

Studies on Interesting Species of the Laboulbeniales Collected from Korea

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(Received April 29, 2011. Accepted July 18, 2011)

Five species of the Laboulbeniales, including two unrecorded species are reported from South Korea. They are as follows; *Dioicomyces anthici* Thaxter on *Anthicus confucii* Marseul, *Laboulbenia melanaria* Thaxter on *Anisodacthius tricuspoidatus* Morawitz, *L. philonthi* Thaxter on *Philonthus wuesthoffi* Bernhauer, *Peyritsiella japonicus* Terada on *Philonthus japonicus* Sharp, and *Scaphidiomyces baeocerae* Thaxter on *Scaphisoma unicolor* Achard. Among these species, *L. melanaria* Thaxter, *S. baeocerae* Thaxter and the male thallus of *D. anthici* Thaxter are newly described from South Korea. *L. Philonthi* Thaxter and *P. japonicus* Terada are newly collected in some places where were unlike with the examined region ago.

KEYWORDS : *Dioicomyces*, *Laboulbenia*, Laboulbeniales, *Peyritsiella*, *Scaphidiomyces*, South Korea

The Laboulbeniales is a highly specialized fungus group of the Ascomycotina. All species of this fungus group are known as the obligate exoparasites of the Arthropoda, especially of insects, with the exception of a small number of species found from mites and millipedes. Members of the Laboulbeniales are widely distributed in the world and include over 2,000 known species under 133 genera, although the richest floras are found in tropical regions. Korean Laboulbeniales were known 75 species under 18 genera in those days [1].

In this study, *Dioicomyces anthici* Thaxter [2-12], *Laboulbenia melanaria* Thaxter [11, 13-17], *L. philonthi* Thaxter [11, 18-20], *Peyritsiella japonicus* Terada [10, 21] and *Scaphidiomyces baeocerae* Thaxter [7, 22, 23] are described, illustrated and identified. All specimens were deposited in the private herbarium of the first author, Department of Biology, College of Education, Chosun University.

Dioicomyces anthici* Thaxter, Proc. Am. Acad. Arts Sci. 37: 33. 1901; *D. formicillae* Thaxter, Proc. Am. Acad. Arts Sci. 48: 169. 1912; *D. angularis* Thaxter, Proc. Am. Acad. Arts Sci. 48: 171. 1912; *D. falcatus* Spegazzini, Anal. Mus. Nac. Hist. Nat. Buenos Aires 29: 522. 1917; *D. formicillae* f. *anthicicola* Spegazzini, Anal. Mus. Nac. Hist. Nat. Buenos Aires 29: 523. 1917; *D. formicillae* f. *brachygnathus* Spegazzini, Anal. Mus. Nac. Hist. Nat. Buenos Aires 29: 524. 1917; *D.

***infuscatus* Spegazzini, Anal. Mus. Nac. Hist. Nat. Buenos Aires 29: 526. 1917; *D. pallidus* Spegazzini, Anal. Mus. Nac. Hist. Nat. Buenos Aires 29: 527. 1917; *D. refractus* Spegazzini, Anal. Mus. Nac. Hist. Nat. Buenos Aires 29: 528. 1917; *D. uncinatus* Spegazzini, Anal. Mus. Nac. Hist. Nat. Buenos Aires 29: 532. 1917; *D. anthici* var. *fuscescens* Maire, Bull. Soc. Hist. Nat. Afr. Nord 11: 135. 1920; *D. guatemalensis* Thaxter, Mem. Am. Acad. Arts Sci. 16: 64. 1931; Tavares, Mycol. Mem. 9: 200. 1985; Huldén, Karstenia 23: 48. 1983; Lee & Sugiyama, Trans. Mycol. Soc. Jpn. 25: 249. 1984; Lee, Korean J. Plant Taxon. 16: 129. 1986; Majewski, Pol. Bot. Stud. 7: 163. 1994; Santamaria, Mycol. Res. 106: 619. 2002.**

Female thallus 178~263 µm long from foot to perithecial tip, brownish, sigmoid to arcuate, 48~75 µm long from foot to apex of primary appendage. Primary appendage conical with a pointed and inwardly curved apex. Cell I, II, III and primary appendage dark brown, often delicately dotted, becoming opaque towards the dorsal side.

