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## SPIDERS OF THE GENUS *DRACONARIUS* (ARANEAE, AMAUROBIIDAE) FROM KOREA

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**ABSTRACT.** Three species of the genus *Draconarius* are recognized from Korea and all are described and illustrated. *Coelotes kayasanensis* Paik 1972 is transferred to *Draconarius* (*D. kayasanensis* new combination) based on the presence of a patellar apophysis, the hooked dorsal apophysis of the conductor in the male palp, the position of the spermathecal head, and the shape of the broadly rectangular genital opening of the female situated posteriorly near the epigastric furrow. The male of *D. coreanus* (Paik & Yaginuma 1969) and the female of *D. kayasanensis* are described for the first time. A neotype of *D. coreanus* is designated in the present study because of the loss of the holotype, limited range of the species, and the small population size. *Draconarius hallaensis* new species is described and is distinguished by its small size (less than 8 mm in total body length), large rounded retrolateral tibial apophysis, and median apophysis that has a distally divided thumb-shaped inner part.

**Keywords:** Taxonomy, spiders, Coelotinae, Asia, morphology

The Holarctic spider subfamily Coelotinae is one of the most common spider taxa in the region and is comprised of at least 373 species (Wang 2002, 2003, 2006; Platnick 2006). Wang (2002) revised the subfamily Coelotinae at the generic level based on 31 characters and 22 taxa, including two outgroup taxa (*Tamgrinia* Lehtinen 1967 and *Amaurobius* C.L. Koch 1837). Of these, the genus *Draconarius* Ovtchinnikov 1999 includes a total of 95 species from a variety of Asian countries (China, 77 species; Thailand, 10; Bhutan, 4; Nepal, 1; Tajikistan, 1; Taiwan, 1; Korea, 1). These taxa are characterized by posteriorly originating copulatory ducts, the presence of a dorsal apophysis on the conductor, and the cymbial furrow more than half the cymbial length. More than 60 species of *Draconarius* are described only from male or female specimens and the genus has been previously included in *Coelotes* Blackwall 1841 (Zhang et al. 2002; Dankittipakul & Wang 2003, 2004; Dankittipakul et al. 2005). This paper revises the species of *Draconarius* found in Korea.

The only species of *Draconarius* currently recorded from Korea, originally named as *Coelotes coreanus* Paik & Yaginuma 1969, was described from a female specimen taken in Seong lava cave, Jeju-do Island, Korea (Paik et al. 1969). Although Namkung (2002,

2003) presented simple illustrations of *D. coreanus*, the species cannot be reliably identified from his pictorial book. Wang (2003) reported *D. coreanus* from two different localities (a female from Mt. Kwanak, Seoul and a male from Mt. Halla, Jeju-do Island). However, his description seemed to be based on misidentified specimens. In this paper, we describe *D. hallaensis* new species based on specimens formerly known as *D. coreanus* collected from Mt. Halla and the additional samples from the Korean National Arboretum of Gwangreung, Gyeonggi-do, in western central Korea.

The holotype of *D. coreanus* has either been lost within the collection of the National Science Museum in Tokyo, Japan, or an error was made by the original authors preventing its correct identification. The type locality of *D. coreanus* (Seong lava cave) was surveyed ten times between August 2003 and January 2006 and we found several specimens which are described here. A neotype for this species is designated from these samples and re-described, along with the first description of males.

*Draconarius kayasanensis* Paik 1972 was first named as *Coelotes kayasanensis*, and based only on a single male (Paik 1972). However, Ovtchinnikov (1999) and Wang

(2002) transferred the species to *Ambanus* Ovtchinnikov 1999 without detailed examination. We collected many specimens of *D. kayasanensis* using pitfall traps and active searching in Mt. Odae National Park in eastern Korea, approximately 100 km from Seoul. After a careful reexamination with detailed illustrations and images taken with a scanning electron microscope, we transfer this species to *Draconarius* based on the presence of a dorsal apophysis on the conductor of the male palp, the position of the spermathecal head, and the shape of the genital opening of the female.

#### MATERIAL AND METHODS

Between 10 to 20 pitfall sites were established in the Seong lava cave on Jeju-do Island and in the surrounding forests (the Korean National Arboretum of Gwangreung, Gyeonggi-do; Mt. Odae National park, Gangwon-do) in Korea. At each site, two pitfall traps (plastic cups, height 6.3 cm, diameter 8 cm) were set 10 m apart (or 5 m inside the cave itself) and filled with ethylene glycol (Greenslade & Greenslade 1971). Drawings were prepared with an Olympus drawing tube, mounted on an Olympus SZX 12 and BX51 interference contrast microscope. The male palp was expanded by quick immersion (5 min) in concentrated KOH (0.2 g/ml H<sub>2</sub>O) and specimens were fixed and preserved in 70% ethanol. Before dissection, the total body was drawn and body length measurements were made from whole specimens temporarily mounted in lactophenol. The genitalia of specimens were dissected in lactophenol, and the parts individually mounted in lactophenol under cover slips subsequently sealed with Glyceel or transparent nail varnish. If necessary, SEM photographs were used for the analysis of details. Scale bars in figures are in millimeters. All specimens examined in this paper will be deposited in the National Biological Resources Center (NBRC), Incheon City.

The descriptive terminology and spination of the legs follows that of Ono (1988) and Wang (2002). Abbreviations used are: a, apical; AER, anterior eye row; AIK, Arachnological Institute of Korea; ALE, anterior lateral eye; ALS, anterior lateral spinneret; AME, anterior median eye; d, dorsal view; ITA, intermediate tibial apophysis; p, prolateral view; PER, posterior eye row; PLE, posterior lateral

eye; PLS, posterior lateral spinneret; PME, posterior median eye; PMS, posterior median spinneret; r, retrolateral view; RTA, retrolateral tibial apophysis.

Family Amaurobiidae Thorell 1870

Subfamily Coelotinae

F.O. Pickard-Cambridge 1893

*Draconarius* Ovtchinnikov 1999

**Type species.**—*Draconarius venustus* Ovtchinnikov 1999, by original designation.

*Draconarius coreanus*

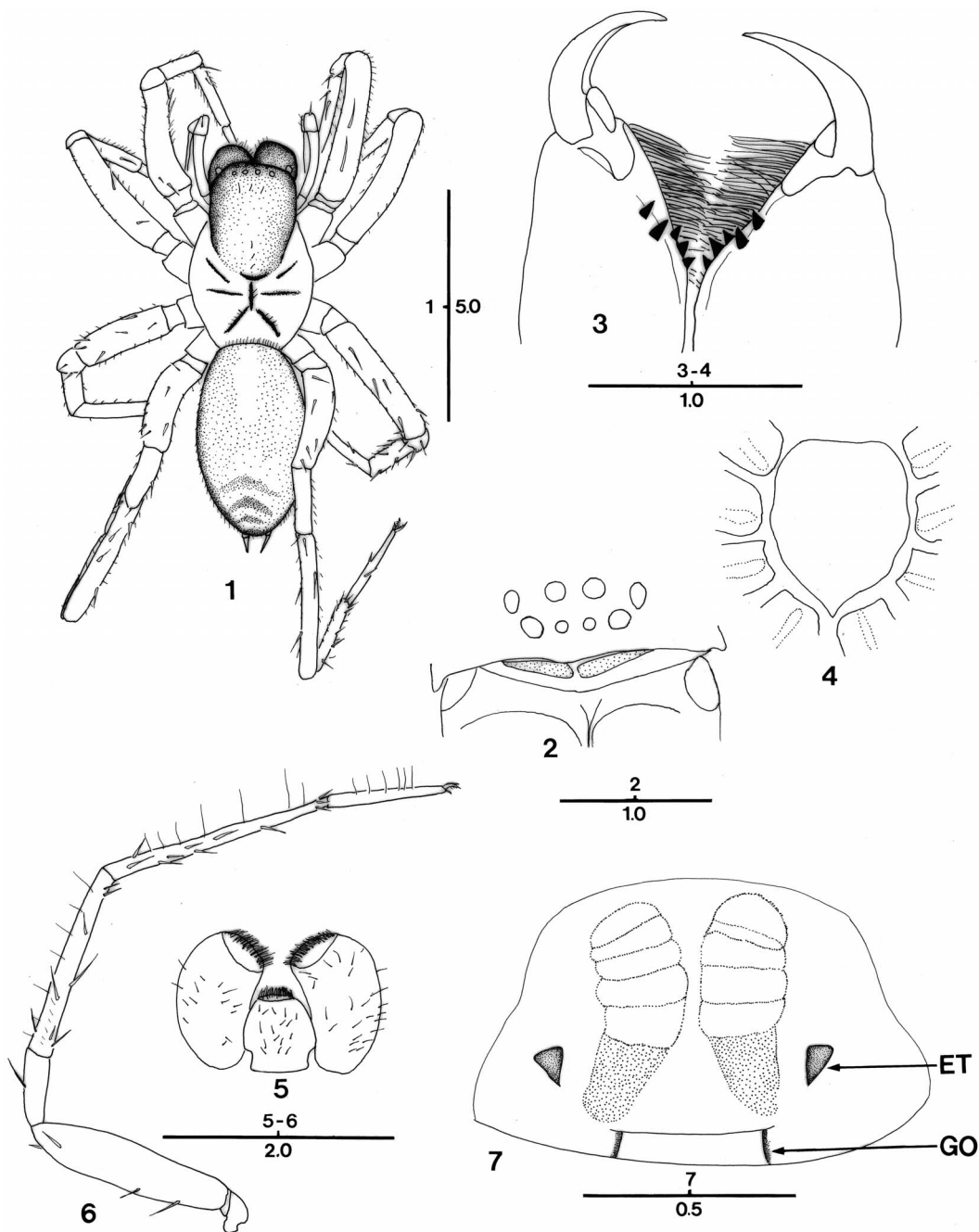
(Paik & Yaginuma 1969)

