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Four new species of the genus *Pholcus* Walckenaer (Araneae, Pholcidae) from Korea

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The genus *Pholcus* Walckenaer, 1805 is the largest genus among the cellar spider family Pholcidae C.L. Koch, 1850, including 339 species. To date, 33 species in the genus are known to be distributed in Korea, being placed into three species-groups (*crypticolens*-group, *phalangioides*-group, and *phungiformes*-group). About 91% of these species are endemic to Korea. In this study, four new species of the genus *Pholcus* were discovered in Korea, *viz*, *Pholcus chuncheonensis* Lee, Choi and Kim sp. nov., *Pholcus pajuensis* Lee, Choi and Kim sp. nov., *Pholcus pocheonensis* Lee, Choi and Kim sp. nov., and *Pholcus unaksanensis* Lee, Choi and Kim sp. nov. These new species are classified as members of the *phungiformes*-group, having morphological characteristics such as male chelicerae with a frontal apophysis, palpal tibia with a prolatero-ventral tubercle, and genital bulb without appendix or having pseudo-appendix, but can be distinguished from congeners by characteristics of the male palp and female genitalia. Detailed descriptions and a key to new species are provided with accompanying photographs.

Keywords: Araneae, Korea, new species, Pholcidae, *Pholcus*, *phungiformes*-group

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Introduction

Pholcus Walckenaer, 1805 is the largest genus among the cellar spider family (Araneae, Pholcidae), including 339 species (World Spider Catalog, 2020), and a classification scheme as species-groups was suggested by Huber (2011). To date, 33 species in the genus are known to be distributed in Korea (World Spider Catalog, 2020), placed into three species-groups, *viz*, *P. crypticolens*-group (4 spp.), *P. phalangioides*-group (1 sp.) and *P. phungiformes*-group (28 spp.) (Huber, 2011; Wang *et al*., 2020).

The endemic species diversity of Korean *Pholcus* species belonging to *phungiformes*-group was first noticed by Paik (1978), describing six new species. Later many indigenous species in this species-group were discovered by several arachnologists, contributing to the current species diversity of the species-group in Korea. Surprisingly, over the half of the species were found in the last decade (Huber, 2011; Seo, 2014; Kim and Ye, 2015; Kim and Kim, 2016; Seo, 2018).

In this paper, we describe four new species belonging to *phungiformes*-group, with accompanying photographs: *Pholcus chuncheonensis* Lee, Choi and Kim sp. nov., *Pholcus pajuensis* Lee, Choi and Kim sp. nov., *Pholcus pocheonensis* Lee, Choi and Kim sp. nov., and *Pholcus unaksanensis* Lee, Choi and Kim sp. nov. Additionally, a key to these new species based on characteristics of copulatory organs is provided.

Materials and Methods

Specimens used in this study were hand-collected from fields and fixed in 80% ethanol. Coloration was described from specimens preserved in 80% ethanol. For male specimens, the left palp and chelicerae were detached from the prosoma to examine morphological details. The epigyne was dissected and cleared in 10% KOH solution in 70°C for 10 min to examine structures of internal genitalia. External morphology and copulatory organs were examined and photographed using a stereomicroscope (Olympus SZX10; Olympus, Tokyo, Japan) and a digital

camera (Sony a6000; Sony, Tokyo, Japan) mounted on the microscope. For detailed examination of male cheliceral apophysis, palpal procursus and female internal genitalia, a compound microscope (Olympus BX53; Olympus, Tokyo, Japan) and a CMOS camera (HK 6E3; Koptic, Yongin, Korea) were used. Photographs were taken in different focal planes, and consecutive images were stacked using Helicon Focus software (Helicon Soft Ltd., Kharkov, Ukraine). Specimens were measured under a stereomicroscope (Olympus SZX10; Olympus, Tokyo, Japan) and analytical software (HK Basic; Koptic, Yongin, Korea). All measurements are in millimeters. Measurements for legs are given as ratio of each leg segment to the patella: total length (femur : patella : tibia : metatarsus : tarsus). Morphological terminology of copulatory organs follows Huber (2011). Specimens, including type specimens used in this study, are deposited at the arthropod collections of the Applied Biology Program, Division of Bio-resource Science, Kangwon National University (KNU), the National Institute of Biological Resources (NIBR) and Korea Institute of Spider and Ecology (KISE), Republic of Korea.

Abbreviations: ALE = anterior lateral eye; AME = anterior median eye; AME–AME = interval between AMEs; AME–ALE = interval between AME and ALE; PLE = posterior lateral eye; PME = posterior median eye; PME–PME = interval between PMEs.

Systematic Accounts

Order Araneae Clerck, 1757
Family Pholcidae C.L. Koch, 1850

Genus *Pholcus* Walckenaer, 1805
Pholcus Walckenaer, 1805: 80. Type species: *Aranea phalangioides* Fuesslin, 1775 by monotypy (assumed, in Huber, 2011).

Pholcus phungiformes-group

Diagnosis (modified from Huber, 2011). Members of *phungiformes*-group can be distinguished from members of other species-groups by the combination of the following characteristics: male chelicerae with a frontal apophysis; male palpal tibia with a prolatero-ventral tubercle; male genital bulb without appendix or having a pseudo-appendix (an apophysis arising from the uncus, not from the basal portion of the genital bulb).

Remarks. Somatic morphological features (e.g., patterns of carapace, sternum, opisthosoma and legs; arrangement of cheliceral apophyses) within members of this species-group are almost identical. Specific delimitation can be achieved by examining the morphological characteristics of copulatory organs in both sexes, which show extreme diversity.

Description of somatic morphology (modified from Huber, 2011). Male (Fig. 1A, C, E, G). Carapace round, pale yellow with dark brown radial linear patterns and marginal line dorsally; 8-eyes, a pair of eye triads (ALE + PME + PLE) at lateral portion in eye area, AMEs at antero-medial portion in eye area; a dark brown mark on the eye area postero-medially; eye area slightly elevated, similar to female; clypeus without apophysis, height similar to chelicera length, with a pair of dark brown marks; chelicera (Fig. 2) brown, with two proximal apophyses (one in retrolateral, the other in frontal) and a distal apophysis arising prolaterally; endite pale yellow, without apophysis; sternum pale yellow, shield-shaped, angular portions slightly elongated toward the spaces between coxae, with dark brown marks marginally and a thin mark postero-medially; opisthosoma cylindrical, grayish yellow, with a lot of dark brown or black internal granular patterns visible through cuticle dorsally and laterally, except the cardiac area; leg femur and tibia with brown and grey band proximally and distally.

Female (Fig. 1B, D, F, H). Body shape and pattern almost same as male, except chelicerae without apophysis and slightly shorter in leg I tibia.

Ecology. Spiders included in this species-group in Korea usually inhabit dusky, humid spaces such as rock crevices, underneath the herb leaves in the woods and road drains, making irregular or dome-sheet webs. They often aggregate in their microhabitat, about dozen individuals.