Perithecium 93~125 µm long, asymmetrical, strongly inflated, with anterior margin strongly concave, broadest below the middle part, tapering gradually to the broad, rounded apex.

Male thallus 50 µm long from foot to the antheridial tip, yellowish brown, nearly straight; basal cell, separated by dark septum from the second slightly elongated cell, the third cell flattened, antheridium terminated distally in

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rounded projection and slender neck.

Host genera. *Anthicus*, *Leptaleus*, *Hirticomus*, *Cyclodinus*, *Cordicomus* and *Formicilla* (Anthicidae, Coleoptera).

Host species in Korea. *Anthicus confucii* Marseul.

Distribution. All continents except Australia.

Specimens examined. Gosiri, Hancheon-myeon, Hwasung-gun, Jeonnam Province, 4 September, 2010, L-Y-2280 and 2281.

This species is a widespread and very variable species. Santamaria [12] studied several hundreds of fungal thalli collected on anthicids from the Iberian Peninsula that may be forms or varieties included in *D. anthici*. After the studies of these specimens, he decided to define the characteristics of *D. anthici* in a broad sense and stated that eleven taxa published by other authors seems preferable to synonymize these forms with *D. anthici*. The examined materials closely resembled the typical appearance of *D. anthici*. Male thallus were newly collected in Korea (Fig. 1).

Laboulbenia melanaria Thaxter, Proc. Am. Acad. Arts Sci. 35: 186. 1899; 13: 338. 1908; Spegazzini, Redia 10: 55. 1914; Barazuc, Bull. Soc. linn. Lyon 43: 78. 1974; Majewski, Pol. Bot. Stud. 7: 96. 1994; Kesel, Stenbeeckia 18: 30. 1998.

Total length to the top of perithecium 175~213 μm . Receptacle suffused with blackish brown except the lower portion of cell I and usually cell II, composed of the basal cylindrical portion and terminal two appendages; the basal portion composed of five cells, tapering towards the base, the fourth layer consisting of two cells, cell I, II, III and IV about 2 times longer than broad, cell V small, rounded or triangular. Insertion cell dark, constricted; two appendages of receptacle arranged antero-posteriorly; posterior appendage straight, slightly darkened, comprising elongated cells, simple or usually more often once ramified on the second cell, 268~293 μm long; anterior appendage composed of a much smaller basal cell and two longer branches, shorter than posterior one. Antheridia produced one or two on the tip of the short two-celled branch or laterally at the second cell of the anterior appendage, 10~20 \times 2.5~3.8 μm .