Figs. 1–19, 50, 51

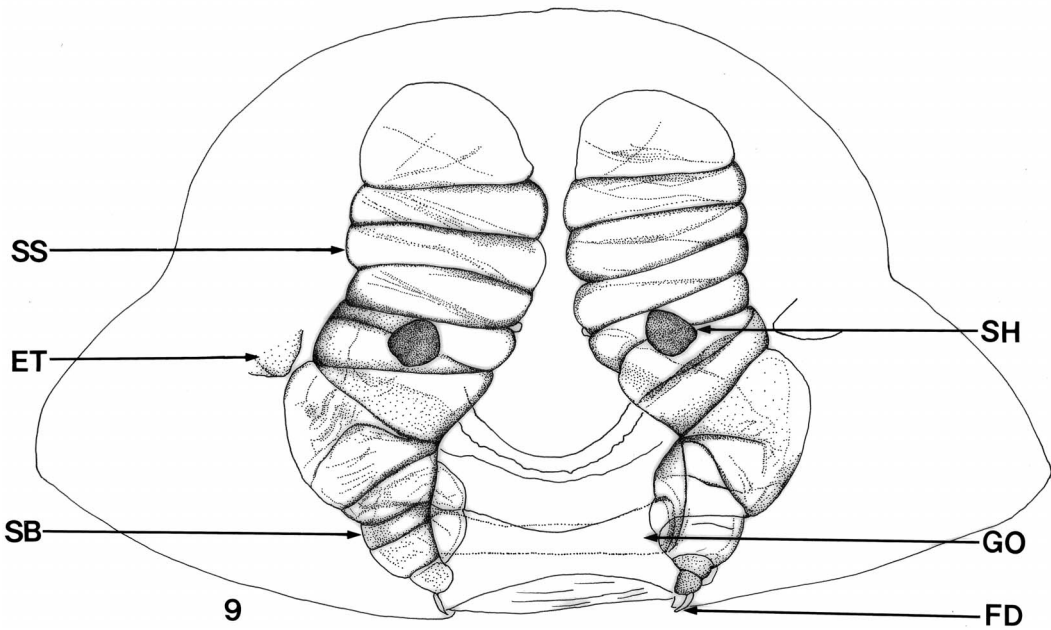
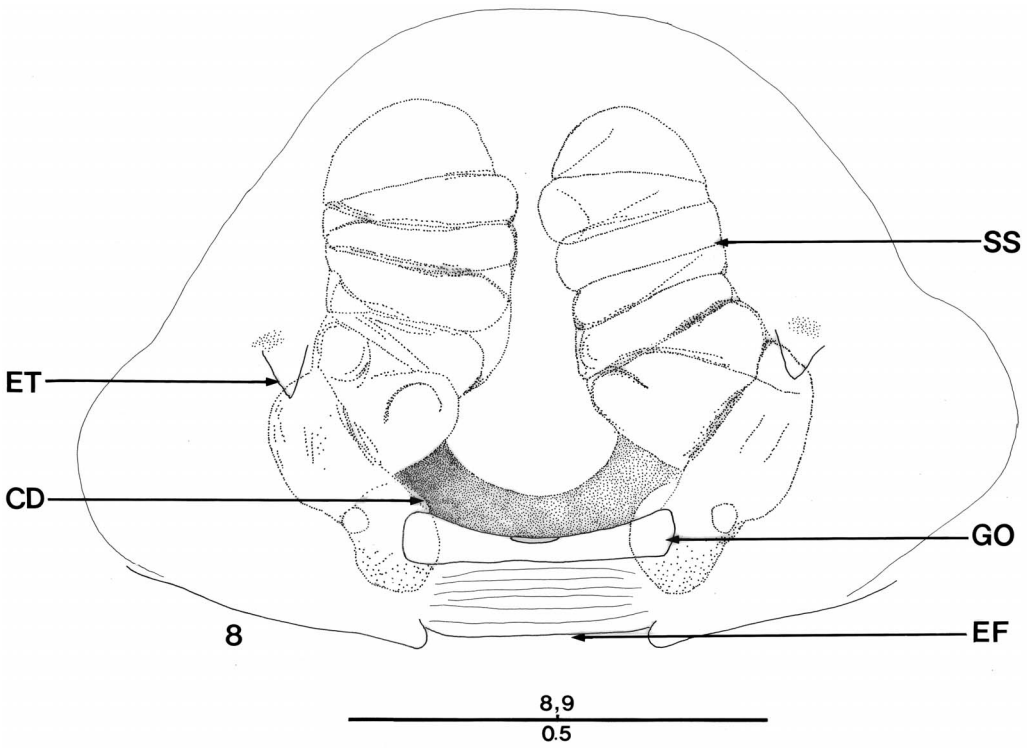
*Coelotes coreanus* Paik & Yaginuma, in Paik et al. 1969:837, figs. 62–64; Paik 1978:337, figs. 149.1–3; Namkung 2002:389, figs. 28.3a, b; Namkung 2003:391, figs. 28.3a, b.

**Material examined.**—KOREA: *Jeju-do*: 1 ♀, Seong lava cave, Sinchangri, Bukjeju-gun, 33°20'06"N, 126°11'10"E, 18 m, 17 January 2005, B.W. Kim (NBRC); 2 ♀, same location, 8 November 2003, B.W. Kim (NBRC); 1 ♂, same location, 9 August 1997, Y.G. Choi (NBRC).

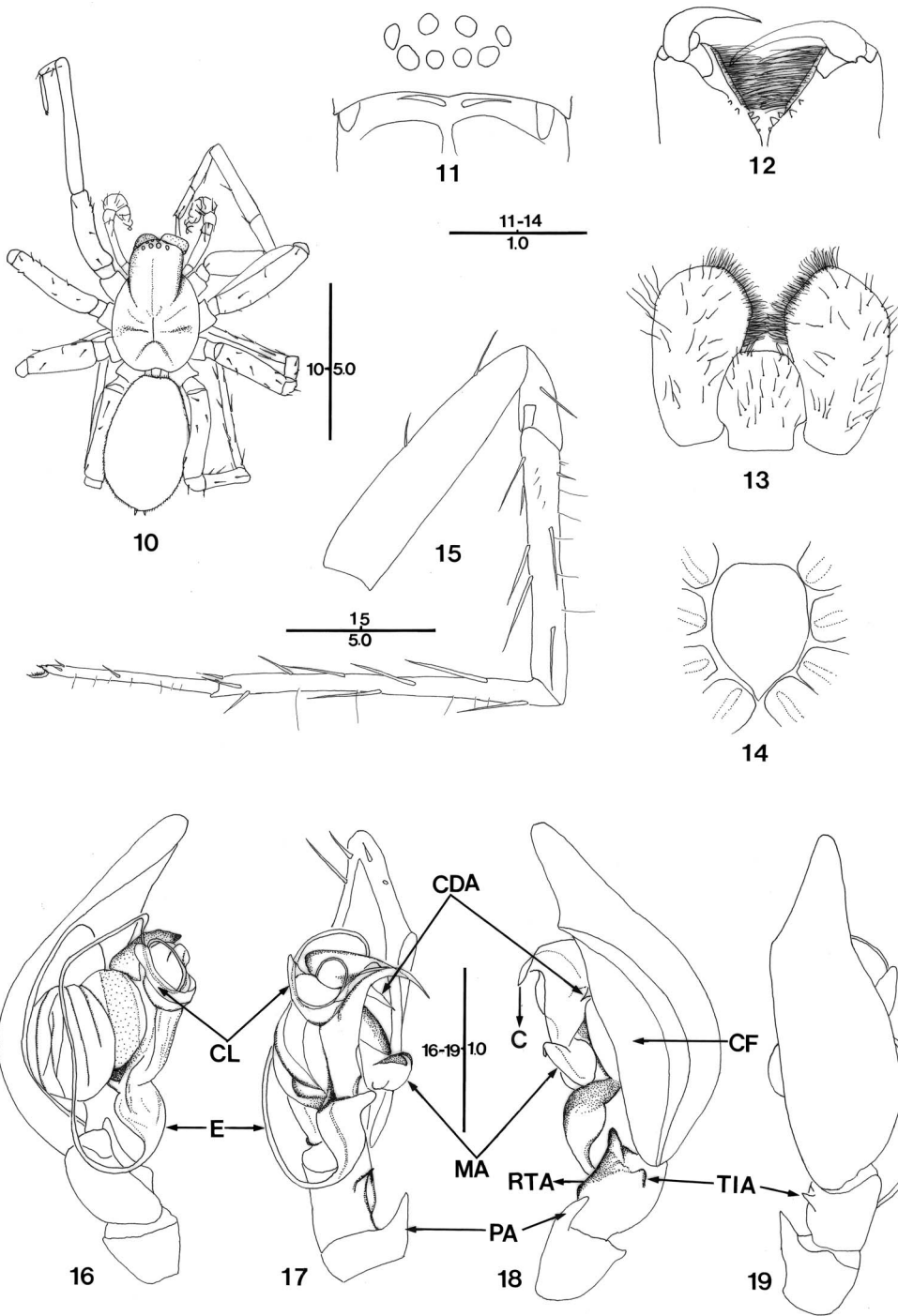
**Diagnosis.**—This species is similar to *D. kayasanensis*, *D. stemmleri* (Brignoli 1978), *D. wudangensis* (Chen & Zhao 1997) and *D. hallaensis* n. sp. in having the female epigynum with atrium (genital opening) very broadly rectangular, situated posteriorly near epigastric furrow, copulatory ducts short, and male palpal organs with cymbial furrow more than half cymbial length, and with large lamella on conductor. The species is easily distinguished by epigynal teeth separated more broader than both spermathecal margins (put between both spermathecal margins in *D. kayasanensis*), spermatheca cylindrical (expanded in *D. kayasanensis*), not attached distally (overlapping in *D. kayasanensis*), spermathecal heads small and circular, situated medially on spermathecae and cymbial furrow elongate, about 68% (83% in *D. kayasanensis*) as long as cymbium, conductor horizontally bent with modified sharp tip, conductor lamella large, median apophysis split distal end with inner part furrowed in the middle, (linear without inner part furrowed in *D. kayasanensis*; rounded in *D. hallaensis*), vague interior projection on the base (distinct in *D. kayasanensis*; fluent in *D. hallaensis*), and retrolateral tibial apophy-



