

## **A New Species of *Pholcus* (Araneae: Phocidae) from Gosu Cave, Korea**

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### **ABSTRACT**

*Pholcus gosuensis* sp. nov. is described from the entrance zone of Gosu cave, Chungcheongbuk-do, Korea. The species is characterized by male palpal organs with three expanded apophyses and developed callosity on procurus, two frontal apophyses of chelicerae and degrading appendix, and sclerotized arches on uterus externus. The species is related to *P. crassus* Paik, 1978 and *P. acutululus* Paik, 1978 in having identical uncus and embolus but differentiated from those species by the combined characters of large apophyses and heavily sclerotized callosity on procurus, and structure of arches on uterus externus.

Key words: *Pholcus gosuensis*, new species, Gosu Cave, Korea

### **INTRODUCTION**

*Pholcus* belonging to 112 species is known by far the largest genus in daddy long legs spiders, pholcids (Platinick, 2004). These spiders are shown the derived features highly in the most useful characters (ex. procurus, uncus, appendix, embolus etc.) of the male large palpal organ and easily distinguished from other genera (Timm, 1976; Huber, 2001). The uncus is usually large, rather flat, and heavily sclerotized with many teeth or scales. The appendix is smaller than other characters of palpal organ, usually hook-shaped, also sclerotized, and is either a single rod or split into two or

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even three parts. The embolus lies between the uncus and appendix is soft and transparent, and thus easy to overlook. Other characters, not exclusive for *Pholcus*, are male chelicerae which are a pair of dark frontal apophyses, the shape of the procurus with ventral boss, and the knob- or worm-shaped apophysis on often roughly triangular or oval epigynum. But the above characters were not described in the explanation of detailed drawings of seven endemic spiders in the genus *Pholcus* from Korea (Paik, 1978; Namkung & Kim, 1990). Specially, Huber (2001) stated that most or all of those described in Paik (1978) and *P. kwanaksanensis* Namkung & Kim, 1990 were indistinguishable in their genitalia from the genus *Leptopholcus*. The genus, *Leptopholcus* is a polyphyletic group of male, leaf-dwelling *Pholcus* species with a tendency to reduce the AME (anterior median eye) and the appendix.

Ten Korean species of the genus *Pholcus* are grouped into two types, which have an appendix of male palpal organs or not. This appendix character is disappeared completely in five Korean endemic species (*P. acutulus* Paik, 1978, *P. crassus* Paik, 1978, *P. extumidus* Paik, 1978, *P. sokkrisanensis* Paik, 1978 & *P. kwanaksanensis*) and five remaining species including endemic species (*P. socheunensis* Paik, 1978 & *P. montanus* Paik, 1978) are retained as second type.

After Lehtinen (1967) recognized haplogyne, the female genital organ of pholcids that lack epigyne and transferring ducts for sperm was not studied in structure and function in detail. Currently, the morphology of the "valve", with a chitinous structure between the uterus externus and the uterus internus is used as a taxonomic character (Huber, 1998). Also, a few of papers have many mistakes in description and drawings of genitalia with atrium, copulatory opening and inner ducts. We suggest three characters in genital organs of hyplogyne female for systematic of phocids: structure or pattern and position of two chitinous uterus structures which are contacted the procurus of male palpal organ during copulatory mechanism.

## MATERIALS AND METHODS

All the materials studied were collected from the threshold zone of the Gosu Cave, Gusu-ri, Danyang-gun, Chungcheongbuk-do, Korea. Type series will be deposited in the collections of the National History Museum, London (NHM). Measurements are in millimeters unless noted otherwise. All of the drawings were prepared with an Olympus drawing tube mounted on Olympus SZX 12 and BX51 interference contrast microscope. Male palpi were expanded by quick (2-5 min) immersion in concentrated KOH (0.2-1.0 g/ml H<sub>2</sub>O), followed by several rinses with, and then prolonged soaking in, distilled water. Full expansion in many cases was only obtained after several KOH-H<sub>2</sub>O cycles.

