

# Enumeration of Remarkable Japanese Discomycetes (3): First Records of Three Inoperculate Helotialean Discomycetes in Japan

**Tsuyoshi Hosoya**

Department of Botany, National Museum of Nature and Science,  
Amakubo 4–1–1, Tsukuba, 305–0005 Japan  
E-mail: hosoya@kahaku.go.jp

**Abstract** Three helotialean discomycetes new to Japan are described, i.e. *Polydesmia pruinosa* (Hyaloscyphaceae), *Hymenoscyphus fructigenus* (Helotiaceae), and *Tapesia fusca* (Dermateaceae).

**Key words:** Japan, mycobiota, new records.

## Introduction

This is the third part of the series on remarkable Japanese discomycetes following Hosoya (2005). Three inoperculate discomycetes with minute apothecia new to Japan are described and illustrated.

## Materials and Methods

Collection and observation procedures followed Hosoya and Otani (1997) and Hosoya (2004). To obtain freezing microtome sections, dried materials were rinsed in a drop of 70% ethanol, rehydrated in water, embedded in mucilage (Tissue Tek II; Miles Laboratories, Inc., Naperville, Illinois, USA), and sliced at 15–25  $\mu\text{m}$  on a microtome (FX-801, Yamato Koki) equipped with an electric freezer (MC-802A, Yamato Koki). The sliced materials were mounted in Melzer's reagent (MLZ; 0.5 g of iodine, 1.5 g of KI, 20 g of chloral hydrate, 20 ml of distilled water), and in cotton blue dissolved in lactic acid (CB/LA) for observation. Colors are recorded in CMYK formulae, available on many web sources and printed color (e.g. Anonymous, 2002).

## Descriptions

### 1. *Polydesmia pruinosa*

[Figs. 1 and 2]

*Polydesmia pruinosa* (Jerdon) Boud.

*Helotium pruinosum* Jerdon. in Berk. & Broome., Ann. Mag. Nat. Hist., Ser. 3, 18: 127. 1866.

*Polydesmia pruinosa* (Jerdon) Boud., Bull. Soc. Mycol. France 1: 113. 1885. — Korf, Mycotaxon 7: 477. 1978. — Korf, Mycotaxon 13: 144. 1981. — Breitenbach et Kränzlin, Fungi Switz. 1: 183. 1984. — Spooner, Bibl. Mycol. 116: 629. 1987. — Raitviir et Galán, Mycotaxon 53: 452. 1995; non *Polydesmia pruinosa* (Wallr.) Sacc. 1889.

*Belonidium pruinosa* (Jerdon) Rehm in Rabenh., Kryptogam. – Fl. Deutschl., Oesterr. Schweiz 1: 510. 1891.

*Belonium pruinosa* (Jerdon) Höhn. in Rehm, Ann. Mycol. 10: 536. 1912.

*Pseudohelotium jerdonii* Sacc., Syll. Fung. 8: 296. 1889 (ut “*jerdonii*”).

*Belonium pyrenomycetum* Vel. (ut ‘*Pyrenomycetum*’), Novitates Mycol. p. 182. 1940. [1939]

**Subiculum** not typically well-developed, reduced to small amount of anchoring hyphae, observed only near the base of apothecia. **Apothecia** gregarious, sessile to very short stipi-

