg I (2.7 : 1.0 : 2.2 : 1.9 : 1.0), leg II (2.4 : 1.0 : 1.8 : 1.7 : 0.9), leg III (1.8 : 1.0 : 0.9 : 1.1 : 0.7), leg IV (2.7 : 1.0 : 1.7 : 1.8 : 0.9); leg formula 1243. Palp (Fig. 4E–H). Patella with one long macroseta; paracymbium (Fig. 4E) hooked, distally blunt; terminal apophysis (Fig. 4F–H) proximally bulbous and abruptly acuminate distally, with slightly widened tip (Fig. 4F); conductor (Fig. 4G) linguolate, distally with small acute notch; median apophysis (Fig. 4H) transverse, dorsal margin of median portion slightly convex, distally curved ventrally and bifurcated with pointed tips (arrowed in Fig. 4H), basally with lamella strongly curved and distally blunt; conductor lobe (Fig. 4G) proximally hidden by basal lamella of median apophysis, distally bent and truncated; embolus (Fig. 4G) acicular and slightly curved.

Female: Unknown in Korea.

Variation. The number of spines on the prolateral portion of tibia II (Fig. 4D) is slightly different from that of Japanese specimen in the first description of male (Tanikawa, 1992b: fig. 6) (14 spines vs. 11 spines). The other characteristics are largely congruent between them.

Distribution. Korea (new record), China, Japan.

Remarks. The male of this species resembles that of Cyclosa oculata (Walckenaer, 1802) (Levi, 1977: fig. 23) sharing similar shape and pattern of opisthosoma (Tanikawa, 1992a, 1992b), but can be distinguished from the latter by the combination of following characteristics: basal lamella of median apophysis smaller than bulbous portion of terminal apophysis, proximally without appendix (vs. larger than bulbous portion of terminal apophysis, proximally with digitiform appendix in C. oculata); median apophysis as long as acuminate portion of terminal apophysis (vs. distinctly longer than terminal apophysis in C. oculata). Cyclosa onoi also looks like Cyclosa octotuberculata Karsch, 1879 (Tanikawa, 1992a: figs. 2, 5–9) sharing similar shapes of terminal apophysis, conductor, embolus, and basal lamella of median apophysis of the male palp but differs from the latter in the following features: opisthosoma caudally with four small protuberances (vs. caudally with six large protuberances in C. octotuberculata); dorsal margin of median apophysis slightly convex in prolateral view (vs. linear in C. octotuberculata).

Genus Plebs Joseph and Framenau, 2012
Plebs Joseph and Framenau, 2012: 293. Type species: Araneus eburnus Keyserling, 1886 (by the original designation).

1⁸Plebs baotianmanensis (Hu, Wang and Wang, 1991) (Figs. 5A–E, 6, 7F)
Araneus baotianmanensis Hu et al., 1991: 37, figs. 1–4 (type locality: Henan, China); Yin et al., 1997: 159, fig. 75a–d; Song et al., 1999: 237, figs. 135Q–S, 147D.
Eriophora baotianmanensis Zhang et al., 2006: 3, fig. 2A–E; Zhu and Zhang, 2011: 224, fig. 160A–E.
Eriophora shaanxiensis Zhu and Wang, in Zhu et al., 1994: 39, fig. 14A–C (type locality: Shaanxi, China) (description of male); Yin et al., 1997: 291, fig. 200a–c; Song et al., 1999: 280, figs. 165N, 166D.
Eriophora wangii Zhu and Song, in Zhu et al., 1994: 42, fig. 17A–C (type locality: Shaanxi, China); Yin et al., 1997: 293, fig. 202a–c; Song et al., 1999: 280, figs. 165H, I, 166D.
Plebs yebongsanensis Kim et al., 2014: 1, figs. 1–10, 11a–c (type locality: Gyeonggi-do, Korea). Previously synonymized with Plebs sachalinensis (Saito, 1934) by Yoo et al., 2015: 50. Syn. nov.