Figures 1–7.—*Draconarius coreanus* (Paik & Yaginuma 1969) from Korea, female. 1. Habitus, dorsal view. 2. Eye area and clypeus, anterior view. 3. Chelicerae, posterior view. 4. Sternum, ventral view. 5. Endites and labium, ventral view. 6. 4th leg (left), prolateral view. 7. Epigynum, ventral view. ET = epigynal teeth, GO = genital opening.



Figures 8, 9.—*Draconarius coreanus* (Paik & Yaginuma 1969) from Korea, female. 8. Epigynum, ventral view. 9. Genitalia, dorsal view. CD = copulatory duct, EF = epigynal furrow, ET = epigynal teeth, FD = fertilization duct, GO = genital opening, SB = spermathecal base, SH = spermathecal head, SS = spermathecal stalk.



Figures 10–19.—*Draconarius coreanus* (Paik & Yaginuma 1969) from Korea, male. 10. Habitus, dorsal view. 11. Eye area and clypeus, anterior view. 12. Chelicerae, posterior view. 13. Endites and labium, ventral view. 14. Sternum, ventral view. 15. 4th leg (left), prolateral view. 16–19. Palp, left, prolateral, ventral, retrolateral, and dorsal views. CDA = conductor dorsal apophysis, C = conductor, CL = conductor lamella, CF = cymbial furrow, E = embolus, MA = median apophysis, PA = patellar apophysis, RTA = retrolateral tibial apophysis, TIA = tibial intermediated apophysis.

sis with sharp distal tip (rounded distal tip in *D. hallaensis*).

**Description.**—*Female*: medium sized spider 9.5 mm in length, slightly longer than male. Carapace elongated, moderately narrowed in eye area, and with distinct longitudinal medial fovea. Abdomen dark brown, with gray chevron patterns, heavily covered with short hair-like setae (Fig. 1). Palp three rows of trichobothria on tibia and 1 claw with 11 pectinate teeth. From dorsal aspect, AER more or less procurved, PER straight and AER slightly smaller than PER. AME smallest, other eyes roughly equal in size. Eye formula  $ALE = PLE = PME > AME/ALE = PLE = PME > AME$ . Clypeal height more than twice the AME; chilum divided (Fig. 2). Chelicerae with many long dense scopula hairs, 3 promarginal and 2 retromarginal teeth, condyle developed laterobasally and fang slightly longer than cheliceral width (Figs. 2, 3). Endite with anterior scopula, longer than wide; labium as long as wide (Fig. 5). Sternum shield-shaped, distinctly longer than wide, widest near coxa II, posterior end not protruding between hind coxae (Fig. 4). Legs without annulations (Figs. 1, 6): leg IV longest, leg III shortest; length of patella I + tibia I slightly shorter than carapace length; trochanters not notched; tibia with 4 rows of 4 to 7 trichobothria (leg I 7p-7d-5d-5r; leg II 5p-7d-4d-5r; leg III 5p-7d-5d-5r; leg IV 6p-8d-6d-5r), metatarsi with 1 row of 8 to 9 trichobothria, tarsi with 1 row of 8 to 10 trichobothria; tarsal organ situated close to distal end of tarsi, slightly anterior to distal-most trichobothrium; tarsi with 3 claws, upper claws with 11 pectinate teeth (13 in leg I), lower with 4 (3 in leg II).

Legs: leg formula 4123. Leg spination: leg I: femur with 5 spines, tibia with 7 spines (prolateral 0-1; ventral 2-2-2a), metatarsus with 8 spines (prolateral 1-1; ventral 2-2-2); leg II: femur with 6 spines, tibia with 8 spines (prolateral 1-1; ventral 2-2-2a), metatarsus with 10 spines (prolateral 1-2; retrolateral 0-0-1; ventral 2-2-2); leg III: femur with 7 spines, tibia with 11 spines (dorsal 1-0-0; prolateral 1-1; retrolateral 1-1; ventral 2-2-2a), metatarsus with 17 spines (dorsal 1-2-0; prolateral 1-1-2; retrolateral 2-0-2; ventral 2-2-2), tarsus with 4 spines (prolateral 0-1-1; ventral 0-1; retrolateral 0-1); leg IV: femur with 6 spines, tibia with 12 spines (dorsal 1-0-1; prolateral 1-1;

retrolateral 1-1; ventral 2-2-2a), metatarsus with 17 spines (dorsal 1-0-0, 1-0; prolateral 1-2-2; retrolateral 1-2-2; ventral 2-2-2), tarsus with 6 spines (prolateral 0-1-1; retrolateral 0-1-1; ventral 0-1-1).

**Genitalia:** Female epigynum and genitalia (Figs. 7–9) with short epigynal teeth slightly longer than wide, situated in the middle of epigynum, separated more broadly than both spermathecal margins; atrium (genital opening) very broadly rectangular, situated posteriorly near epigastric furrow; copulatory ducts short, broadly semicircular in shape, extending mesad of both epigynal teeth and originating posteriorly near epigastric furrow; spermathecae cylindrical, not attached distally; spermathecal heads small and circular, situated medially on spermathecae; spermathecal base a small complicated structure, situated on lateral margin of atrium; spermathecal stalk slender, not extended, situated side-by-side between both epigynal teeth; fertilization duct short, slender, underside situated close to epigastric furrow.

*Male*: medium sized spider 9.0 mm in length (Fig. 10), slightly smaller than female. Eye formula  $ALE = PLE = PME > AME/ALE = PLE = PME > AME$ . Clypeal height about twice AME diameter; chilum divided (Fig. 11). Chelicerae with many long dense scopula hairs, 3 promarginal, median tooth largest, 2 retromarginal teeth and small condyles at base and fang as long as wide (Fig. 12). Endite with anterior scopula, longer than wide; labium as long as wide (Fig. 13). Sternum shield-shaped, distinctly longer than wide, widest near coxae II, posterior end not protruding between hind coxae (Fig. 14). Legs (Figs. 10, 15) without annulations: leg formula 4123; tarsi with 3 tarsal claws, upper claws with 8 pectinate teeth (11 on leg I), lower claws with 2 (4 on leg IV); 4 rows of 2 to 6 trichobothria (leg I 6p-6d-2d-6r; leg II 6p-6d-6d-5r; leg III 6p-6d-5d-6r; leg IV 4p-6d-5d-4r), metatarsi with 1 row of 8 trichobothria, tarsi with 1 row of 8 trichobothria. Leg spination: leg I: femur with 8 spines, tibia with 7 spines (prolateral 0-0-1; ventral 2-2-2d), metatarsus with 8 spines (prolateral 1-1; retrolateral 0-0-1; ventral 2-2-1); leg II: femur with 7 spines, tibia with 8 spines (prolateral 0-1-1a; ventral 2-2-2a), metatarsus with 17 spines (dorsal 1-0-0; prolateral and retrolateral 1-0, 1-2-2; ventral 2-2-2), tarsus with

4 spines (prolateral 1-1; retrolateral 0-1; ventral 0-1); leg III: femur with 7 spines, tibia with 10 spines (dorsal 1-1; prolateral 1-1; ventral 2-2-2a), metatarsus with 10 spines (prolateral 1-2; retrolateral 1-1; ventral 2-2-1), tarsus absent; leg IV: femur with 6 spines, tibia with 10 spines (prolateral 1-1; retrolateral 1-1; ventral 2-2-2a), metatarsus with 16 spines (dorsal 1-0; prolateral and retrolateral 1-0, 1-2-2; ventral 2-2-2), tarsus with 5 spines (prolateral 1-1; retrolateral 0-1-1; ventral 0-1).