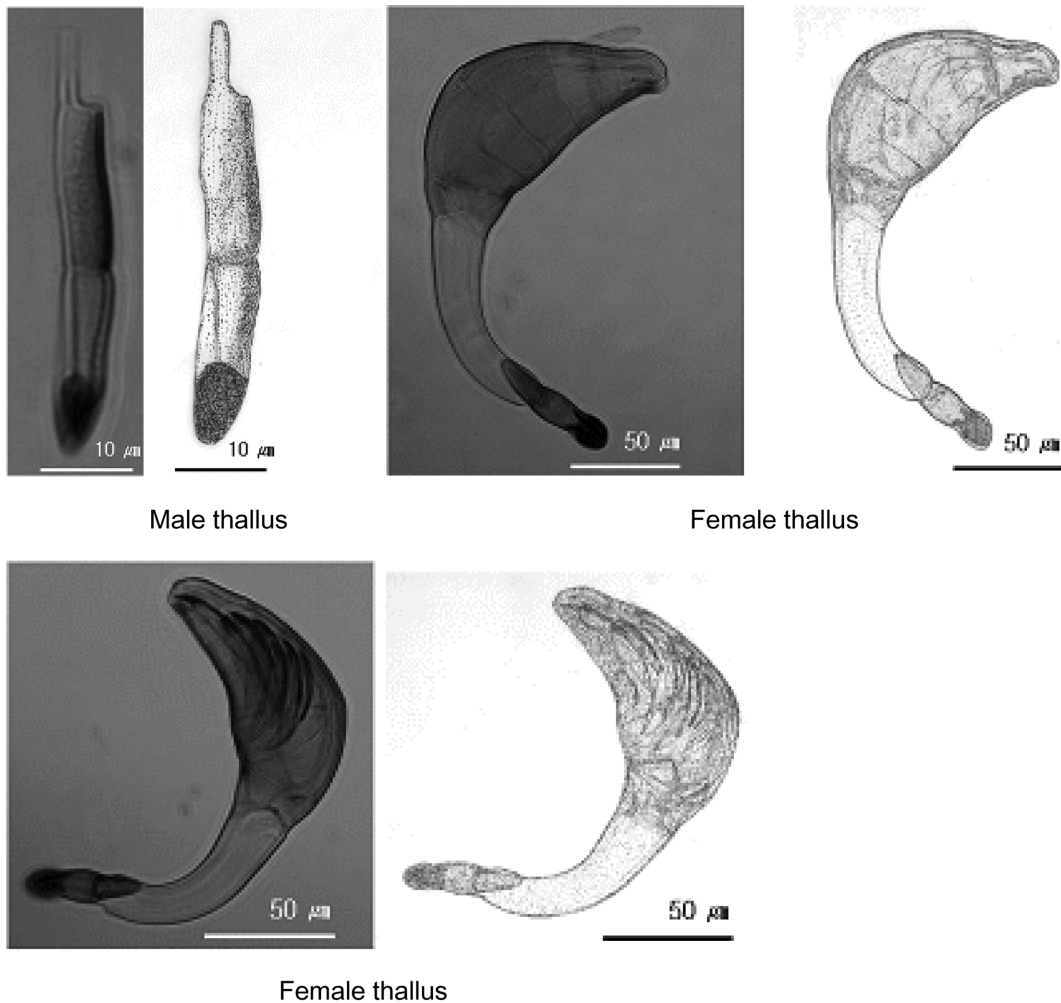


Fig. 1. *Dioicomycetes anthici* Thaxter on *Anthicus confucii* Marseul.

Perithecium nearly free, uniformly suffused with clear blackish brown, cylindrical, straight or bent slightly outward; anterior tip more deeply blackish brown, posterior tip-edge hyaline, the stalk cell of perithecium somewhat shorter than cell III.

Host genera. *Anisodactylus Brachinus*, *Diachromus* and *Ophonus* (Carabidae, Coleoptera).

Host species in Korea. *Anisodactylus tricuspидatus* Morawitz.

Distribution. Europe, Korea (new), North Africa and Western Asia.

Specimens examined. Bangujeong, Seokgok-myeon, Gokseong-gun, Jeonnam Province, 15 August, 2005, L-Y-