Checklist for 32 Korean *Pholcus phungiformes*-group (including 4 new species)

Pholcus acutulus Paik, 1978
Pholcus cheongogensis Kim and Ye, 2015
Pholcus chiakensis Seo, 2014
Pholcus chuncheonensis Lee, Choi and Kim **sp. nov.**
Pholcus crassus Paik, 1978
Pholcus deunggolensis Kim and Kim, 2016
Pholcus extumidus Paik, 1978
Pholcus gajiensis Seo, 2014
Pholcus gosuensis Kim and Lee, 2004
Pholcus jindongensis Seo, 2018
Pholcus joreongensis Seo, 2004
Pholcus juwangensis Seo, 2014
Pholcus kwanaksanensis Namkung and Kim, 1990
Pholcus kwangkyosanensis Kim and Park, 2009
Pholcus montanus Paik, 1978
Pholcus nodong Huber, 2011
Pholcus okgye Huber, 2011
Pholcus pajuensis Lee, Choi and Kim **sp. nov.**
Pholcus palgongensis Seo, 2014
Pholcus piagolensis Seo, 2018
Pholcus pocheonensis Lee, Choi and Kim **sp. nov.**

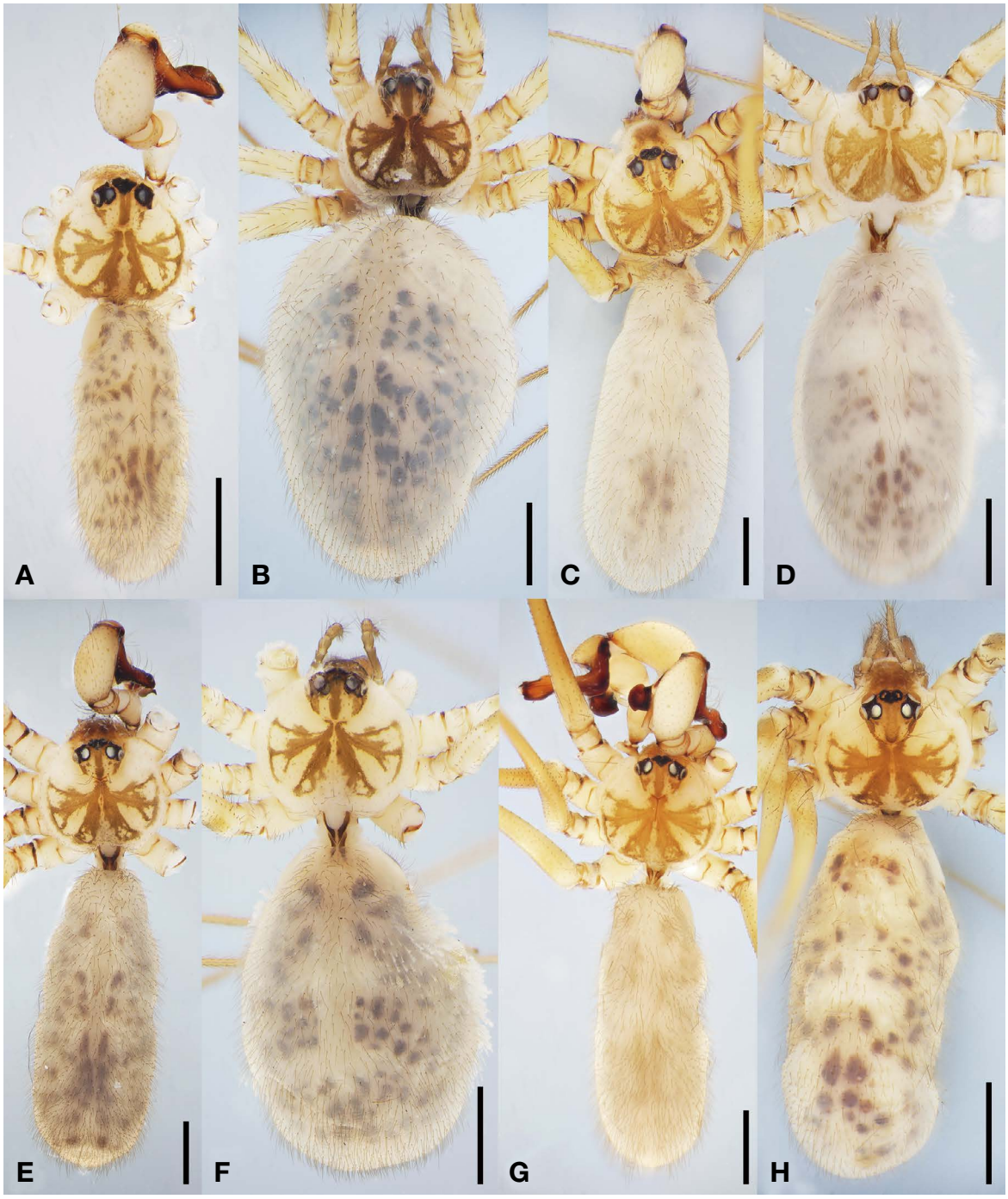

Fig. 1. Habitus of new *Pholcus* species, dorsal view (A, C, E, G, male, B, D, F, H, female). A, B, *P. chuncheonensis* Lee, Choi and Kim sp. nov.; C, D, *P. pajuensis* Lee, Choi and Kim sp. nov.; E, F, *P. pocheonensis* Lee, Choi and Kim sp. nov.; G, H, *P. unaksanensis* Lee, Choi and Kim sp. nov. Scale bars = 1 mm.

Pholcus pojeonensis Kim and Yoo, 2008
Pholcus pyeongchangensis Seo, 2018
Pholcus seorakensis Seo, 2018
Pholcus simbok Huber, 2011
Pholcus socheunensis Paik, 1978
Pholcus sokkrisanensis [*sic*] Paik, 1978
Pholcus uiseongensis Seo, 2018
Pholcus unaksanensis Lee, Choi and Kim **sp. nov.**
Pholcus woongil Huber, 2011
Pholcus yeongwol Huber, 2011
Pholcus parkyeonensis Kim and Yoo, 2009 (North Korea)

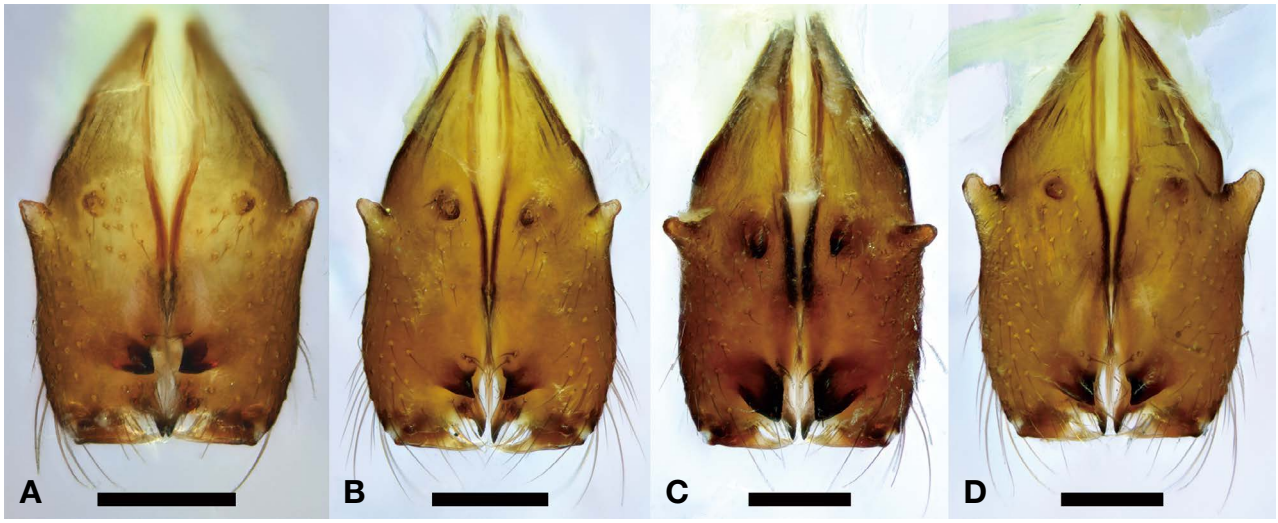

Fig. 2. Chelicerae of new *Pholcus* species, frontal view. A, *P. chuncheonensis* Lee, Choi and Kim sp. nov.; B, *P. pajuensis* Lee, Choi and Kim sp. nov.; C, *P. pocheonensis* Lee, Choi and Kim sp. nov.; D, *P. unaksanensis* Lee, Choi and Kim sp. nov. Scale bars = 0.25 mm.