Male palp (Figs. 16–19, 50, 51) with 1 patellar apophysis; retrolateral tibial apophysis (RTA) long, about as long as tibia, broadly extended to the ventral part; intermediate tibial apophysis (ITA) small, grooved; cymbial furrow very elongate, about 68 % (1.5/2.2) as long as cymbial length, enclosing well developed concavity and with distal projection; conductor horizontally bent with modified sharp tip and slightly separated from lamella; conductor dorsal apophysis slender situated under conductor tip; conductor lamella large, modified with many small setules; embolus posterior in origin, extremely long linear, at least 2 times width of cymbium; median apophysis semicircular, split distal end with inner divided into 2 parts on the middle and vague interior projection on the base.

**Dimensions (mm).**—*Female*: Body length 9.5; carapace length 4.7, width 3.1, height 3.0; chelicera length 2.6, width 1.1, fang length 1.3; sternum length 2.5, width 1.9; endite length 1.5, width 0.8; labium length 0.7, width 0.7; clypeus height 0.2; AER 1.5, PER 2.0, AME 0.1, ALE 0.2, PME 0.2, PLE 0.2. Palp: femur 1.7, patella 0.7, tibia 1.0, tarsus 1.8, total 5.2. Leg I: femur 3.7, patella 1.6, tibia 3.0, metatarsus 3.0, tarsus 1.9, total 13.2. Leg II: femur 3.3, patella 1.6, tibia 2.5, metatarsus 2.7, tarsus 1.8, total 11.9. Leg III: femur 3.1, patella 1.5, tibia 2.2, metatarsus 3.0, tarsus 1.7, total 11.5. Leg IV: femur 4.0, patella 1.6, tibia 3.4, metatarsus 4.4, tarsus 2.0, total 15.4. Abdomen length 4.8, width 2.5, height 2.9. ALS 0.5; PLS 0.9 (0.5, 0.4).

*Male*: Body length 9.0; carapace length 4.1, width 2.9, height 3.3; chelicera length 1.8, width 0.9, fang length 1.0; sternum length 2.1, width 1.7; endite length 1.2, width 0.7; labium length 0.6, width 0.7; clypeus height 0.2; AER 1.2, PER 1.8, AME 0.1, ALE 0.2, PME 0.2, PLE 0.2. Palp: femur 1.5, patella 0.5, tibia 0.5, tarsus 2.2, total 4.7. Leg I: femur 3.5, patella

1.3, tibia 3.0, metatarsus 3.2, tarsus 1.9, total 12.9. Leg II: femur 3.3, patella 1.4, tibia 2.6, metatarsus 3.0, tarsus 1.9, total 12.2. Leg III: femur 3.3, patella 1.4, tibia 2.5, metatarsus 3.0, tarsus 1.9, total 12.1. Leg IV: femur 4.0, patella 1.4, tibia 3.4, metatarsus 4.7, tarsus 2.3, total 15.8. Abdomen length 4.5, width 3.0, height 3.3. ALS 0.5; PLS 0.9 (0.4, 0.5).

**Distribution.**—This species is known only from Seong lava cave, Jeju-do Island, Korea.

**Remarks.**—The specimens were found wandering on the lava surface of Seong lava cave.

***Draconarius kayasanensis* (Paik 1972)**

new combination

Figs. 20–39, 52, 53

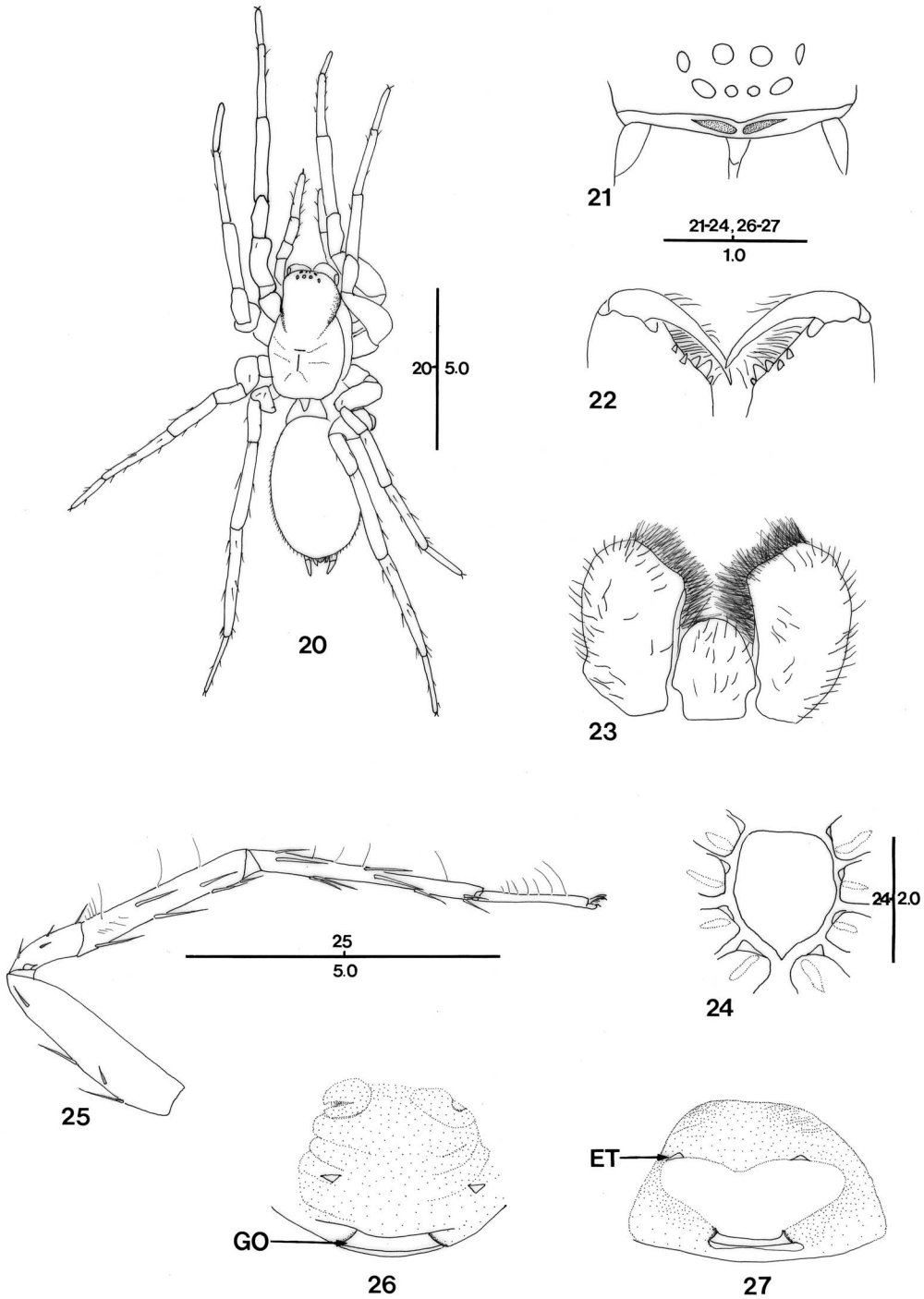
*Coelotes kayasanensis* Paik 1972:49, figs. 1–7; Paik 1978:343, figs. 153.1–3.

*Ambanus kayasanensis* (Paik 1972): Ovtchinnikov 1999:64; Wang 2003:27; Namkung 2003:396, fig. 28.10a; Namkung 2003:398, fig. 28.10a.