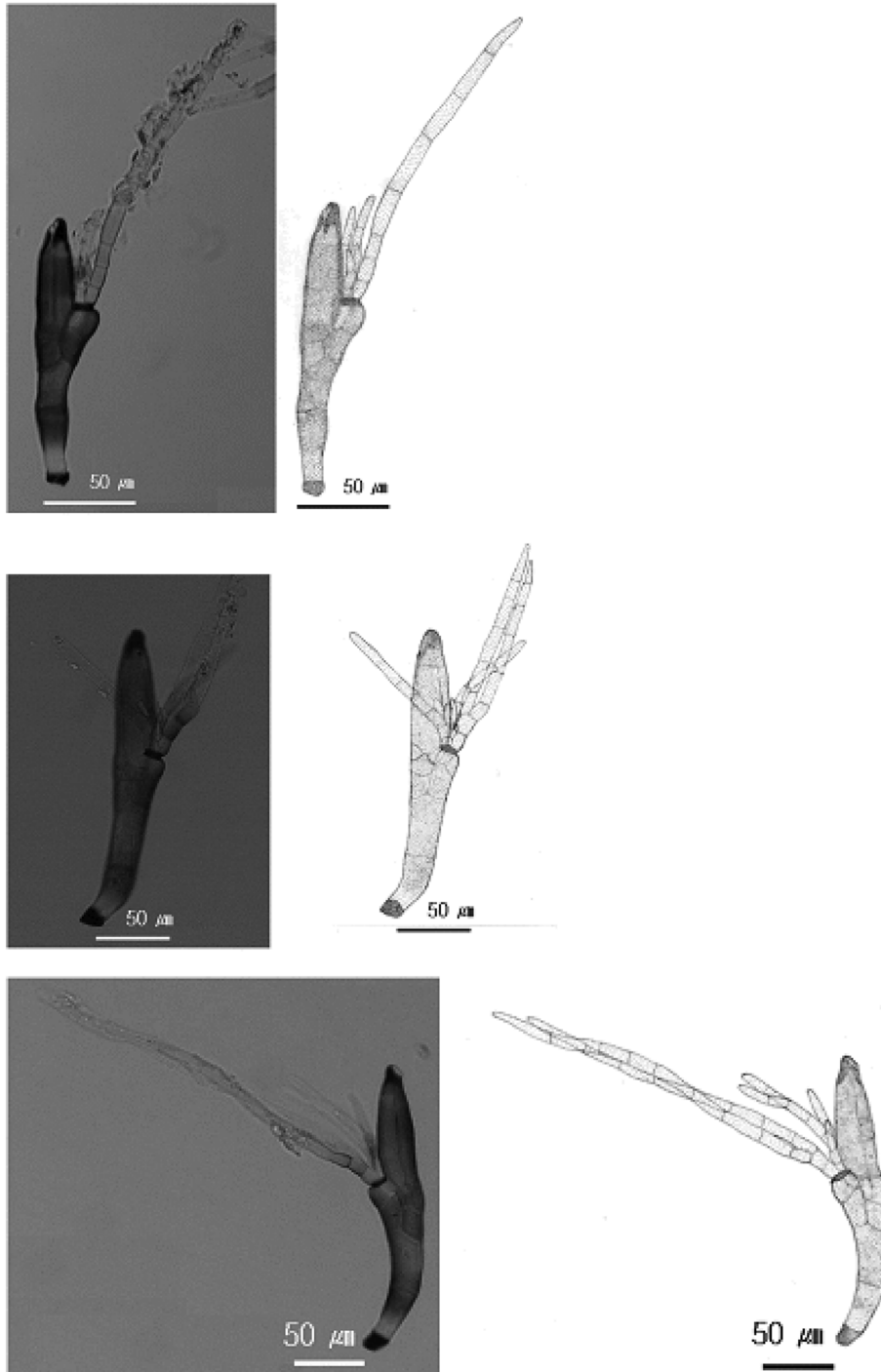


Fig. 2. *Laboulbenia melanaria* Thaxter on *Anisodacthius tricuspидatus* Morawitz.

2228~2234.

The present species is closely related to *L. flagellata* Peyritsch but differs in the following features; the former has a dark posterior appendage, less well-developed anterior appendage proliferating into only two branchlets and a slender, cylindrical perithecium, while the latter has a hyaline posterior appendage, well-developed anterior appendage and a inflated, ovated perithecium (Fig. 2). Infected beetles were collected near river, in plant remains in riverside bushes. Thalli occurred on the margin of the right or left elytra.