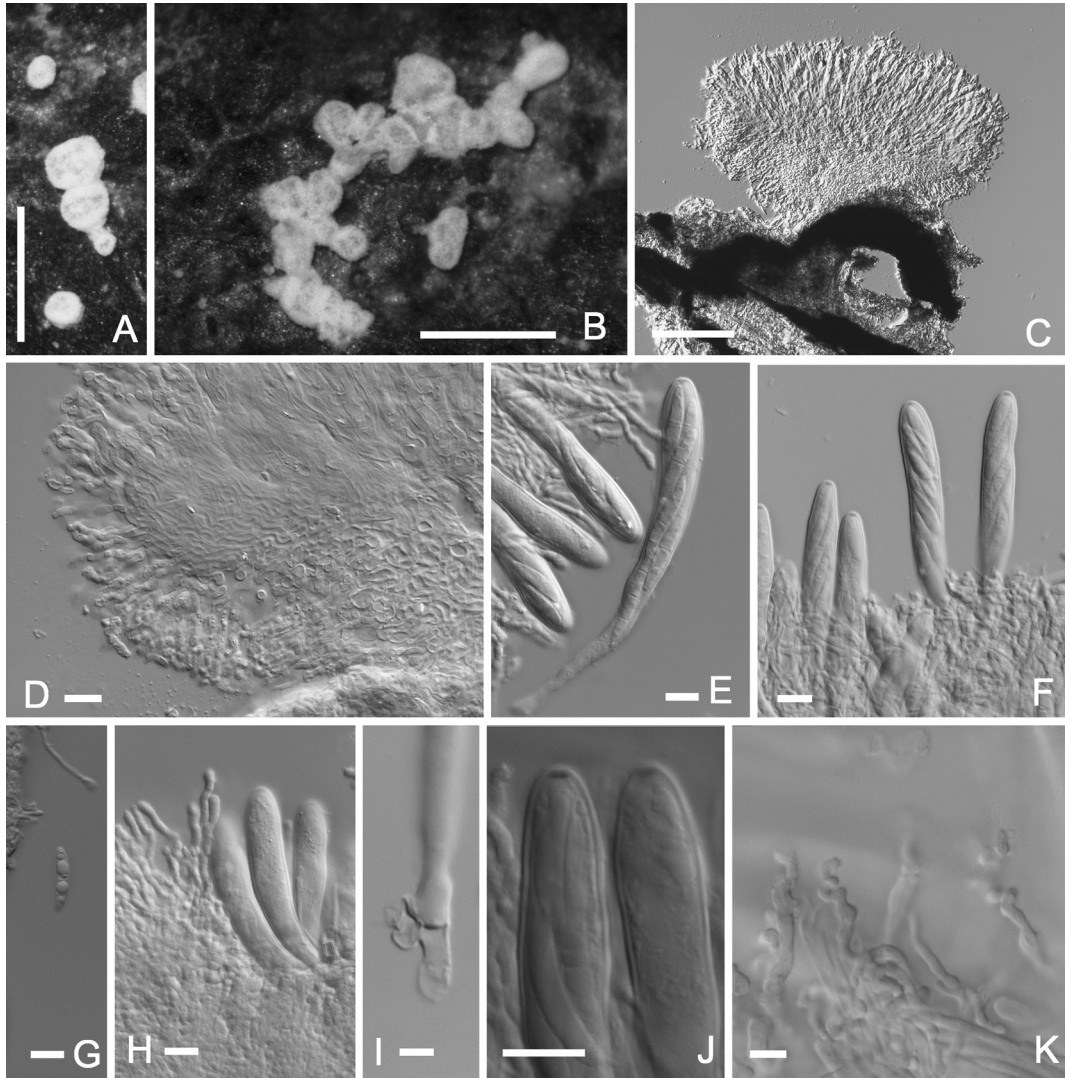


Fig. 1. *Polydesmia pruinosa* (TNS-F-12764).

A, B. Dried apothecia. Note some in B are coalescent. C. Vertical section of the apothecium. Note the apothecium occurring on black peridium of the pyrenomycete on woody substrate. D. Vertical section at the margin, showing ectal excipulum, hairs and the paraphyses. E and F. Asci mounted in MLZ. G. Ascospore. Note oil globules. H. Paraphyses. I. Crozier at the base of the ascus. J. Close up of the ascus apex in MLZ showing MLZ+ reaction at the apex. K. Close up of the paraphyses. Note strongly coiled paraphysis at the right. C and D light microscopy mounted in CB/LA, E–K in MLZ, respectively. Scales. A and B, 0.5 mm; C, 0.1 mm; D–K, 10  $\mu$ m.

tate, pulvinate when young, patelliform to turbinate, 200  $\mu$ m high when mature; disc finely pruinose, flat to slightly convex, up to 400  $\mu$ m in diam., pure white to dull white; margin indistinct, not elevated; receptacle finely pruinose, concolorous or paler than the disc. **Ectal excipulum** not

well-defined, textura intricata, of closely interwoven hyphae, 2 to 3  $\mu$ m thick. **Hairs** simple or branched, agglutinated, irregularly winding, irregularly curled at the apex, 1.5–2  $\mu$ m wide, bearing fine granules. **Asci** c. 80 $\times$ 10  $\mu$ m, cylindrical clavate, stipitate, narrowed to the base,