A key to four new species of *Pholcus phungiformes*-group

Male

1. Trochanter apophysis straight; pseudo-appendix present (Figs. 3, 5)····· 2
− Trochanter apophysis perpendicularly curved; pseudo-appendix absent (Figs. 7, 9)····· 3
2. Prolateral process of procursus tip bifurcated (dorsal branch large and sharpened, ventral branch with 1−5 small spikes distally); posterior margin of uncus round; pseudo-appendix spatula-shaped (Fig. 3) ····· ····*Pholcus chuncheonensis* Lee, Choi and Kim **sp. nov.**
− Prolateral process of procursus tip not branched and round, with 2 spikes; posterior margin of uncus elongated and sharpened; pseudo-appendix hook-shaped (Fig. 5) ····· ····· *Pholcus pajuensis* Lee, Choi and Kim **sp. nov.**
3. Procursus tip with a membranous prolateral process and a bifurcated ventral process; posterior portion of uncus with a sharpened process (Fig. 7) ····· ····· *Pholcus pocheonensis* Lee, Choi and Kim **sp. nov.**
− Procursus tip with a large finger-like process with 2 spikes, ventral process not bifurcated; posterior portion of uncus without sharpened process (Fig. 9) ····· ····· *Pholcus unaksanensis* Lee, Choi and Kim **sp. nov.**

Female

1. Lateral margin of internal genitalia not strongly curved (Figs. 4B, 6B) ····· 2
− Lateral margin of internal genitalia strongly curved, S-shaped (Figs. 8B, 10B) ····· 3
2. Epigynal plate with melanized pattern on posteromost margins of each lateral portion; anterior arch of internal genitalia indistinctly visible through anterior cuticle of epigyne; lateral portion of internal genitalia elongated both anteriorly and posteriorly; pore plate inverted L-shaped (Fig. 4) ····· ···· *Pholcus chuncheonensis* Lee, Choi and Kim **sp. nov.**
− Epigynal plate with melanized pattern covered about half of each lateral portion; anterior arch of internal genitalia distinctly visible through anterior cuticle of epigyne; lateral portion of internal genitalia not elongated, posterior portion modified as flower-bud shape; pore plate round (Fig. 6) ····· ····· *Pholcus pajuensis* Lee, Choi and Kim **sp. nov.**
3. Epigynal knob long as height of epigynal plate; anterior arch of internal genitalia W-shaped; pore plate oval (Fig. 8) ··· *Pholcus pocheonensis* Lee, Choi and Kim **sp. nov.**
− Epigynal knob distinctly shorter than height of epigynal plate; anterior arch of internal genitalia inverted U-shaped; pore plate round (Fig. 10) ····· ····· *Pholcus unaksanensis* Lee, Choi and Kim **sp. nov.**

***Pholcus chuncheonensis* Lee, Choi and Kim sp. nov. (Figs. 1A, B, 2A, 3, 4)**

Korean name: 춘천유령거미 (신칭)

Type material. Holotype, ♂, Korea: Gangwon-do, Chuncheon-si, Dongsan-myeon, Research Forest of Kangwon National University (37°46′38″N, 127°48′51″E), 14 May 2016, JG Lee and JH Lee leg. (NIBR). Paratype, ♀, same data as for holotype (KNU).

Other materials examined. 1♂ 3♀♀, same data as for holotype (KNU); 11♂♂ 5♀♀, Gangwon-do, Chuncheon-si, Soyang-dong, Mt. Bongeuisan (37°53′23″N, 127°43′56″E), 05 Oct. 2015, DY Choi leg. (KISE); 16♂♂ 8♀♀, Gangwon-do, Chuncheon-si, Namsan-myeon, near Gangchon sewage treatment plant (37°48′23″N,

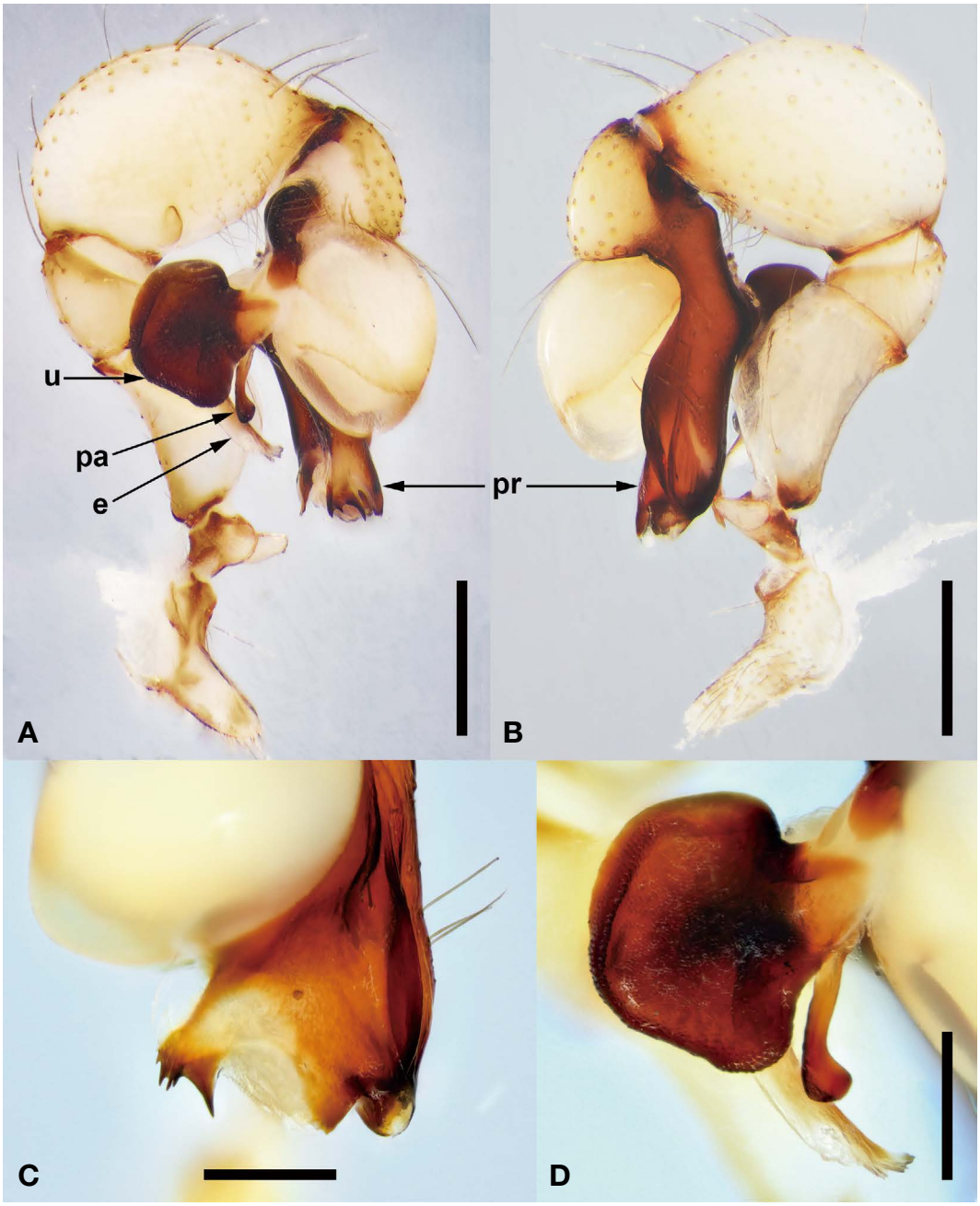

Fig. 3. *Pholcus chuncheonensis* Lee, Choi and Kim sp. nov., male. A, B, left palp (A, prolateral view, B, retrolateral view); C, procursus tip, dorsal view; D, bulbal process, prolateral view. Abbreviations: e = embolus, pa = pseudo-appendix, pr = procursus, u = uncus. Scale bars = 0.5 mm (A, B), 0.25 mm (C, D).