***Laboulbenia philonthi* Thaxter, Proc. Am. Acad. Arts Sci. 28: 174. 1893; Majewski, Pol. Bot. Stud. 7: 119. 1994; Lee & Na, Kor. J. Mycol. 26: 115. 1998; Lee *et al.*, Kor. J. Mycol. 30: 130. 2002.**

Host genera. *Gabriys*, *Daragabrius* and *Philonthus* (Coleoptera, Staphylinidae).

Host species in Korea. *Philonthus wuesthoffi* Bernhauer.

Distribution. Europe, Korea, North and Central America and Turkey.

Specimens examined. Pond Doam, Gangjin-gun, Jeonnam Province, 23 July, 2009, L-Y-2220~2222.

This species was found by Lee *et al.* [19, 20] from the Upo Swamp. The most interesting characteristic of this present species is the dark septa of the appendages (Fig. 3). The infected insects were found on moist ground and grass around the pond. Thalli grow on the host abdomen,

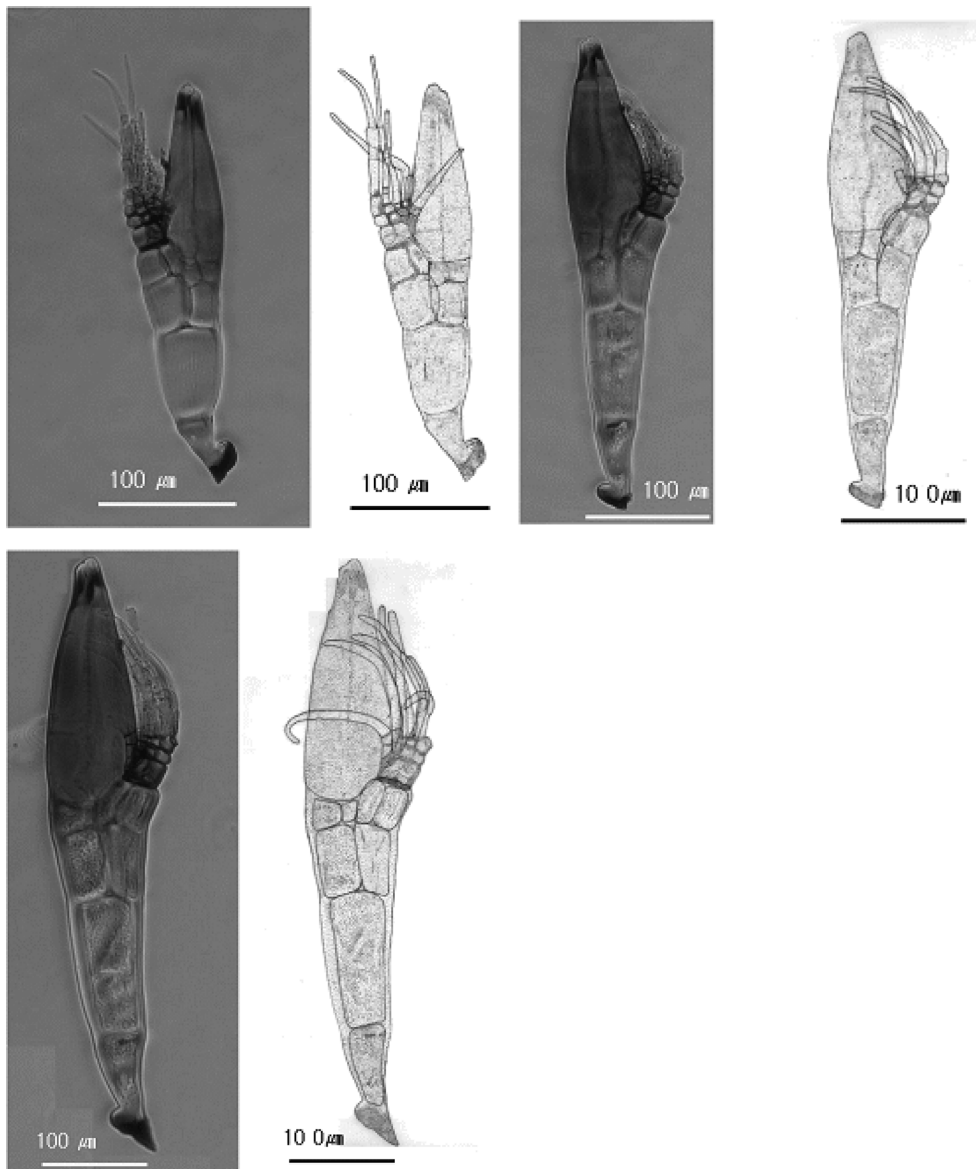


Fig. 3. *Laboulbenia Philonthi* Thaxter on *Philonthus wuesthoffi* Bernhauer.

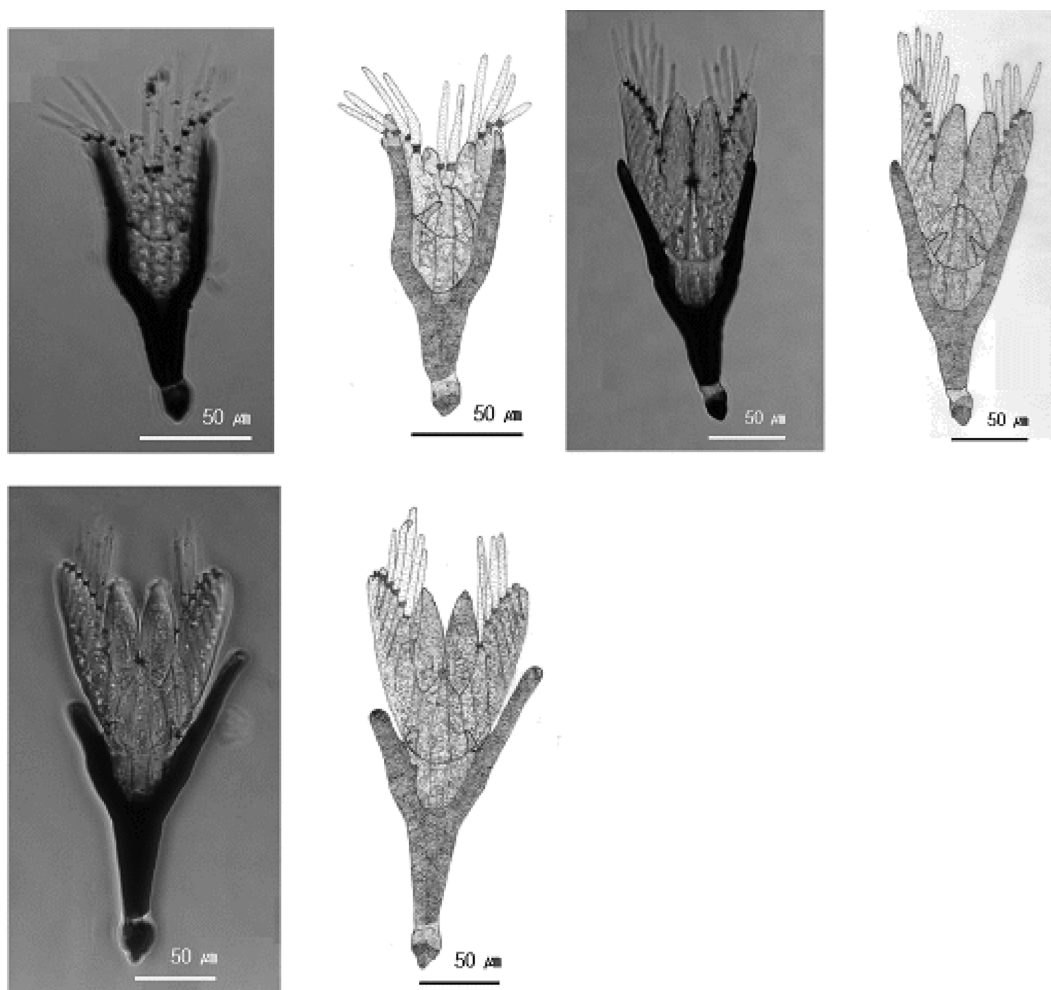


Fig. 4. *Peyritschiella japonicus* Terada on *Philonthus japonicus* Sharp.

head, elytra and legs.