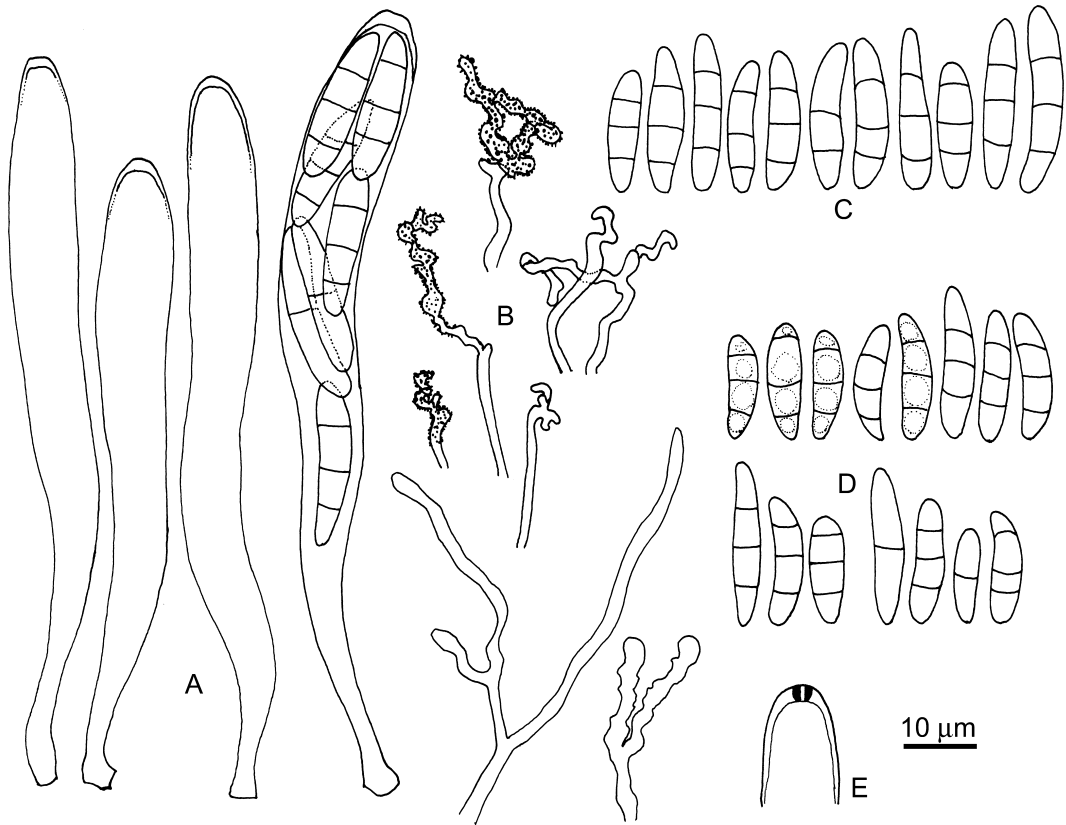


Fig. 2. Camera lucida illustration of *Polydesmia pruinosa* (TNS-F-12764 and TNS-F-17785).

A. Ascus (TNS-F-12764). B. Paraphyses. The lower two are from TNS-F-17785. C. Ascospores. D. Ascospores, some showing oil globules (TNS-F-17785). E. Ascus apex showing the pore stained in MLZ.

arising from croziers; apex conical, pore strongly MLZ+ without KOH pretreatment. **Ascospores**  $13.5\text{--}24(-37)\times 3.5\text{--}5.5\ \mu\text{m}$  ( $19.7\pm 3.3\times 4.2\pm 0.4\ \mu\text{m}$  on average  $\pm$ SD,  $n=35$ ), elongate ellipsoid, straight or slightly curved, 1–3-septate, mostly 3-septate, occasionally containing one large oil globule visible in each cell in MLZ mounts. **Paraphyses** filiform, flexuous, simple or irregularly branched or strongly coiled at the apex,  $1.5\ \mu\text{m}$  wide, having granules at the upper portion, exceeding the ascus to give a pruinose appearance to the hymenium.

Specimens examined. HONSHU: TNS-F-12764, Tsukuba University Sugadaira Montane Research Center, Ueda-shi, Nagano Pref. ( $36^{\circ}31'30.1''\text{N}$ ,  $138^{\circ}20'49.1''\text{E}$ , alt. 1,346 m), on decaying pyrenomycete, 25–IX–2006. col. T.

Hosoya; TNS-F-17785, Idenzawa, Nakagawa, Yamakita-cho, Ashigarakami-gun, Kanagawa Pref. ( $35^{\circ}27'18.7''\text{N}$ ,  $138^{\circ}59'49.3''\text{E}$ , alt. 824 m), on decaying pyrenomycete, 3–VII–2005. col. T. Hosoya; TNS-F-24781, Mt. Tsukuba, Tsukubashi, Ibaraki Pref., on decaying pyrenomycete, IX–94. col. T. Hosoya.

Known distribution. Europe, North America, Macaronesia.

Notes. The genus *Polydesmia* currently consists of eight species (Svrček, 1967; Korf, 1978, 1981; Raitviir and Galán, 1995; Huhtinen and Santesson, 1997; Zhuang, 1999, 2000). The members of *Polydesmia* occur on various substrates including fungi, lichens, ferns, herbs, wood and fruits. *Polydesmia pruinosa*, the type of the genus, is well distinguished from the rest