127°38′20″E), 20 Oct. 2015, DY Choi leg. (KISE); 20♂♂ 15♀♀, Gangwon-do, Chuncheon-si, Namsan-myeon, near Gangchon youth hostel (37°48′20″N, 127°37′47″E), 20 Oct. 2015, DY Choi leg. (KISE); 1♂, Gangwon-do, Chuncheon-si, Dongnae-myeon, Mt. Daeryongsan (37°51′03″N, 127°48′31″E), 05 Jul. 2019, JG Lee and JH Lee leg. (KNU); 1♂, Gangwon-do, Chuncheon-si, Dongnae-myeon, Mt. Daeryongsan (37°51′03″N, 127°48′31″E), 30 Aug. 2019, JG Lee and JH Lee leg. (KNU); 1♂ 1♀, Gangwon-do, Hongcheon-gun, Bukbang-myeon, Nature Environment Research Park (37°45′19″N, 127°50′57″E), 16 May 2019, JG Lee and JH Lee leg. (KNU); 12♂♂ 8♀♀, Gyeonggi-do, Gapyeong-gun, Cheongpyeong-myeon, Goseong-ri (37°42′45″N, 127°29′56″E), 25 Jun. 2018, DY Choi leg. (KISE).

Etymology. The specific epithet is derived from the holo-

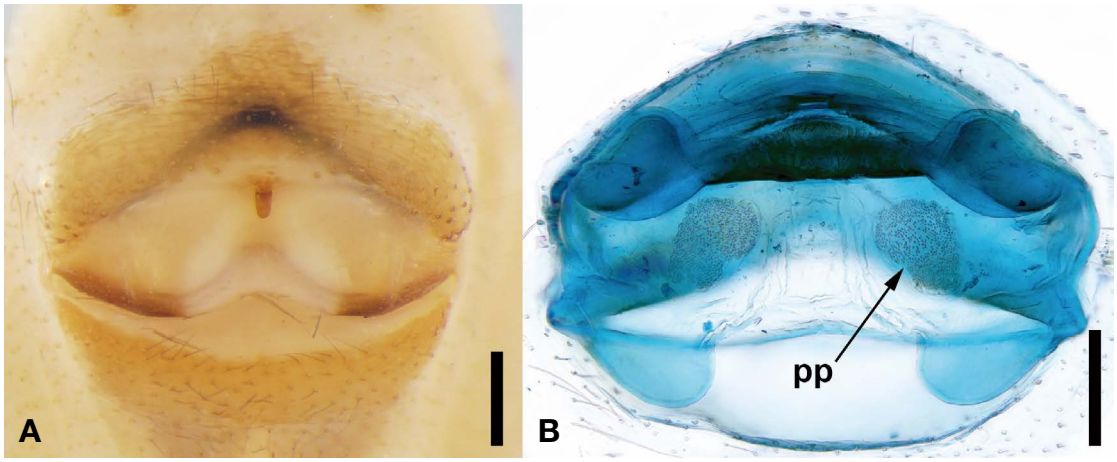

Fig. 4. *Pholcus chuncheonensis* Lee, Choi and Kim sp. nov., female. A, epigyne, ventral view; B, internal genitalia, dorsal view. Abbreviation: pp = pore plate of internal genitalia. Scale bars = 0.25 mm.

type locality, Chuncheon.

Diagnosis. This species can be distinguished from the other *Pholcus* species by the combination of following characteristics: Male - procursus with a bifurcated prolateral process (dorsal branch large and sharpened, ventral branch with 1−5 small spikes distally); uncus round, ear-shaped; pseudo-appendix present, spatula-shaped; trochanter apophysis much shorter than palpal femur, slender and triangular, distally blunt; Female - epigynal plate high as an anterior cuticle of epigyne; lateral portion of epigynal plate slightly extended posteriorly, melanized pattern present only at posteromost margin; internal genitalia margin distinctly extended, making lobe-like structure pointing anteriorly and posteriorly; pore plate thick, inverted L-shaped.

Description. Male (holotype). Somatic morphology (Fig. 1A, B) follows the description of the species-group. Total length 3.97. Prosoma 1.30 long, 1.37 wide. Diameter of AME 0.11, ALE 0.14, PME 0.10, PLE 0.13. AME−AME 0.05, AME−ALE 0.04, PME−PME 0.19. Chelicera (Fig. 2A) with a thumblike lateral proximal apophysis, a round frontal proximal apophysis and a triangular distal apophysis. Sternum 0.62 long, 0.94 wide. Opisthosoma 2.62 long, 1.13 wide. Leg I 29.90 (12.9 : 1.0 : 12.6 : 20.8 : 3.4), Leg II 20.22 (12.5 : 1.0 : 11.0 : 16.9 : 2.6), Leg III 14.63 (11.2 : 1.0 : 9.5 : 14.3 : 2.6), Leg IV 19.07 (11.6 : 1.0 : 8.9 : 15.0 : 2.3). Leg formula 1243. Palp (Fig. 3). Trochanter apophysis much shorter than femur, slender and triangular distally blunt, not curved; femur ventrally swollen roundly; tibia with a prolatero-ventral tubercle; procursus dark brown, bent perpendicularly, with two ventral knees; dorsal portion of procursus roundly swollen; procursus tip with a blunt retrolateral process with 3 ridges, a triangular median process and a bifurcated prolateral process (dorsal branch large and sharpened, ventral branch with 5 small spikes distally); genital bulb round, pale yellow; uncus dark reddish brown, round, ear-shaped, with many tiny tubercles marginally; pseudo-appendix dark reddish brown, spatula-shaped; embolus weakly sclerotized, pale yellow, longer than pseudo-appendix.

Female (Paratype). Somatic morphology follows the description of the species-group. Total length 4.89. Prosoma 1.21 long, 1.34 wide. Diameter of AME 0.10, ALE 0.14, PME 0.15, PLE 0.15. AME−AME 0.03, AME−ALE 0.04, PME−PME 0.18. Sternum 0.71 long, 0.91 wide. Opisthosoma 3.25 long, 1.51 wide. Leg I 28.69 (14.0 : 1.0 : 13.7 : 22.4 : 4.2), Leg II 19.92 (10.4 : 1.0 : 8.9 : 13.9 : 2.6), Leg III 14.66 (9.1 : 1.0 : 7.4 : 11.4 : 2.3), Leg IV 19.92 (12.4 : 1.0 : 10.2 : 15.7 : 2.2). Leg formula 1243. Epigyne (Fig. 4A). Anterior cuticle triangular, dark brown; epigynal plate bright ivory, height similar to anterior cuticle, lateral portion slightly extended posteriorly, melanization only present at posteromost margin; epigynal knob small and thin, reddish brown. Internal genitalia (Fig. 4B). Anterior arch horizontal, reddish brown, about 1/3 of epigyne width; antero-lateral margin and postero-lateral margin extended as lobes, pointing both anteriorly and posteriorly, respectively; pore plate thick, inverted L-shaped.

Variation. Male (n = 10) total length 3.97−5.74. Prosoma length 1.30−1.73, width 1.37−1.77. Tibia of Leg I 7.43−12.07. The number of spikes of ventral branch of prolateral process on procursus varies within species, from 1 to 5 (mainly 5).

Female (n = 10) total length 4.89−5.91. Prosoma length 1.21−1.57, width 1.34−1.52. Tibia of Leg I 7.09−8.48.

Distribution. Korea (Chuncheon, Hongcheon, Gapyeong).