Peyritschiella japonicus Terada, *Trans. Mycol. Soc. Jpn.* **21**: 95. 1980; Lee, *Korean J. Plant Taxon.* **16**: 127. 1986.

Thalli length 195~238 × 90~110 µm. Receptacle marginally blackened, forked, consisting of four layers of cells; the first layer hyaline, blackish brown at the base, small, nearly isodiametric; the second layer almost entirely blackened; the third layer consisting of five blackish brown macula cells and blackish opaque lateral cells, forming a blackish projection on either side; the fourth layer almost hyaline or suffused with brown, concave distally, consisting of 22~26 cells.

Perithecia yellowish brown, deeply suffused on the upper and outer sides, egg-shaped, short and stout, narrowly surrounded by the projections of the fourth layer of receptacle, with a paired horizontal auricles near the apex, 105 × 23 µm. Antheridia horn-shaped, formed above the distal end of the third layer of receptacle, 15~25 × 7.5 µm. Appendage hyaline, cylindrical, 50 × 62 µm long.

Host genus. *Philonthus* (Staphylinidae, Coleoptera).

Host species in Korea. *Philonthus japonicus* Sharp.

Distribution. Japan and Korea.

Specimens examined. Mt. Sobaek, Yeongju, Gyeongbuk Province, 14 July, 2007, L-Y-2255, 2256 and 2271.

This species was described by Lee [10] from Gwangju. The present species is very similar to *P. hybridus* Thaxter, but it is easily distinguished by the perithecium which almost always occurs in a pair, narrowly surrounded by the projections of the fourth layer of receptacle, bearing a pair of horizontally elongated auricles near the perithecial apex and not exceeding the fourth layer of receptacle (Fig. 4). Thalli were present on the abdomen and the margin of elytra.

Scaphidiomyces baecerae Thaxter, *Proc. Am. Acad. Arts Sci.* **48**: 209. 1912; *Mem. Am. Acad. Arts Sci.* **16**: 264. 1931; Tavares, *Mycol. Mem.* **9**: 314. 1985.