Material examined. Korea: 1♀, Chuncheongbuk-do: Danyang-gun, Danyang-eup, a mountain trail near Gosu Cave, 36°59′23″N, 128°23′00″E, 17 Jul 2021, Lee JH (KNU); 1♂, Gangwon-do: Yeongwol-gun, Gimsatgat-myeon, Mt. Taehwasan, 37°07′47″N, 128°31′54″E, 30 Jul 2020, Lee JG (NIBRIV0000895759); 1♀, Chuncheon-si, Dongsan-myeon, Kangwon National University Experimental Forest, 37°46′50″N, 127°49′05″E, 24 Jun 2021, Lee JH (KNU); 1♀, Gyeonggi-do: Pocheon-si, Idong-myeon, Nogok-ri, 38°01′45″N, 127°20′38″E, 5 Jul 2017, Lee JG and Lee JH (KNU); 1♂, Yeoncheon-gun, Baekhak-myeon, Tonggu-ri, 38°01′45″N, 126°55′11″E, 7–14 Jun 2020, Lee JG and Lee JH, Malaise trap (KNU); 1♀, ditto, 25 Jul 2021, Lee JH (KNU); 1♀, Suraksan, 37°41′01″N, 127°03′51″E, 31 May 2019, Lee JG and Lee JH (KNU).

Comparative material. Plebs sachalinensis (Saito, 1934): Korea: 2♂♀, 2♂♂, Gangwon-do: Chuncheon-si, Dongsan-myeon, Kangwon National University Experimental Forest.

Korean name: 1⁸어리북왕거미(신장)
Fig. 5. Plebs baotianmanensis (Hu, Wang and Wang, 1991) (A–E) and Plebs sachalinensis (Saito, 1934) (F–J), females. A, F, Habitus, dorsal view; B, G, Ditto, ventral view; C, H, Epigyne, ventral view; D, I, Ditto, posterior view; E, J, Ditto, lateral view. LP, lateral plate of epigynal base; MP, median plate of epigynal base; SC, scape. Scale bars: A, B, F, G = 1 mm, C–E, H–J = 0.1 mm.

Four Araneid Species from Korea

Forest, 37°46'38"N, 127°48'51"E, 14 May 2016, Lee JG and Lee JH (KNU); 1♀, ditto, 37°46'50"N, 127°49'05"E, 24 Jun 2021, Lee JH (KNU); 1♂, Chuncheon-si, Dongnae-myeon, near the summit of Mt. Daeryongsan, 37°50'49"N, 127°49'15"E, 21 May 2021, Lee JH (KNU); 1♀, Pyeongchang-gun, Jinbu-myeon, near Sangwonsa Temple in Mt. Odaesan, 37°47'04"N, 128°33'45"E, 14 Jul 2020, Lee JG et al. (KNU); 1♀, Gyeonggi-do: Namyangju-si, Joan-myeon, Mt. Ungilsan, 37°34'04"N, 127°16'56"E, 8 Jun 2014, Lee JG and Lee JH (KNU); 1♀, 1♂ subadult, ditto, 18 May 2019 (KNU); 1♀, ditto, 1 Jun 2019 (KNU); 1♂, Dongducheon-si, Soyo-dong, Mt. Soyosan, 37°56'46"N, 127°04'42"E, 21 May 2016, Lee JG and Lee JH (KNU).

**Diagnosis.** This species can be distinguished from its congeners by the combination of following characteristics: Female—anterior portion of lateral plate of epigynal base elongated roundly; median plate of epigynal base anteriorly protruded, medially with horizontal groove. Male—terminal apophysis distally emarginate and scooped, proximal portion with large subquadrate sclerite; conductor bifurcated with two truncated branches; median apophysis proximally with three small teeth, distally scooped and truncated, dorsal portion of
tip triangular (modified after Zhu et al., 1994).