Abbreviations used in text: AME= anterior median eye, ALE= anterior lateral eye, PME= posterior median eye, PLE= posterior lateral eye, AP1= lateral apophysis on procurus, AP2= apical apophysis on procurus, AP3= lower apophysis on procurus, B= Genital bulb, BP= basal prominence on genital bulb, CDP= circular depression procurus, CL= Clypeus, CP= Callosity on procurus, E= Embolus, FAC1, 2= frontal apophyses of chelicerae, H= Haematodocha, HPE= hook-like prominence on epigynum, IAP= a inner apophysis on fumer of male palp, IP= inflatable area on procurus, LAC1, 2= lateral apophyses of chelicerae, P= Procurus, U= Uncus, R= dark

colored ribbon around genital bulb, SC= swelled carapace, SUE1, 2, 3= Sclerotized arch of uterus externus, TB= Trichobothrium, TP= Trochanter process.

## SYSTEMATIC ACCOUNTS

### \**Pholcus gosuensis* sp. nov. (Figs. 1-3)

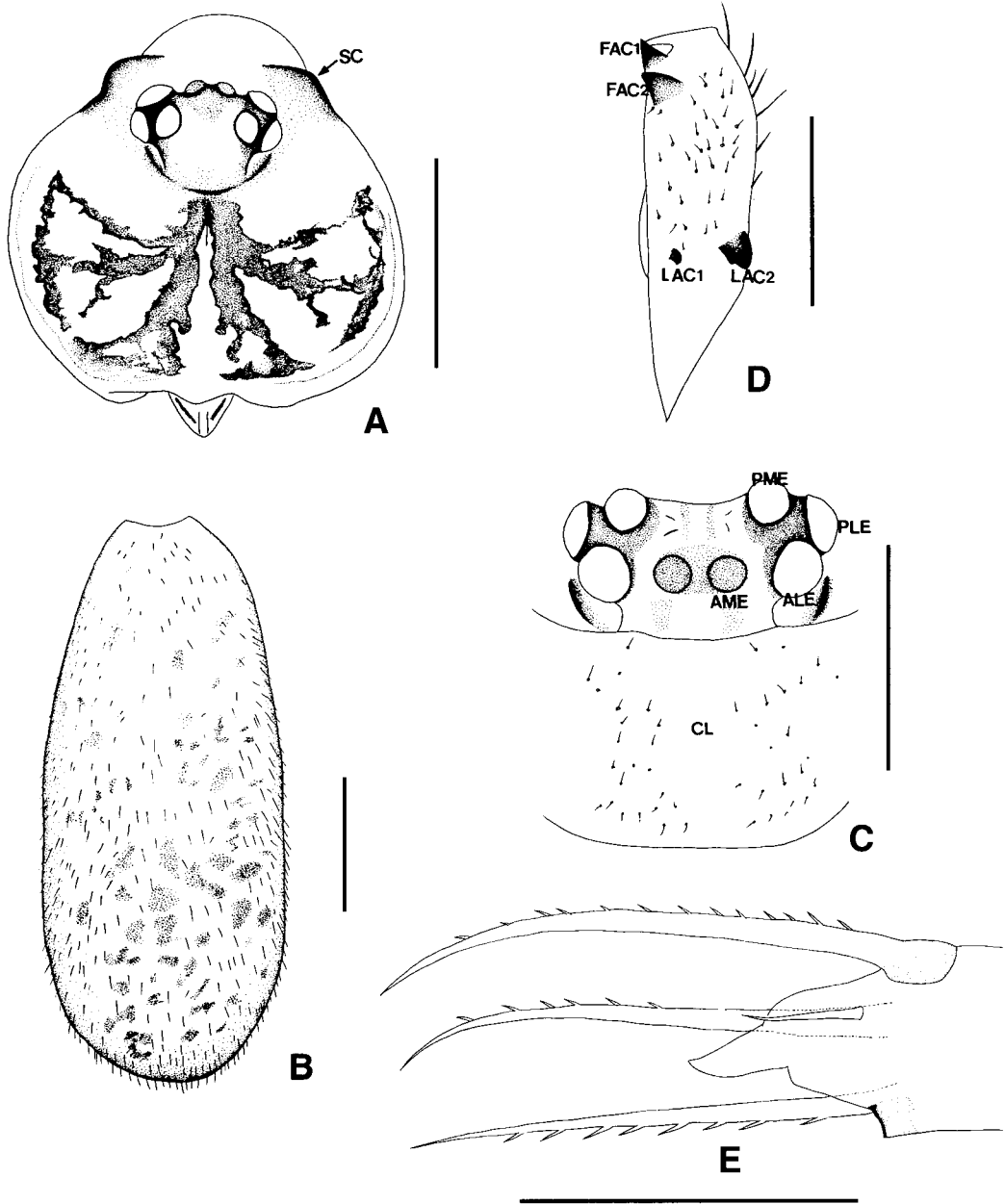
**Material examined.** Holotype: ♂, Gosu cave, Danyang-gun, Chungcheongbuk-do, 13 Aug. 1984, J. Namkung, in entrance zone. Paratype: 1♂1♀, Gosu cave, Danyang-gun, Chungcheongbuk-do, 27 Oct. 1975, 1♂, 20 Jan. 1982, J. Namkung, 1♂6♀, 17 Jul. 1999, 2♀♀, 1. Nov. 1999, Y.G. Choi, in entrance zone.