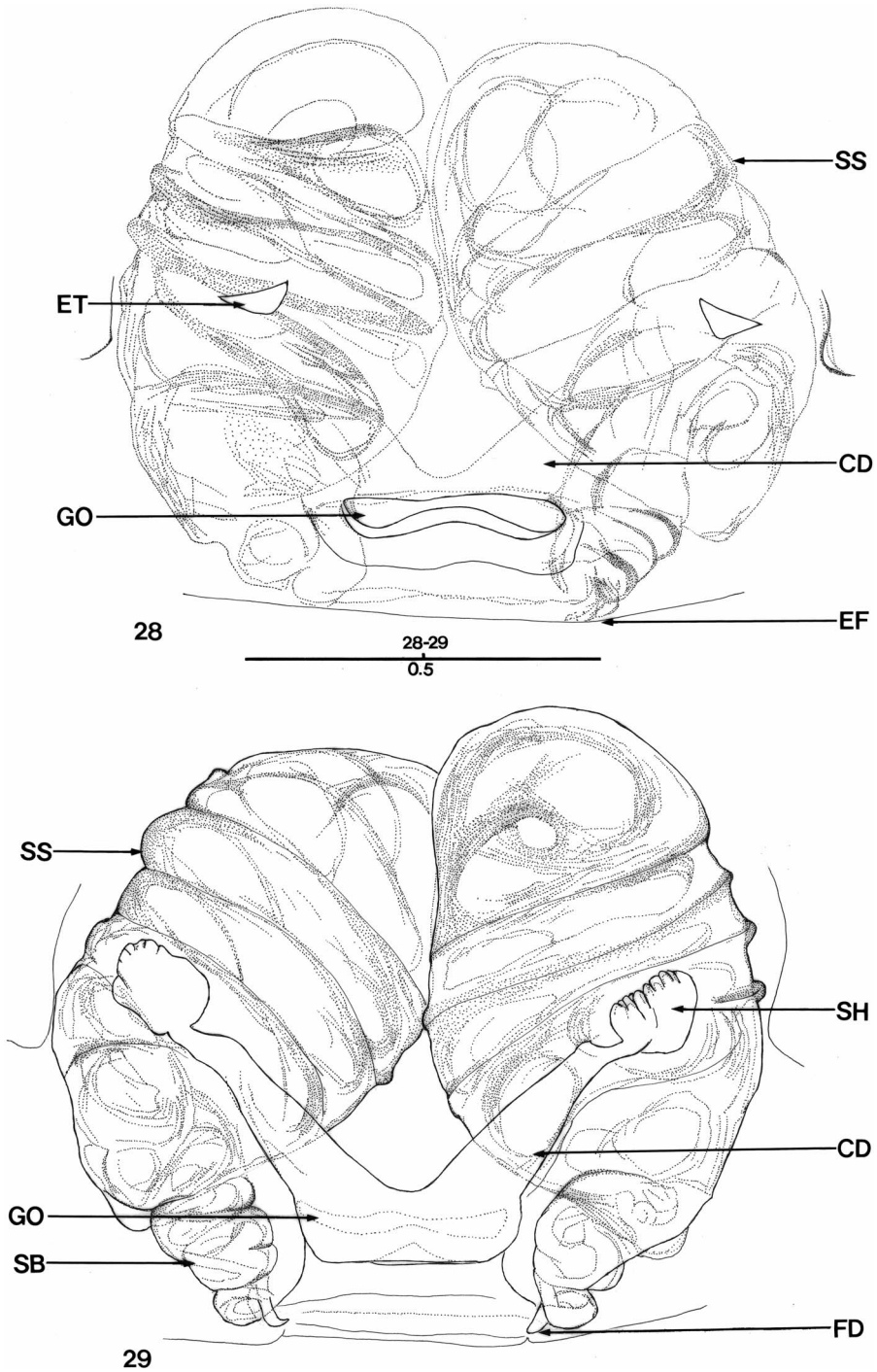
**Material examined.**—KOREA: *Gangwon-do*: 3 ♂, Gwangmijang in Mt. Odae, Gangreung City, 37°49'17"N, 128°38'16"E, 357 m, 10 June 2005, B.W. Kim (NBRC); 17 ♂, Mae Mountain summit in Mt. Odae, 37°45'35"N, 128°34'46"E, 1108 m, same date, B.W. Kim (NBRC); 1 ♂, 1 ♀, Temple Sangwon in Mt. Odae, Pyeongchang-gun, 37°47'00"N, 128°34'10"E, 839 m, same date, B.W. Kim (NBRC); 27 ♂, 1 ♀, same location, 11 June 2005, B.W. Kim (NBRC); 3 ♀, same location, 28 September 2005, B.W. Kim (NBRC); 2 ♂, same location, 11 October 2005, B.W. Kim (NBRC); 4 ♂, Temple Woljeong in Mt. Odae, Pyeongchang-gun, 37°43'48"N, 128°35'43"E, 662 m, 10 May 2005, B.W. Kim (NBRC); 2♂, same location, 11 October 2005, B.W. Kim (NBRC).

**Diagnosis.**—This species is similar to *D. coreanus*, *D. stemmleri*, *D. wudangensis* and *D. hallaensis* in having the female epigynum with atrium (genital opening) very broadly rectangular, situated posteriorly near epigastric furrow, copulatory ducts short, and male palpal organs with cymbial furrow more than half cymbial length, and a large lamella on conductor. The species is easily distinguished by the epigynal teeth situated along both spermathecal margins (separated more broadly than both spermathecal margins in *D. coreanus*), spermathecal heads spherical, spermathecal stalk expanded anteriorly (cylindrical in *D. coreanus*), overlapped, and cymbial furrow