***Pholcus pajuensis* Lee, Choi and Kim sp. nov.**
(Figs. 1C, D, 2B, 5, 6)
Korean name: 파주유령거미 (신칭)

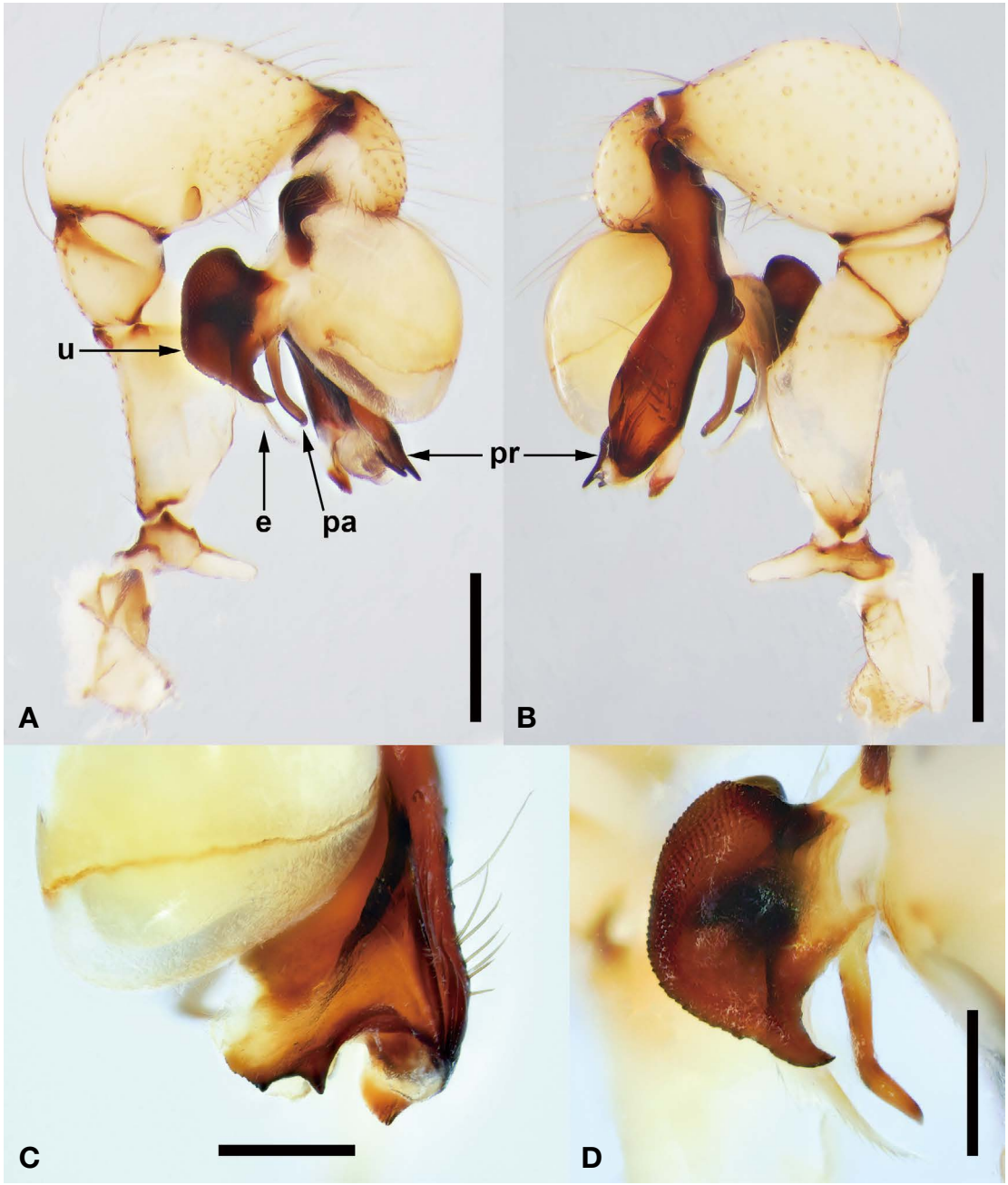

Fig. 5. *Pholcus pajuensis* Lee, Choi and Kim sp. nov., male. A, B, left palp (A, prolateral view, B, retrolateral view); C, procursus tip, dorsal view; D, bulbal process, prolateral view. Abbreviations: e = embolus, pa = pseudo-appendix, pr = procursus, u = uncus. Scale bars = 0.5 mm (A, B), 0.25 mm (C, D).

Type material. Holotype, ♂, Korea: Gyeonggi-do, Paju-si, Jeokseong-myeon, near Gloucester Valley Battle Monument (37°56′51″N, 126°55′58″E), 03 Jul. 2016, JG Lee and JH Lee leg. (NIBR). Paratype, ♀, same data as for holotype (KNU).

Other materials examined. 1♂ 1♀, same data as for holotype (KNU); 16♂♂ 15♀♀, Gyeonggi-do, Paju-si, Gwangtan-myeon, Bokwangsa Temple valley in Mt. Goryeongsan (37°45′10″N, 126°55′01″E), 01 Jun. 2014, DY Choi leg. (KISE).

Etymology. The specific epithet is derived from the type locality, Paju.

Diagnosis. This species can be distinguished from the other *Pholcus* species by the combination of following characteristics: Male - procursus tip with a round prolateral process with 2 spikes; posterior edge of uncus extended

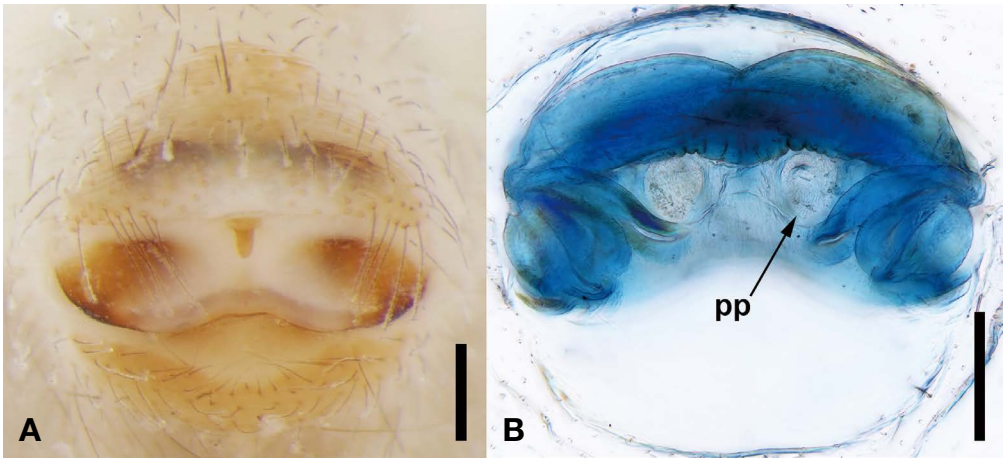

Fig. 6. *Pholcus pajuensis* Lee, Choi and Kim sp. nov., female. A, epigyne, ventral view; B, internal genitalia, dorsal view. Abbreviation: pp = pore plate of internal genitalia. Scale bars = 0.25 mm.

and distally sharpened; pseudo-appendix present, slender and distally hook-shaped; Female - sclerotized anterior arch of internal genitalia slightly curved roundly; postero-lateral portion of internal genitalia with flower-bud like modification.

Description. Male (holotype). Somatic morphology (Fig. 1C, D) follows the description of species-group. Total length 5.91. Prosoma 1.76 long, 1.61 wide. Diameter of AME 0.11, ALE 0.16, PME 0.17, PLE 0.16. AME–AME 0.04, AME–ALE 0.03, PME–PME 0.23. Chelicera (Fig. 2B) with a thumblike lateral proximal apophysis, a round frontal proximal apophysis and a notched triangular distal apophysis. Sternum 0.82 long, 1.14 wide. Opisthosoma 3.97 long, 1.73 wide. Leg I 47.26 (19.2 : 1.0 : 18.9 : 32.3 : 3.6), Leg II 31.49 (14.1 : 1.0 : 12.5 : 20.5 : 2.7), Leg III 22.16 (10.4 : 1.0 : 8.6 : 13.3 : 1.9), Leg IV 29.18 (13.6 : 1.0 : 10.9 : 17.3 : 2.1). Leg formula 1243. Palp (Fig. 5). Trochanter apophysis much shorter than femur, slender and triangular, distally blunt, not curved; femur ventrally swollen roundly; tibia with a prolatero-ventral tubercle; procursus dark brown, bent perpendicularly, with 2 ventral knees, dorsally roundly swollen; procursus tip with a retrolateral process with 3 ridges, prolateral round process with 2 spikes and a sharpened ventral process; genital bulb round, pale yellow; uncus dark reddish brown, oval, with many tiny tubercles and posteriorly extended and sharpened; pseudo-appendix dark reddish brown, slender and distally curved like a hook; embolus weakly sclerotized, pale yellow, longer than pseudo-appendix.