**Description. Male.** Prosoma ochre yellow and length/width/height 1.66/1.82/1.21. Carapace slightly wider than length with brownish gray dorsal marks and thoracic furrow (Fig. 1A). Eye pattern as in figs. 1A, C and eye area expanded on carapace diameter AME 1.61 μm, ALE 2.50 μm, PME 1.96 μm, PLE 2.77 μm, distance PME-PME 4.38 μm. Eye ratio, AME < PME < ALE < PLE (100: 122: 155: 172). Clypeus as in fig. 1C, without marks and six times of the diameter AME. Chelicerae as in fig. 1D with two pairs of frontal apophyses, FAC1, 2, two pairs of lateral apophyses, LAC1, 2 and length/width, 0.71/0.30. Opistosoma cylinder-type, with very indistinct darker spots dorsally and length/width/height, 4.24/1.76/1.88. Labium swelled and entirely fused to sternum. Sternum broadly protruded, not extending between 4th coxae and length/width, 1.18/1.55. Palps as in figs. 2A-F, with one inner apophysis on femur and with large developed procurus that have three apophyses, AP1, 2, 3 on distal region, sclerotized prolonged callosity, inflatable area and circular depression site, and globular shaped genital bulb with two organs: embolus dorsally tip hairy and disc-shaped unculus heavily sclerotized that is provided with minute scales. No appendix between embolus and unculus. Legs brownish yellow, without spines, without curved and vertical hairs and with three tarsal claws. leg I, 40.79 (femur 11.93, patella 0.64, tibia 11.93, metatarsus 14, tarsus 2.29); leg II, 30.86 (8.57, 0.64, 7.93, 12.29, 1.43); leg III, 21.28 (6.07, 0.64, 5.29, 8.21, 1.07); leg IV, 28.06 (8.5, 0.64, 7.21, 10.57, 1.14).

**Female.** In general very similar to male. Tip of palpal tarsus as in fig. 1E. Prosoma length/width/height 1.61/1.70/1.36. Opistosoma length/width/height, 4.09/2.58/2.49; chelicerae length/width, 0.58/0.27; chelicerae fang length, 0.21; clypeus height, 0.58; endite length/width, 0.42/1.12; labium length/width, 0.39/0.61; sternum length/width, 1.64/1.94; diameter AME 1.06 μm, ALE 1.28 μm, PME 1.38 μm, PLE 1.28 μm, distance PME-PME 2.02 μm; leg I, 34.44 (femur 9, patella 0.64, tibia 9.5, metatarsus 15.3, tarsus missing); leg II, 24.71 (6.64, 0.57, 6.14, 10.07, 1.29); leg III, 16.79 (4.93, 0.57, 4.5, 6.79, missing); leg IV, 13.64 (6.86, 0.57, 6.21, missing, missing). Epigynum as in figs. 3A-C, consisting of frontal plate with worm-shaped "knob" (HPE) and posterior plate swelled. Female genitalia as in fig. 3D with a pair of circular sclerotized arches of uterus externus, one triangular in middle and a pair of small arches in upper region.