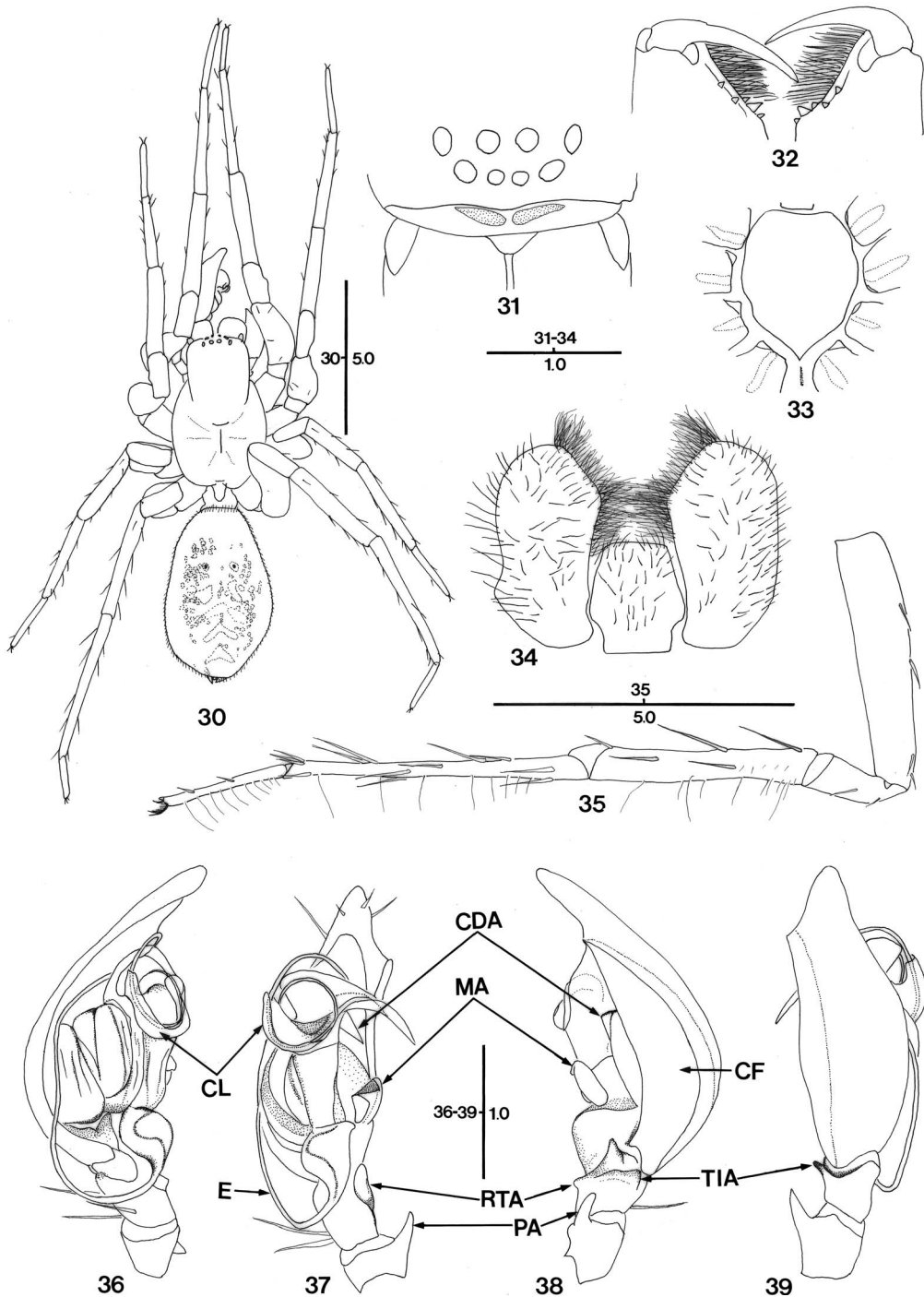




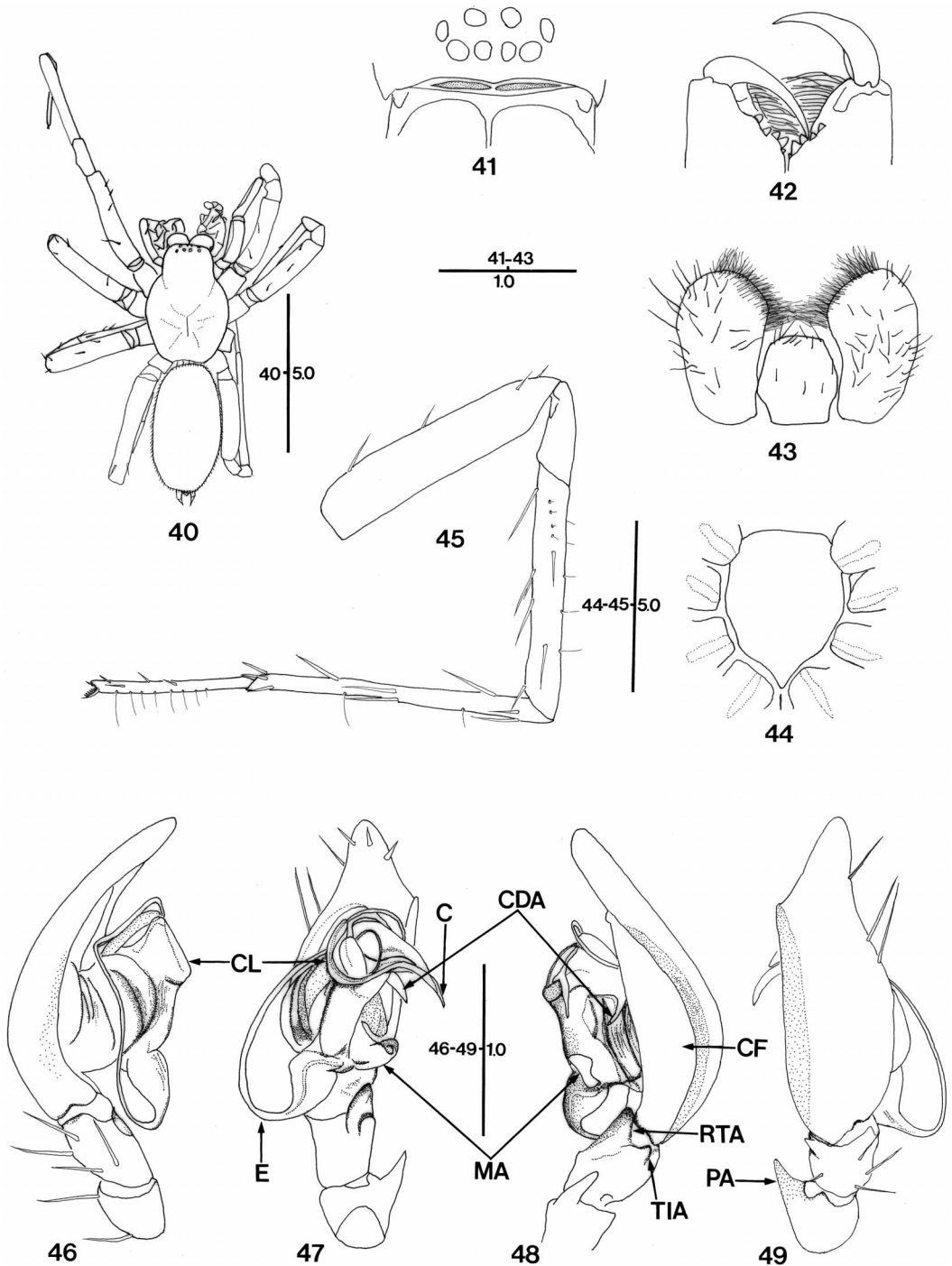
Figures 20–27.—*Draconarius kayasanensis* (Paik 1972) from Korea, female. 20. Habitus, dorsal view. 21. Eye area and clypeus, anterior view. 22. Chelicerae, posterior view. 23. Endites and labium, ventral view. 24. Sternum, ventral view. 25. 4th leg (left), prolateral view. 26. Epigynum, ventral view. 27. Epigynum, posterior view. ET = epigynal teeth, GO = genital opening.



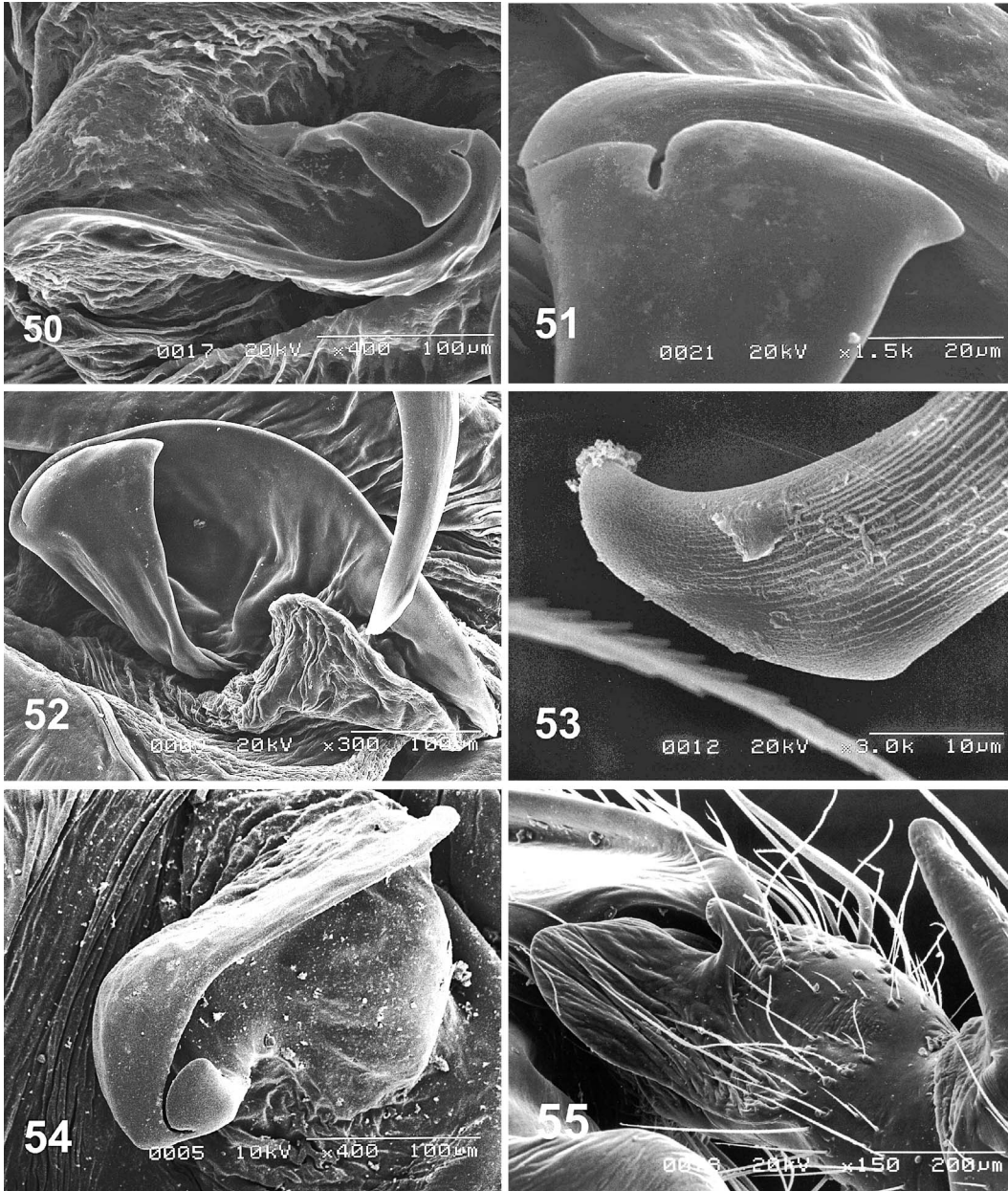
Figures 28, 29.—*Draconarius kayasanensis* (Paik 1972) from Korea, female. 28. Epigynum, ventral view. 29. Genitalia, dorsal view. CD = copulatory duct, EF = epigynal furrow, ET = epigynal teeth, FD = fertilization duct, GO = genital opening, SB = spermathecal base, SH = spermathecal head, SS = spermathecal stalk.