Female (Paratype). Somatic morphology follows the description of the species-group. Total length 5.40. Prosoma 1.58 long, 1.46 wide. Diameter of AME 0.10, ALE 0.14, PME 0.17, PLE 0.16. AME–AME 0.04, AME–ALE 0.03, PME–PME 0.22. Sternum 0.80 long, 1.07 wide. Opisthosoma 3.40 long, 1.35 wide. Leg I 33.13 (13.9 : 1.0 : 13.5 : 21.6 : 3.5), Leg II 22.40 (12.3 : 1.0 : 10.8 : 16.5 : 2.5), Leg III 16.57 (9.9 : 1.0 : 8.3 : 12.4 : 2.2), Leg IV 22.80 (12.2 : 1.0 : 10.1 : 15.2 : 2.2). Leg formula 1423. Epigyne (Fig. 6A). Anterior cuticle triangular, grayish brown; epigynal plate bright ivory, height about 1/2 of anterior cuticle height, lateral portion slightly extended posteriorly, gradient melanization covering about half of lateral portion of epigynal plate; epigynal knob small and thin, yellowish brown. Internal genitalia (Fig. 6B). Anterior arch slightly curved roundly, reddish brown, length as width of epigyne, distinctly visible through epigynal anterior cuticle; postero-lateral portion with flower-bud like modification; pore plate round, small as epigynal knob.

Variation. Male (n = 10) total length 5.06–6.15. Prosoma length 1.54–1.76, width 1.49–1.72. Tibia of Leg I 10.46–12.44.

Female (n = 10) total length 5.21–5.84. Prosoma length 1.48–1.62, width 1.39–1.57. Tibia of Leg I 7.43–9.03.

Distribution. Korea (Paju).

Remarks. The female of *P. pajuensis* is very similar to *Pholcus woongil*, having a distinct anterior arch of the internal genitalia and gradient melanization on the lateral portion of the epigynal plate. However, this species can be easily distinguished from the latter by following characteristics: anterior arch of internal genitalia round (W-shaped in *P. woongil*); presence of postero-lateral flower-bud like modification of internal genitalia (absent in *P. woongil*); pore plate small and round (oblong in *P. woongil*).

Pholcus pocheonensis Lee, Choi and Kim sp. nov. (Figs. 1E, F, 2C, 7, 8)

Korean name: 포천유령거미 (신칭)

Type material. Holotype, ♂, Korea: Gyeonggi-do, Pocheon-si, Idong-myeon, Nogok-ri (38°01′45″N, 127°20′

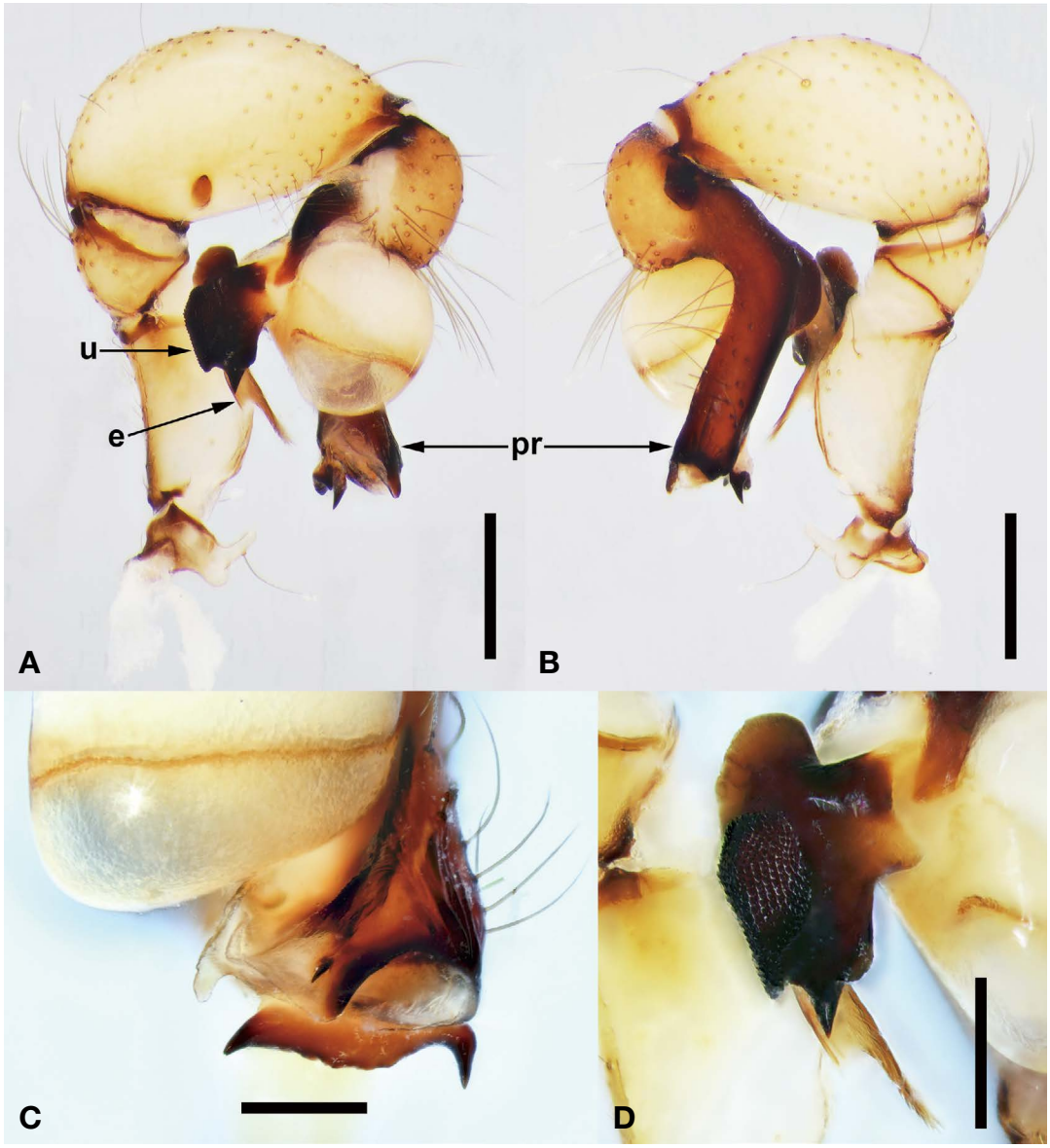

Fig. 7. *Pholcus pocheonensis* Lee, Choi and Kim sp. nov., male. A, B, left palp (A, prolateral view, B, retrolateral view); C, procursus tip, dorsal view; D, bulbal process, prolateral view. Abbreviations: e = embolus, pr = procursus, u = uncus. Scale bars = 0.5 mm (A, B), 0.25 mm (C, D).

38″E), 06 Aug. 2017, JG Lee leg. (NIBR). Paratype, ♀, same locality as for holotype, 19 Jun. 2017, JG Lee leg. (KNU).

Other materials examined. 2♂♂ 1♀, same data as for paratype (KNU); 2♂♂ 2♀♀, same locality as for holotype, 09 Oct. 2017, JG Lee leg. (KNU); 10♂♂ 21♀♀, Gyeonggi-do, Pocheon-si, Yeongbuk-myeon, near Sanjeong Lake (38°04′23″N, 127°19′26″E), 08 Aug. 2014, DY Choi leg. (KISE).

Etymology. The specific epithet is derived from the type locality, Pocheon.

Diagnosis. This species can be distinguished from the other *Pholcus* species by the combination of following characteristics: Male - procursus tip with a large sharpened process and a membranous process prolaterally and bifurcated ventral process; uncus with a diamond-shaped prolateral process and a sharpened process on posterior margin; pseudo-appendix absent; Female - sclerotized anterior arch of internal genitalia wide W-shaped, distinctly visible through the epigynal anterior cuticle; epigynal knob long as height of epigynal plate, dark brown; lateral margin of internal genitalia strongly curved, S-shaped, posterior curve larger than anterior curve, bulging dorsally.