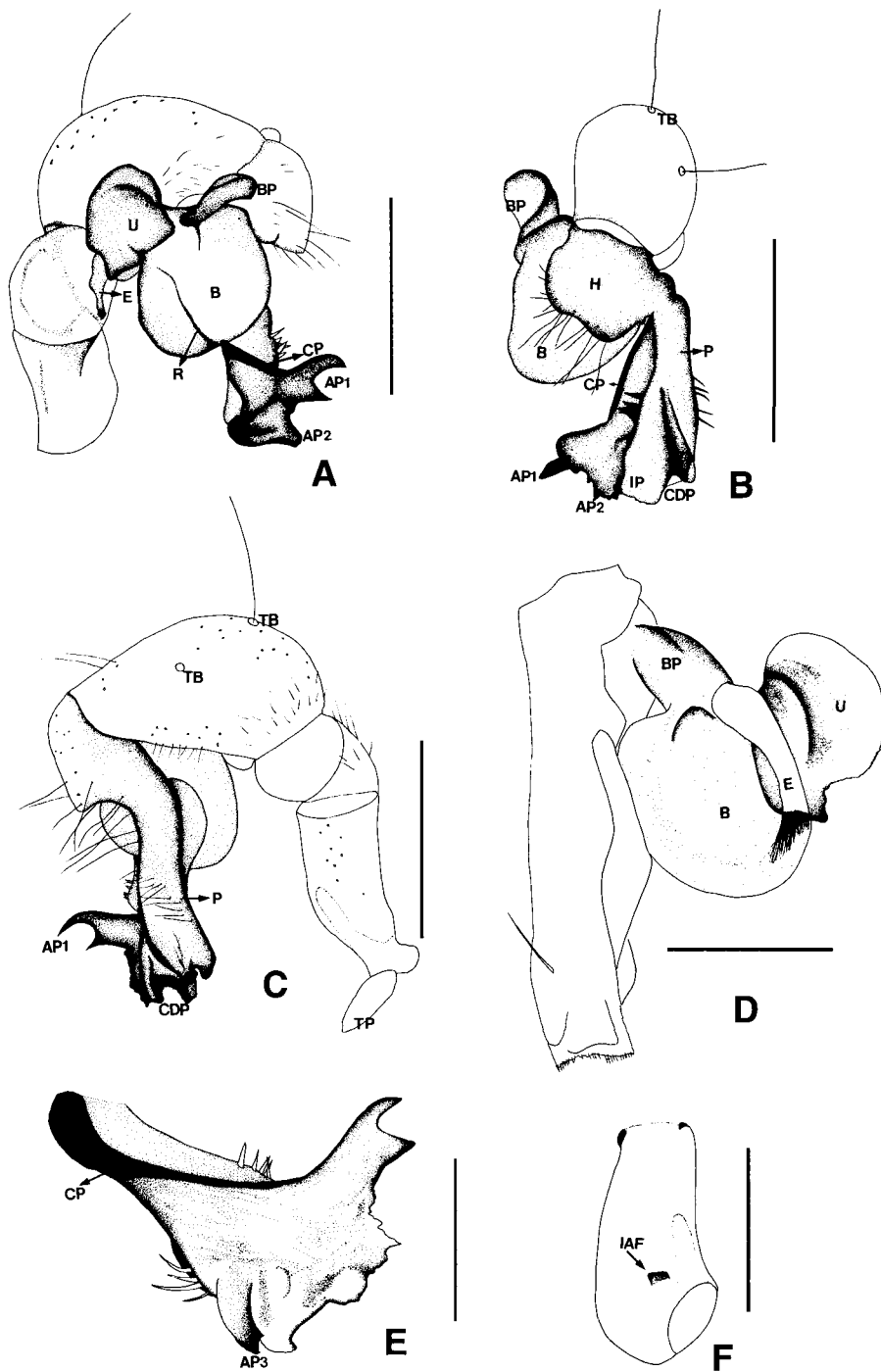
**Etymology.** The specific name is taken from its type locality, Gosu cave, Korea.