Figures 30–39.—*Draconarius kayasanensis* (Paik 1972) from Korea, male. 30. Habitus, dorsal view. 31. Eye area and clypeus, anterior view. 32. Chelicerae, posterior view. 33. Endites and labium, ventral view. 34. Sternum, ventral view. 35. 4th leg (left), prolateral view. 36–39. Palp, left, prolateral, ventral, retrolateral and dorsal views. CDA = conductor dorsal apophysis, C = conductor, CL = conductor lamella, CF = cymbial furrow, E = embolus, MA = median apophysis, PA = patellar apophysis, RTA = retrolateral tibial apophysis, TIA = tibial intermediated apophysis.



Figures 40–49.—*Draconarius hallaensis* n. sp. from Korea, male. 40. Habitus, dorsal view. 41. Eye area and clypeus, anterior view. 42. Chelicerae, posterior view. 43. Endites and labium, ventral view. 44. Sternum, ventral view. 45. 4th leg (left), prolateral view. 46–49. Palp, left, prolateral, ventral, retrolateral and dorsal views. CDA = conductor dorsal apophysis, C, conductor; CL = conductor lamella, CF = cymbial furrow, E = embolus, MA = median apophysis, PA = patellar apophysis, RTA = retrolateral tibial apophysis, TIA = tibial intermediated apophysis.



Figures 50–55.—SEM photographs of *Draconarius* species from Korea, male left palps. 50. *Draconarius coreanus*, male palp, left part, median apophysis. 51. *Draconarius coreanus*, male palp, left part, distal part of median apophysis. 52. *Draconarius kayasanensis*, male palp, left part, median apophysis. 53. *Draconarius kayasanensis*, male palp, left part, distal tip of embolus. 54. *Draconarius hallaensis* n. sp., male palp, left part, median apophysis. 55. *Draconarius hallaensis* n. sp., male palp, left part, retro-lateral tibial apophysis.

very elongate, about 83% (68% in *D. coreanus*) as long as cymbium, conductor roundly curved with modified sharp tip and distinctly separated from lamella on lateral margin, me-

dian apophysis thin semicircular, linear split distal end without inner part furrowed (with inner part furrowed on the middle in *D. coreanus*; rounded in *D. hallaensis*), distinct in-

terior semicircular projection on the base (vague in *D. coreanus*; fluent in *D. hallaensis*) and retrolateral tibial apophysis sharp distal tip (rounded distal tip in *D. hallaensis*).

**Description.**—*Female*: Medium sized spider 9.5 mm, distinctly smaller than male. Carapace elongated, moderately narrowed in eye area, and with distinct longitudinal medial fovea. Abdomen dark brown, without gray chevron patterns, heavily covered with short hairs (Fig. 20). Palp: with 3 trichobothrial rows on tibia; 1 claw with 8 pectinate teeth. From dorsal aspect, AER and PER straight, and AER slightly smaller than PER. AME smallest, others roughly same size. Eye formula  $ALE = PLE = PME > AME/ALE = PLE = PME > AME$ . Clypeal height twice as long as AME diameter; chilum divided (Fig. 21). Chelicerae with many long dense scopula hairs, 3 promarginal, median tooth largest, 2 retromarginal teeth, condyle developed laterobasally and fang slightly shorter than cheliceral width (Fig. 22). Endite with anterior scopula, longer than wide; labium as long as wide (Fig. 23). Sternum shield-shaped, longer than wide, widest near coxae II, posterior end not protruded between hind coxae (Fig. 24). Legs without annulations (Figs. 20, 25); leg IV longest, leg III shortest; length of patella I + tibia I slightly shorter than carapace length; trochanters not notched; tibia with 4 rows of 3 to 6 trichobothria (5p-5d-3d-5r on leg I, 3p-6d-5d-4r on leg II, 4p-6d-5d-5r on leg III, 5p-5d-5d-5r on leg IV), metatarsi 1 row of 5 to 7, tarsi with 1 row of 6 to 7; tarsal organ situated close to distal end of tarsi, slightly anterior of most distal trichobothrium; tarsi with 3 claws, upper claws with 10 (11 in leg II) pectinate teeth, lower claw with 4.

Leg spination: femur I with 7 spines, tibia with 7 (0-0-1 on prolateral; 2-2-2a on ventral), metatarsus 7 (0-0-1 on prolateral; 2-2-2 on ventral); femur II with 7 spines, tibia 8 (1-1 on prolateral; 2-2-2a on ventral), metatarsus with 10 spines (0-1-2 on prolateral; 0-1-0 on retrolateral; 2-2-2 on ventral); femur III with 6 spines, tibia 12 (1-0-1 on dorsal; 1-1 on prolateral and retrolateral; 2-2-2a on ventral), metatarsus 17 (1-0 on dorsal; 10, 1-2-2 on prolateral and retrolateral; 2-2-2 on ventral), tarsus 5 (1-1 on prolateral; 0-1-0 on retrolateral; 0-2 on ventral); femur IV with 6 spines, tibia 12 (1-0-1 on dorsal; 1-1 on prolateral and

retrolateral; 2-2-2a on ventral), metatarsus with 17 spines (1-0 on dorsal; 10, 1-2-2 on prolateral and retrolateral; 2-2-2 on ventral), tarsus with 6 (1-1 on prolateral; 0-1-1 on retrolateral; 0-2 on ventral).

Female epigynum (Figs. 26–29) with short epigynal teeth slightly wider than length, situated on both spermathecal margins; atrium (genital opening) very broadly rectangular, situated posteriorly near epigastric furrow; copulatory ducts short, broadly V-shaped, extending mesad of both epigynal teeth and originating posteriorly near epigastric furrow; spermathecal heads spherical, situated medially on spermathecae; spermathecal base small complicated structure, situated on the lateral margin of atrium; spermathecal stalk extended anteriorly, overlapped; fertilization duct short, slender, underside situated close to epigastric furrow.

*Male*: Medium sized spider 11.6 mm, distinctly larger than female. Eye formula  $ALE = PLE = PME > AME/ALE = PLE = PME > AME$ . Clypeal height more than twice AME diameter; chilum distinctly divided (Fig. 31). Chelicerae with many long dense scopula hairs, 3 promarginal, median tooth largest, 2 retromarginal teeth and small condyle at base and fang slightly longer than wide (Fig. 32). Endite with anterior scopula, longer than wide; labium as long as wide (Fig. 33). Sternum shield-shaped, longer than wide, widest near coxae II, posterior end not protruded between hind coxae (Fig. 34).

Legs without annulations (Figs. 30, 35): formula 4123, similar to female; tarsi with 3 tarsal claws, upper claws with 10 pectinate teeth (11 on leg I), lower with 3 (4 on leg IV); tibia with 4 rows of 5 to 7 trichobothria (leg I 7p-6d-6d-7r, leg II 5p-6d-5d-6r, leg III 5p-7d-5d-6r, leg IV 6p-5d-6d-6r), metatarsi with 1 row of 8 trichobothria (7 on leg III), tarsi with 1 row of 9 trichobothria (8 on leg I and 10 on leg IV). Leg spination: Leg I femur with 8 spines, tibia with 8 spines (ventral 2-2-2a; prolateral 0-1-1), metatarsus with 8 spines (ventral 2-2-2; prolateral 1-1); leg II: femur with 7 spines, tibia with 9 (prolateral 1-1-1; ventral 2-2-2a), metatarsus with 11 spines (dorsal 1-0-0; prolateral 1-2; retrolateral 1-0; ventral 2-2-2), tarsus with no spines; leg III: femur with 7 spines, tibia with 12 (dorsal 1-0-1; prolateral 1-1; retrolateral 1-1; ventral 2-2-2a), metatarsus with 16 spines (dorsal

1-0 on; prolateral and retrolateral 1-0, 1-2-2; ventral 2-2-1), tarsus with 4 spines (prolateral 1-1; retrolateral and ventral 0-1); leg IV: femur with 6 spines, tibia with 12 (dorsal 1-1; prolateral and retrolateral 1-1; ventral 2-2-2a), metatarsus with 17 spines (dorsal 1-0; prolateral and retrolateral 1-2, 2-2-2; ventral 1-2-2), tarsus with 5 (prolateral 1-1; retrolateral 0-1-1; ventral 0-1).

Male palp (Fig. 36–39, 52–53) with 1 patellar apophysis; retrolateral tibial apophysis (RTA) long, about same length as tibia, broadly extended to the ventral; intermediated tibial apophysis (ITA) small grooved; cymbial furrow very elongate, about 83% (2.0/2.4) as long as cymbial length, enclosing concavity, with distal projection; conductor roundly curved with modified sharp tip and distinctly separated from lamella on lateral margin; conductor dorsal apophysis slender situated under conductor tip; conductor lamella large, modified with many small setules; embolus posterior in origin, extremely long linear, at least 2 times width of cymbium, with terminal part injector-shaped; median apophysis thin semicircular, linearly split distal end without inner part furrowed on the middle, with distinct interior projection on the base.