Description. Male (holotype). Somatic morphology (Fig.

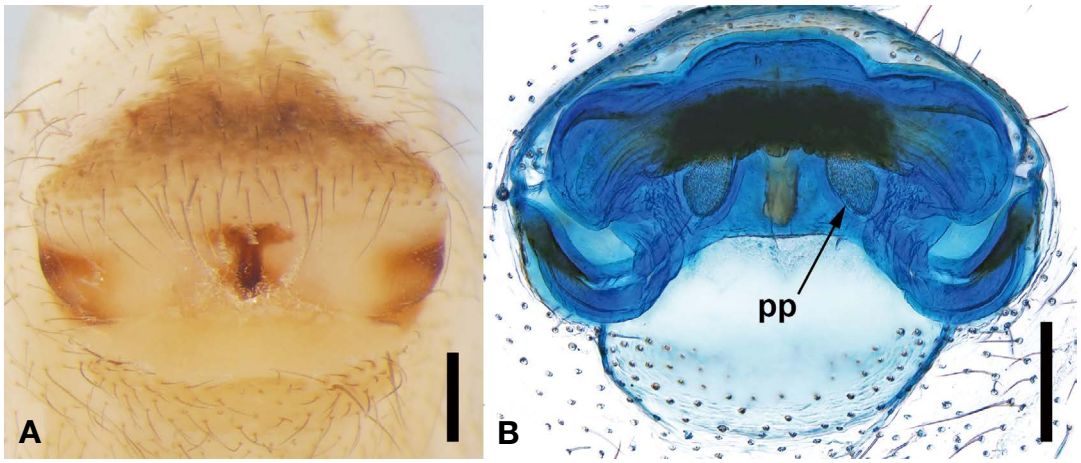

Fig. 8. *Pholcus pocheonensis* Lee, Choi and Kim sp. nov., female. A, epigyne, ventral view; B, internal genitalia, dorsal view. Abbreviation: pp = pore plate of internal genitalia. Scale bars = 0.25 mm.

1E, F) follows the description of species-group. Total length 6.44. Prosoma 1.94 long, 1.91 wide. Diameter of AME 0.12, ALE 0.17, PME 0.16, PLE 0.17. AME–AME 0.06, AME–ALE 0.05, PME–PME 0.24. Chelicera (Fig. 2C) with a thumblike lateral proximal apophysis, a ventrally curved frontal proximal apophysis and a large trapezoid distal apophysis. Sternum 0.93 long, 1.24 wide. Opisthosoma 4.36 long, 1.73 wide. Leg I 56.89 (21.2 : 1.0 : 21.1 : 35.3 : 2.6), Leg II 39.42 (14.9 : 1.0 : 13.5 : 21.5 : 2.3), Leg III 26.63 (10.4 : 1.0 : 9.2 : 14.0 : 1.9), Leg IV 35.52 (13.5 : 1.0 : 11.8 : 18.0 : 1.8). Leg formula 1243. Palp (Fig. 7). Trochanter apophysis much shorter than femur, curved perpendicularly; femur ventrally swollen; tibia with a prolatero-ventral tubercle; procursus dark brown, bent perpendicularly, with a ventral knee; procursus tip with a membranous process prolaterally, a large sharpened process with 2 spines medially and a bifurcated process ventrally; genital bulb round, pale yellow; uncus dark brown, with a diamond-shaped prolateral process covered with many tiny tubercles, postero-dorsal margin extended and distally sharpened; pseudo-appendix absent; embolus weakly sclerotized, pale yellow, longer than uncus.

Female (Paratype). Somatic morphology follows the description of the species-group. Total length 5.22. Prosoma 1.55 long, 1.48 wide. Diameter of AME 0.09, ALE 0.15, PME 0.15, PLE 0.15. AME–AME 0.03, AME–ALE 0.04, PME–PME 0.18. Sternum 0.78 long, 0.96 wide. Opisthosoma 3.38 long, 1.47 wide. Leg I 34.03 (14.1 : 1.0 : 14.2 : 24.1 : 4.2), Leg II 23.15 (13.4 : 1.0 : 12.4 : 19.4 : 3.1), Leg III 16.63 (10.7 : 1.0 : 9.1 : 13.8 : 2.4), Leg IV 23.11 (11.4 : 1.0 : 9.5 : 15.0 : 2.3). Leg formula 1243. Epigyne (Fig. 8A). Anterior cuticle triangular, grayish yellow; epigynal plate bright ivory, height much shorter than anterior cuticle height, lateral portion slightly extended posteriorly, gradient melanization on lateral margin; epigynal knob dark brown, long as height of epigynal plate. Internal genitalia (Fig. 8B). Anterior arch W-shaped, length similar to epigyne width, dark brown, distinctly visible through epigynal anterior cuticle; lateral margin of internal genitalia strongly curved, S-shaped, posterior curve larger than anterior curve, bulging dorsally; pore plate oval.

Variation. Male (n = 10) total length 5.10–6.44. Prosoma length 1.74–1.94, width 1.57–1.91. Tibia of Leg I 11.80–14.77.

Female (n = 10) total length 4.45–6.01. Prosoma length 1.53–1.77, width 1.41–1.68. Tibia of Leg I 8.40–9.95.

Distribution. Korea (Pocheon).

Pholcus unaksanensis Lee, Choi and Kim sp. nov. (Figs. 1G, H, 2D, 9, 10)

Korean name: 운악유령거미 (신칭)

Type material. Holotype, ♂, Gyeonggi-do, Gapyeong-gun, Ha-myeon, Mt. Unaksan (37°51′55″N, 127°20′21″E), 05 Aug. 2014, DY Choi leg. (NIBR). Paratype, ♀, same data as for holotype (KNU).

Other materials examined. 1♀, same data as for holotype (KNU). 3♂♂ 23♀♀, same data as for holotype (KISE).

Etymology. The specific epithet is derived from the type locality, Mt. Unaksan.

Diagnosis. This species can be distinguished from the other *Pholcus* species by the combination of following characteristics: Male - procursus tip with a large finger-like prolateral process with 2 spikes; uncus oval, posteriorly pointed but distally blunt; pseudo-appendix absent; Female - sclerotized anterior arch of internal genitalia inverted U-shaped, distinctly visible through the epigynal anterior cuticle; lateral margin of internal genitalia strongly curved, S-shaped.