**Description. Female** (♀ from Namyangju): Total length 5.97. Prosoma 2.55 long, 2.34 wide, cephalic area 1.37 wide; carapace (Fig. 5A) yellowish brown, cephalic area dark brown. Diameter of AME 0.13, ALE 0.11, PME 0.13, PLE 0.08. Median ocular area 0.23 long, anteriorly 0.34 wide, posteriorly 0.35 wide. Chelicerae with four promarginal teeth and three retromarginal teeth. Labium (Fig. 5B) 0.49 long, 0.27 wide, blackish brown and anteriorly ivory. Sternum (Fig. 5B) 1.13 long, 1.06 wide, dark brown. Opisthosoma (Fig. 5A, B) 4.30 long, 2.89 wide, ovoid, with pair of indistinct shoulder humps; dorsally blackish brown anteriorly with pair of small, round ivory spots (sometimes connected to median ivory area); median portion with ivory inverted-triangular area, with cardiac pattern and granular pattern; posterolateral portion greyish brown, with folium
consisted of several pairs of black horizontal lines; ventrally black with pair of ivory round marks between posterior margin of black square mark and spinneret area. Leg (Fig. 5A, B) greyish yellow, distally darker, femora with dark brown annulation distally and pale brown band ventromedially, patellae with dark brown annulation proximally and distally, tibiae with broad dark brown annulation medially and distally, metatarsi with broad dark brown annulation subproximally, tarsi with dark brown annulation proximally and distally; palp femur greyish yellow, elsewhere gradually dark brown distally; leg I 9.72 (2.87 + 1.36 + 2.36 + 2.12 + 1.01), leg II 8.73 (2.63 + 1.11 + 2.07 + 2.10 + 0.82), leg III 5.13 (1.64 + 0.74 + 1.07 + 1.08 + 0.60), leg IV 8.64 (2.56 + 1.17 + 2.14 + 1.98 + 0.79), palp 2.63 (0.72 + 0.37 + 0.62 + 0.92); ratio of leg I (2.1 : 1.0 : 1.7 : 1.6 : 0.7), leg II (2.4 : 1.0 : 1.9 : 1.9 : 0.7), leg III (2.2 : 1.0 : 1.4 : 1.5 : 0.8), leg IV (2.2 : 1.0 : 1.8 : 1.7 : 0.7), palp (1.9 : 1.0 : 1.7 : 2.5); leg formula 1243. Epigyne (Fig. 5C–E). Scape (Fig. 5C, E) approxi-

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mately twice as long as epigynal base length, not wrinkled, slender and slightly sinuated, with blunt tip; lateral plate of epigynal base (Fig. 5C, D) with anterior portion strongly elongated roundly; median plate of epigynal base (Fig. 5D) with bulged anterior portion, median portion with horizontal groove.