**Remarks.** The new species is related to two Korean endemic species, *P. crassus* Paik, 1978 and

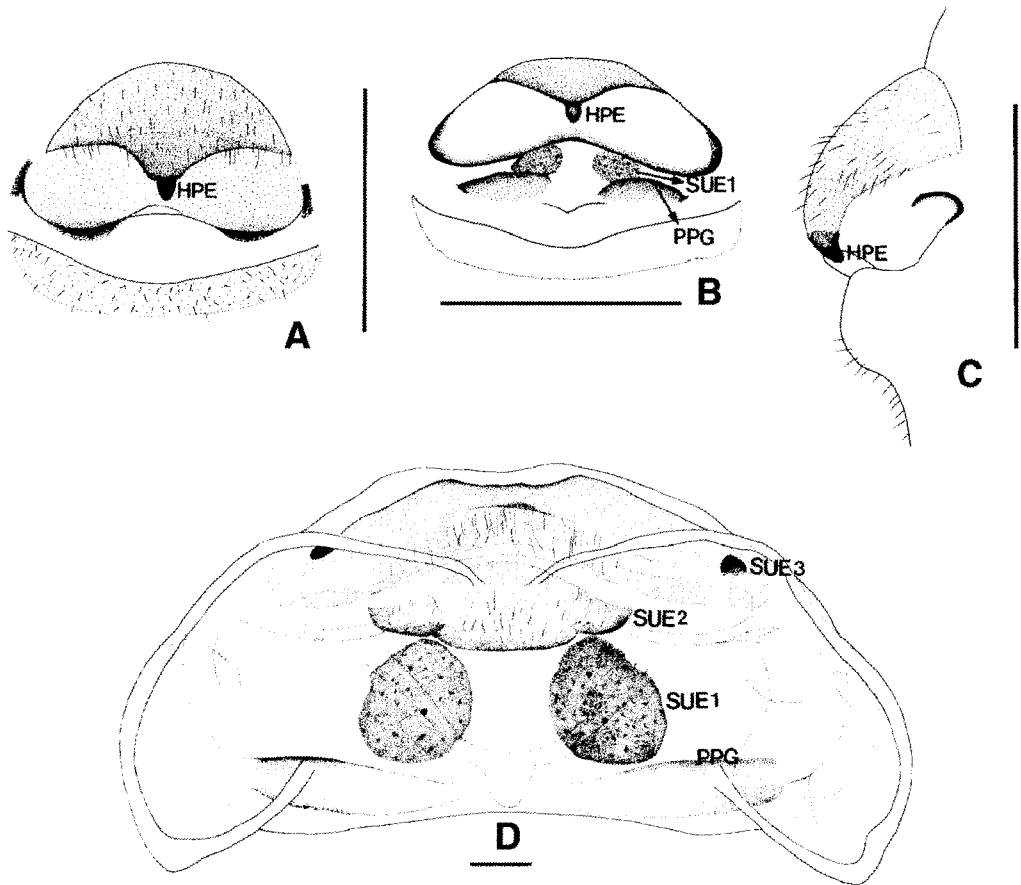


**Figs. 1A-E.** *Phocus gusuensis* sp. nov. (A-D, male; E, female). A, prosoma, dorsal view; B, opistosoma, dorsal view; C, eye area and clypeus, frontal view; D, right chelicerae, frontal view; E, tip of female palp, left part, retrolateral view. Scale bars = 1 mm (A-C), 0.5 mm (D), 0.1 mm (E).

*P. acutulus* Paik, 1978 in having identical uncus, embolus, degrading appendix and a hook-like prominence on epigynum. But this species is differentiated from large developed apophyses and heavily sclerotized callosity on procurus of male palpi, each two frontal and lateral apophyses of



**Figs. 2A-F.** Male palpal organs of *Pholcus gosuensis* sp. nov. (left part). A, bulb and procrurus, inner ectal view; B, procrurus, frontal view; C, procrurus, outer ectal view; D, uncus and embolus, ectal view; E, procrurus, inner ectal view; F, femur, inner ectal view. Scale bars = 1 mm (A-C), 0.5 mm (D-F).



**Figs. 3A-D.** Female genital organs of *Pholcus gosuensis* sp. nov. A-C, epigynum; A, ventral view; B, posterior view; C, lateral view; D, genitalia, ventral view. Scale bars = 1 mm (A-C), 0.1 mm (D).

chelicerae, and sclerotized arches of uterus externus of female genitalia.

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## 한국 고수동굴산 유령거미과(거미강: 거미목)의 1신종

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### 요 약

한국 고수동굴 입구지대에서 채집된 유령거미과 1신종, 고수유령거미 (*Pholcus gosuensis* sp. nov.)를 기재한다. 본 신종은 매우 발달된 후측면부배엽(procurus)와 위턱의 전면과 측면 돌기, 퇴화된 구보조돌기(appendix) 그리고 바깥자궁(uterus externus)에 있는 경질화된 알키스(arches)를 가지고 있다. 또한 비슷한 구돌기(uncus)와 삼입기를 보유한 한국 고유종인 부채유령거미와 목이유령거미를 닮았으나 수컷 후측면부배엽에 있는 큰 돌기들과 강하게 경질화된 켈로시티(callosity) 그리고 바깥자궁에 있는 경질화된 무늬들의 구조로 구별할 수 있다.