**Dimensions (mm).**—*Female*: Body length 9.5; carapace length 3.9, width 2.6, height 2.3; chelicera length 1.7, width 1.0, fang length 0.6; sternum length 2.1, width 1.7; endite length 1.3, width 0.7; labium length 0.6, width 0.6; clypeus height 0.2; AER 0.8, PER 1.1, AME 0.1, ALE 0.2, PME 0.2, PLE 0.2. Palp: femur 1.4, patella 0.6, tibia 0.8, tarsus 1.5, total 4.3. Leg I: femur 3.0, patella 1.3, tibia 2.5, metatarsus 2.5, tarsus 1.6, total 10.9. Leg II: femur 2.8, patella 1.3, tibia 2.1, metatarsus 2.4, tarsus 1.6, total 10.2. Leg III: femur 2.5, patella 1.2, tibia 1.8, metatarsus 2.4, tarsus 1.4, total 9.3. Leg IV femur 3.3, patella 1.4, tibia 2.8, metatarsus 3.8, tarsus 1.7, total 13.0. Abdomen length 4.5/4.5, width 2.9/3.0, height 2.8/3.3. ALS 0.5/0.5; PLS 0.8/0.9 (0.4/0.4, 0.4/0.5).

*Male*: Body length 11.6; carapace length 4.1, width 2.9, height 3.3; chelicera length 1.8, width 0.9, fang length 1.0; sternum length 2.1, width 1.7; endite length 1.2, width 0.7; labium length 0.6, width 0.7; clypeus height 0.2; AER 0.7, PER 1.0, AME 0.1, ALE 0.2, PME 0.2, PLE 0.2. Palp: femur 1.5, patella 0.5, tibia 0.5, tarsus 2.2, total 4.7. Leg I: femur 3.5, patella

1.3, tibia 3.0, metatarsus 3.2, tarsus 1.9, total 12.9. Leg II: femur 3.3, patella 1.4, tibia 2.6, metatarsus 3.0, tarsus 1.9, total 12.2. Leg III: femur 3.3, patella 1.4, tibia 2.5, metatarsus 3.0, tarsus 1.9, total 12.1. Leg IV: femur 4.0, patella 1.4, tibia 3.4, metatarsus 4.7, tarsus 2.3, total 15.8. Abdomen length 4.5, width 3.0, height 3.3. ALS 0.5; PLS 0.9 (0.4, 0.5).

**Distribution.**—Mt. Odae, Gangwon-do, Korea.

**Remarks.**—The specimens were found wandering on the ground among stones and leaf litter.

*Draconarius hallaensis* new species

Figs. 40–49, 54, 55

*Draconarius coreanus* (Paik & Yaginuma 1969): Wang 2002:67; Wang 2003:526, figs. 22C–E (males misidentified).

**Material examined.**—KOREA: *Cheju-do*: Holotype ♂, Mt. Halla, Seoguiipo City, 33°(18–20)'N, 126°(33–39)'E, Jeju-do Island, 12 August 1984, J.P. Kim (NBRC). KOREA: Paratypes: 4 ♂, same locality, 12 August 1984, J.P. Kim (NBRC); 12 ♂, Korean National Arboretum of Gwangreung, Pocheon city, 37°45'N, 127°10'E, Gyeonggi-do, 23 August 1994, K.S. Lee (NBRC).

**Diagnosis.**—This species is similar to *D. coreanus*, *D. kayasanensis*, *D. stemmleri* and *D. wudangensis* in having the male palpal organs with the cymbial furrow longer than half the cymbium length, median apophysis split distal end and a large lamella on the conductor. The species is also distinguished by its small size (less than 8 mm in total body length), cymbial furrow elongate, about 74% (68% in *D. coreanus*; 83% in *D. kayasanensis*) as long as cymbium, conductor horizontally bent with modified sharp tip, median apophysis semicircular, split distal end curved roundly in the inside, thumb-shaped inner part (with inner part furrowed on the middle in *D. coreanus*; linearly in *D. kayasanensis*), broadly fluent interior projection on the base (distinct in *D. kayasanensis*; vague in *D. coreanus*) and retrolateral tibial apophysis rounded distal tip (sharp in *D. coreanus* and *D. kayasanensis*).

**Description.**—*Holotype male*: medium sized spider, 7.8 mm. Carapace elongated, moderately narrowed in eye area, and with distinct longitudinal medial fovea. Abdomen dark brown, without gray chevron patterns,

heavily covered with short hairs (Fig. 40). From dorsal aspect, AER more or less procurved, PER straight and AER slightly smaller than PER. AME smallest, other eyes roughly equal in size. Eye formula  $ALE = PLE = PME > AME$ . Clypeal height slightly less than twice the AME; chilum divided (Fig. 41). Chelicerae with 3 promarginal, 2 retromarginal teeth, condyle developed laterobasally and fang slightly longer than cheliceral width (Fig. 42). Endite with anterior scopula, longer than wide; labium as long as wide (Fig. 43). Sternum shield-shaped, distinctly longer than wide, widest near coxae II, posterior end not protruded between hind coxae (Fig. 44). Legs: without annulations (Figs. 40, 45), leg formula 4123; leg IV longest, leg III shortest; length of patella I + tibia I slightly shorter than carapace length; trochanters not notched; tibia with 4 rows of 2 to 6 trichobothria (leg I 5p-2d-6d-2r, leg II 5p-4d-4d-4r, leg III 3p-6d-2d-4r, leg IV 4p-4d-3d-3r), metatarsi with 1 row of 2 to 6 trichobothria, tarsi with 1 row of 3 to 8 trichobothria; tarsal organ situated close to distalmost of tarsi, slightly anterior of distalmost trichobothrium; tarsi with 3 claws, upper claws with 10 pectinate teeth (8 in leg III and IV), lower claw with 2 (3 in leg III). Leg spination: leg I: femur with 6 spines (dorsal 1-1-2; prolateral 0-0-2), tibia with 7 spines (prolateral 0-0-1; ventral 2-2-2a), metatarsus with 8 spines (prolateral 1-1; ventral 2-2-2); leg II: femur with 5 spines, tibia with 7 spines (prolateral 0-1-1; ventral 1-2-2a), metatarsus with 9 spines (prolateral 1-1; retrolateral 0-1-0; ventral 2-2-2); leg III: femur with 6 spines, tibia with 10 spines (dorsal 1-0-1; prolateral and retrolateral 1-1; ventral 0-2-2a), metatarsus with 16 spines (prolateral and retrolateral 1-0, 1-2-2; ventral 2-2-2), tarsus with 4 spines (prolateral 1-1; retrolateral 0-1-0; ventral 0-0-1); leg IV: femur with 5 spines, tibia IV with 10 spines (prolateral and retrolateral 1-1; ventral 2-2-2a), metatarsus with 17 spines (dorsal 1-0-0; prolateral and retrolateral 1-0, 1-2-2; ventral 2-2-2), tarsus with 6 spines (prolateral and retrolateral 0-1-1; ventral 0-2).

Male palp (Figs. 46–49, 54, 55) with 1 patellar apophysis; retrolateral tibial apophysis (RTA) long, about same length as tibia, broadly extended to the ventral; intermediate tibial apophysis (ITA) small grooved; cymbial furrow very elongate, about 74% (1.4/1.9) as

long as cymbial length, enclosing concavity, with distal projection; conductor horizontally bent with modified sharp tip and slightly separated from lamella; conductor dorsal apophysis slender, situated under conductor tip; conductor lamella large, modified with many small setules; extremely long linear, at least 2X width of cymbium; median apophysis semicircular, split distal end curved roundly in the inside, thumb-shaped inner part, broadly fluent interior projection on the base and retrolateral tibial apophysis rounded distal tip.

*Female*: Unknown.

**Dimensions (mm).**—*Male*: Body length 7.8; carapace length 3.9, width 2.7, height 2.0; cheliceral length 1.6, width 0.8, fang length 0.9; sternum length 2.0, width 1.5; endite length 1.0, width 0.6; labium length 0.6, width 0.5; clypeus height 0.2; AER 0.6, PER 0.8, AME 0.1, ALE 0.2, PME 0.2, PLE 0.2. Palp: femur 1.4, patella 0.5, tibia 0.4, tarsus 1.9, total 4.2. Leg I: femur 3.1, patella 1.2, tibia 2.7, metatarsus 2.8, tarsus 1.8, total 11.6. Leg II: femur 2.9, patella 1.2, tibia 2.3, metatarsus 2.7, tarsus 1.7, total 10.8. Leg III: femur 2.7, patella 1.2, tibia 1.9, metatarsus 2.8, tarsus 1.5, total 10.1. Leg IV: femur 3.5, patella 1.3, tibia 3.0, metatarsus 4.0, tarsus 1.9, total 13.7. Abdomen length 4.0, width 2.3, height 2.3.

**Distribution.**—Korea (Korean National Arboretum of Gwangreung, Mt. Halla).

**Remarks.**—Specimens of this species were found wandering on the ground among stones and leaf litter.

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