**Male (1♂ from Chuncheon):** Total length 4.70. Prosoma 2.57 long, 2.20 wide, cephalic area 1.13 wide; carapace (Fig. 6A) coloration same as female, but with distinct median groove with T-shaped black mark. Diameter of AME 0.13, ALE 0.11, PME 0.11, PLE 0.11. Median ocular area 0.22 long, anteriorly 0.33 wide, posteriorly 0.30 wide. Chelicerae with four promarginal teeth and three retromarginal teeth. Labium (Fig. 6B) 1.15 long, 0.80 wide, dark brown. Opisthosoma (Fig. 6A, B) 2.70 long, 1.86 wide, generally similar to female but with indistinct patterns. Leg (Fig. 6A, B) greyish yellow, each segment gradually darkened as greyish brown distally; coxa III (Fig. 6C) with two short spines, coxa IV (Fig. 6C) with three short spines, tibia II (Fig. 6D) with six stout spines and two small spines arranged in two rows prolaterally; leg I 9.19 (2.91 + 1.15 + 2.44 + 1.84 + 0.85), leg II 8.36 (2.55 + 1.02 + 2.00 + 1.90 + 0.89), leg III 5.27 (1.82 + 0.65 + 1.11 + 1.05 + 0.64), leg IV 8.06 (2.48 + 0.89 + 1.90 + 1.97 + 0.82); ratio of leg I (2.5 : 1.0 : 2.1 : 1.6 : 0.7), leg II (2.5 : 1.0 : 2.0 : 1.9 : 0.9), leg III (2.8 : 1.0 : 1.7 : 1.6 : 1.0), leg IV (2.8 : 1.0 : 2.1 : 2.2 : 0.9); leg formula 1243. Palp (Fig. 6E–I) patella with one long macroseta; paracymbium (Fig. 6G) hooked, distally pointed; tegulum (Fig. 6G) with round protrusion; terminal apophysis (Fig. 6E, H, I) blunt and scooped, distally emarginate, proximal portion with large subquadrate sclerite (arrowed 1 in Fig. 6H, arrowed in Fig. 6I); conductor (Fig. 6E, I) distally heavily sclerotized and bifurcated, with two truncated branches (dorsal branch narrower than ventral branch); median apophysis (Fig. 6E, F, H) thick and curved nearly perpendicularly, proximally with three small teeth (arrowed 2 in Fig. 6H), distally scooped and truncated, dorsal portion of tip triangular; arch of median apophysis (Fig. 6E, H) marginally curled and scaled; conductor lobe head (Fig. 6E, H, I) distally oval, marginally scaled; embolus (Fig. 6E, H, I) sinuated and distally heavily sclerotized and pointed.

**Coloration in live materials.** Female (Fig. 7F) cephalic area and leg annulations black. Carapace, opisthosoma, and leg femora covered with white pubescence dorsally. Antero-lateral portion of the opisthosoma with small, irregular reddish-brown marks. Overall body patterns same as preserved materials, but more distinct in live materials.

**Variation.** Female (n = 6) total length 5.84–7.09. Some without pair of small ivory spots on anterodorsal portion of opisthosoma.

**Distribution.** Korea (new record), China.

**Remarks.** The female of this species is superficially similar to *Plebs sachalinensis* (Saito, 1934) (Fig. 5), sharing following patterns of the opisthosoma: anteriorly dark brown, medi ally with ivory inverted-triangular mark, laterally with black marks making folium pattern. However, this species can be readily distinguished from the latter by the combination of following characteristics: cephalic area dark brown and cervical groove without dark brown mark (Fig. 5A) (vs. cephalic area not darkened, cervical groove with dark brown mark in *P. sachalinensis*, Fig. 5F); epigynal scape twice as long as epigynal base length (Fig. 5C) (vs. 1.5 times as long as epigynal base in *P. sachalinensis*, Fig. 5H); anterior portion of lateral plate of epigynal base protruded (Fig. 5C) (vs. not protruded in *P. sachalinensis*, Fig. 5H); median plate of epigynal plate with horizontal groove (Fig. 5D) (vs. without groove in *P. sachalinensis*, Fig. 5I).

*Plebs yebongsanensis* Kim, Ye and Lee, 2014 was described based on a single female from Mt. Yebongsan, Namyangju-si. Later Yoo et al. (2015) synonymized this species with *P. sachalinensis* without plausible explanations to justify their treatment. Judging from figures of somatic characters and the epigyne of the holotype of *P. yebongsanensis* (Kim et al., 2014: figs. 1–10), it is apparently conspecific with *P. baotianmanensis*, even though distal portion of epigynal scape was broken off in holotype of *P. yebongsanensis*. Therefore, *P. yebongsanensis* should be removed from the synonymy of *P. sachalinensis* and newly synonymized with *P. baotianmanensis*.

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**CONFLICTS OF INTEREST**

No potential conflict of interest relevant to this article was reported.

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