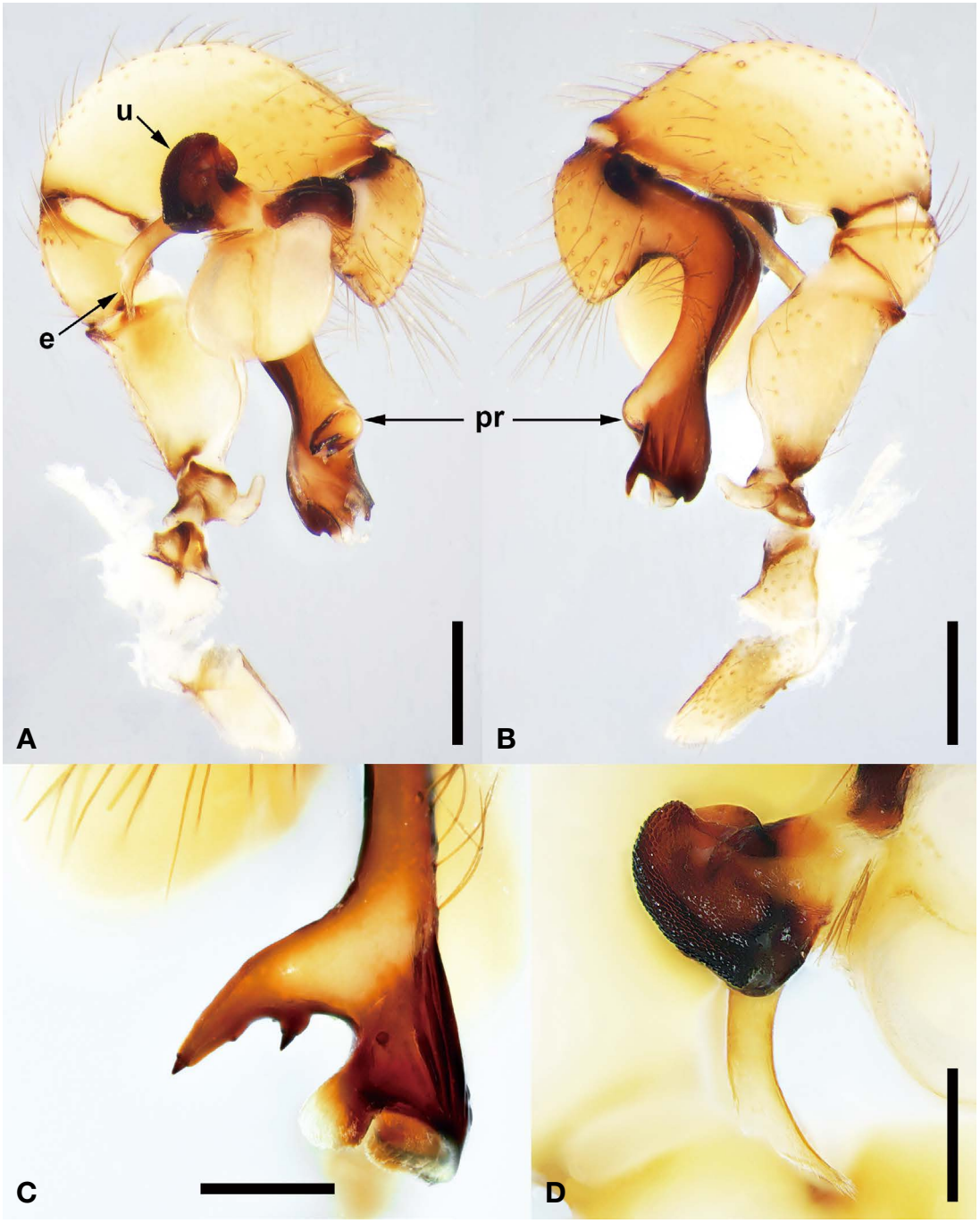

Fig. 9. *Pholcus unaksanensis* Lee, Choi and Kim sp. nov., male. A, B, left palp (A, prolateral view, B, retrolateral view); C, procursus tip, dorsal view; D, bulbal process, prolateral view. Abbreviations: e = embolus, pr = procursus, u = uncus. Scale bars = 0.5 mm (A, B), 0.25 mm (C, D).

Description. Male (holotype). Somatic morphology (Fig. 1G, H) follows the description of species-group. Total length 5.42. Prosoma 1.71 long, 1.62 wide. Diameter of AME 0.12, ALE 0.15, PME 0.14, PLE 0.15. AME–AME 0.05, AME–ALE 0.05, PME–PME 0.22. Chelicera (Fig. 2D) with a thumblike lateral proximal apophysis with secondary process, a round frontal proximal apophysis and a notched triangular distal apophysis. Sternum 0.89 long, 1.20 wide. Opisthosoma 3.71 long, 1.57 wide. Leg I 45.06 (16.5 : 1.0 : 16.6 : 27.7 : 3.5), Leg II 30.53 (10.3 : 1.0 : 9.3 : 15.1 : 2.0), Leg III 21.37 (8.5 : 1.0 : 7.3 : 11.2 : 1.6), Leg IV 28.11 (12.2 : 1.0 : 10.9 : 16.6 : 1.9). Leg formula 1243.

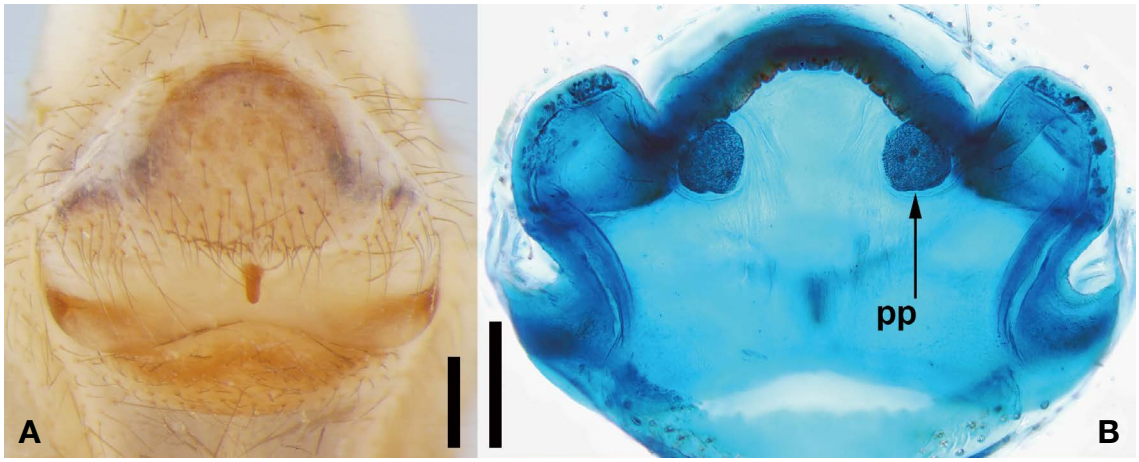

Fig. 10. *Pholcus unaksanensis* Lee, Choi and Kim sp. nov., female. A, epigyne, ventral view; B, internal genitalia, dorsal view. Abbreviation: pp = pore plate of internal genitalia. Scale bars = 0.25 mm.

Palp (Fig. 9). Trochanter with a proximal hump retrolaterally, trochanter apophysis much shorter than femur, curved perpendicularly toward tibia and curved once again, pointing retrolaterally; femur ventrally swollen; tibia with a prolatero-ventral tubercle; procursus reddish brown, bent perpendicularly, with a ventral knee; procursus tip with a large finger-like process pointing prolaterally, slightly curved distally, proximally with a short branch (process tip and branch tip with a spike respectively); genital bulb round, pale yellow; uncus oval, dark brown, with many tiny tubercles, posterior margin pointed but distally blunt; pseudo-appendix absent; embolus weakly sclerotized, pale yellow, longer than uncus.

Female (Paratype). Somatic morphology follows the description of the species-group. Total length 5.27. Prosoma 1.60 long, 1.47 wide. Diameter of AME 0.10, ALE 0.15, PME 0.15, PLE 0.18. AME–AME 0.05, AME–ALE 0.04, PME–PME 0.20. Sternum 0.77 long, 1.09 wide. Opisthosoma 3.41 long, 1.68 wide. Leg I 34.88 (12.0 : 1.0 : 12.1 : 20.7 : 3.3), Leg II 24.15 (10.3 : 1.0 : 9.6 : 15.1 : 2.3), Leg III 17.94 (8.5 : 1.0 : 7.3 : 11.1 : 2.1), Leg IV 23.88 (10.6 : 1.0 : 9.3 : 14.5 : 2.0). Leg formula 1243. Epigyne (Fig. 10A). Anterior cuticle triangular, grayish yellow; epigynal plate grayish yellow, posterior margin of lateral portion slightly extended, gradient melanization on lateral margin; epigynal knob reddish brown, shorter than height of epigynal plate. Internal genitalia (Fig. 10B). Anterior arch inverted U-shaped, visible through epigynal anterior cuticle; lateral margin strongly curved, S-shaped; pore plate round.

Variation. Male (n = 4) total length 5.33–5.72. Prosoma length 1.71–1.89, width 1.62–1.83. Tibia of Leg I 11.47–15.45.

Female (n = 10) total length 4.61–5.79. Prosoma length 1.43–1.69, width 1.42–1.70. Tibia of Leg I 7.81–9.66.

Distribution. Korea (Gapyeong).

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