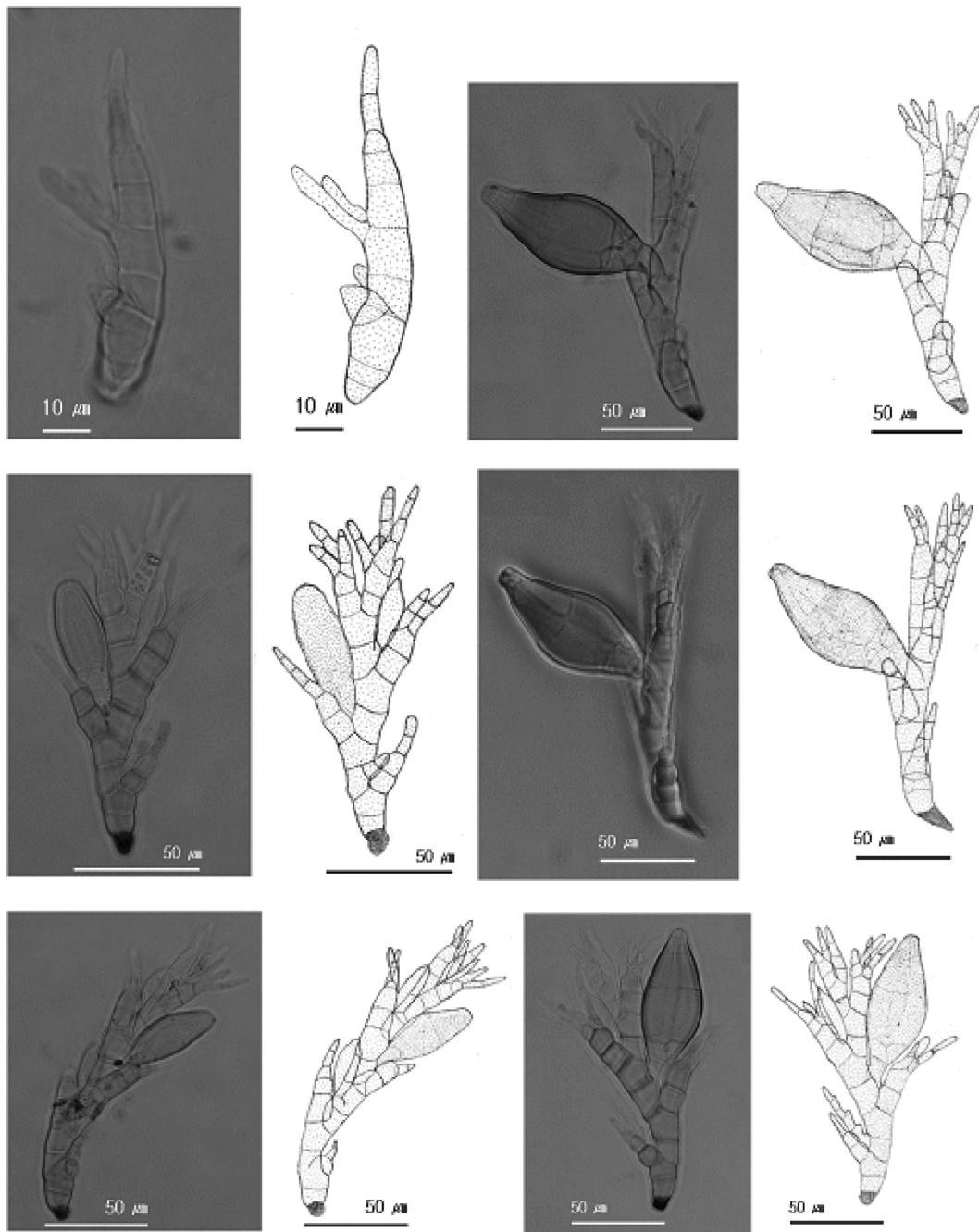


Fig. 5. *Scaphidiomyces baecerae* Thaxter on *Scaphisoma unicolor* Achard.

Total length to the top of mature perithecium 152.5~192.5 µm. Thalli hyaline, yellowish brown. Axis composed of the primary and secondary receptacle; the primary receptacle consisting of two superposed cells; cell I slightly longer than broad, narrow, often deeply suffused with brown just above the foot; cell II broader than length, bearing laterally the primary appendage and distally the secondary receptacle; the secondary receptacle composed of usually four branchlets, the branchlets consisting of usually four or five similar, stout cells, slightly longer than broad, bearing distally two or three short, tapering

the secondary appendages and the simple, flask-shaped antheridia. Perithecium proper short, stout, symmetrical, both margins strongly convex, tapering from the middle portion to the tip, blunt and nearly symmetrical apex, perithecia 45~85 × 20~40 µm, the stalk cells 10~30 µm.

Host genus. *Baecera* (Scaphidiidae, Coleoptera).

Host species in Korea. *Scaphisoma unicolor* Achard.

Distribution. Argentina, Korea (new), Philippines, West

Africa and West Indies.

Specimens examined. Mt. Deogyu, Jeonbuk Province, 12 July, 2003, L-Y-2243 and 2244.

Four species of the genus *Scaphidiomyces* were found in the world. This species is closely related to *S. scaphicomae* Thaxter, but seems to differ in its stouter, more compact habit, the short branches, perithcia being closely associated on the axis and approximately symmetrical (Fig. 5). The infected insects were collected on some mushrooms from a mountainous forest. Thalli grew near outer margin and surface of elytra.

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