of the members by its fungicolous habitat. *Polydesmia pruinosa* is known to occur on *Cryptosphaeria*, *Diatrype*, *Diatrypella*, and *Melogramma* (Korf, 1978), and seems to be widespread in the world, but infrequently reported. Although the host was decaying and unidentifiable, the hosts of the specimens examined in the present study varied and the apothecial micro-morphology differed slightly. The ascospores of TNS-F-12764 ( $15\text{--}27 \times 3.5\text{--}5.5 \mu\text{m}$ ;  $21.2 \pm 3.0 \times 4.3 \pm 0.47 \mu\text{m}$  on average  $\pm$  SD,  $n=20$ ) were larger than TNS-F-17785 ( $13.5\text{--}23 \times 3.5\text{--}5 \mu\text{m}$ ;  $17.8 \pm 2.70 \times 4.1 \pm 0.39 \mu\text{m}$ ;  $n=15$ , Fig. 2), although the ascospore dimension formed a continuum in the two specimens. Paraphyses of the former were more complex than the latter (Fig. 2). Because host selectivity often influences varia-

tions in fungi, infraspecific taxa may be found in *P. pruinosa*.

Verkley (2005) reported a *Fusarium*-like anamorph, *Brefeldochium pruinorum*, produced on oatmeal agar, for this species.

## 2. *Hymenoscyphus fructigenus*

[Figs. 3 and 4]

*Hymenoscyphus fructigenus* (Bull.) Gray, Nat. Arrang. Brit. Pl. 1: 673. 1821. — Dennis, Kew Bull. 39: 763. 1985. — Lizon, Mycotaxon 45: 20. 1992. — Breitenbach et Kränzlin, Fungi Switz. 1: 166. 1984.

*Peziza fructigena* Bull. Hist. Champ. France p. 236, tab. 228, 1791; Fries, Syst. Mycol. 2: 118. 1822.

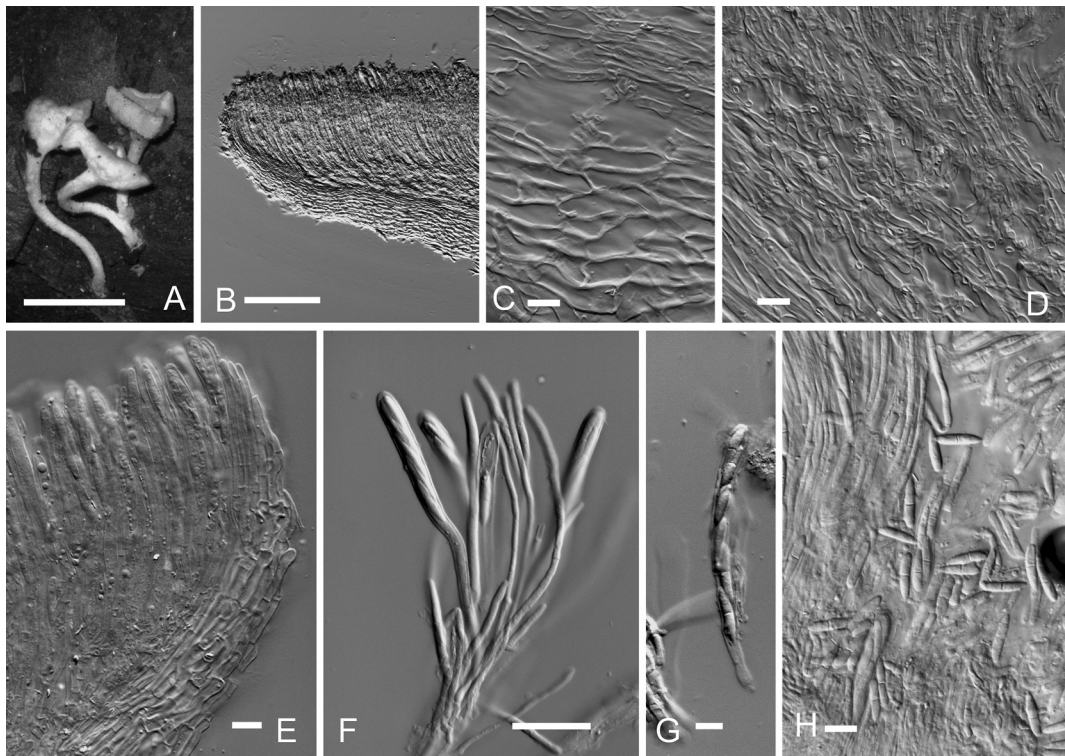


Fig. 3. *Hymenoscyphus fructigenus* (TNS-F-15233).

A. Dried apothecia. B. Vertical section of an apothecium. C. Close up of the ectal excipulum composed of thick-walled prismatic cells. D. Close up of the medullary excipulum. E. Close up of the apothecium at the margin showing the ectal and medullary excipulum. F. Asci and paraphyses. G. Ascus. H. Ascospores. Note some of them are one septate. Scales. A, 1 mm; B, 50  $\mu\text{m}$ ; C–E, 10  $\mu\text{m}$ . B–E light microscopy mounted in CB/LA, F–H in MLZ, respectively.

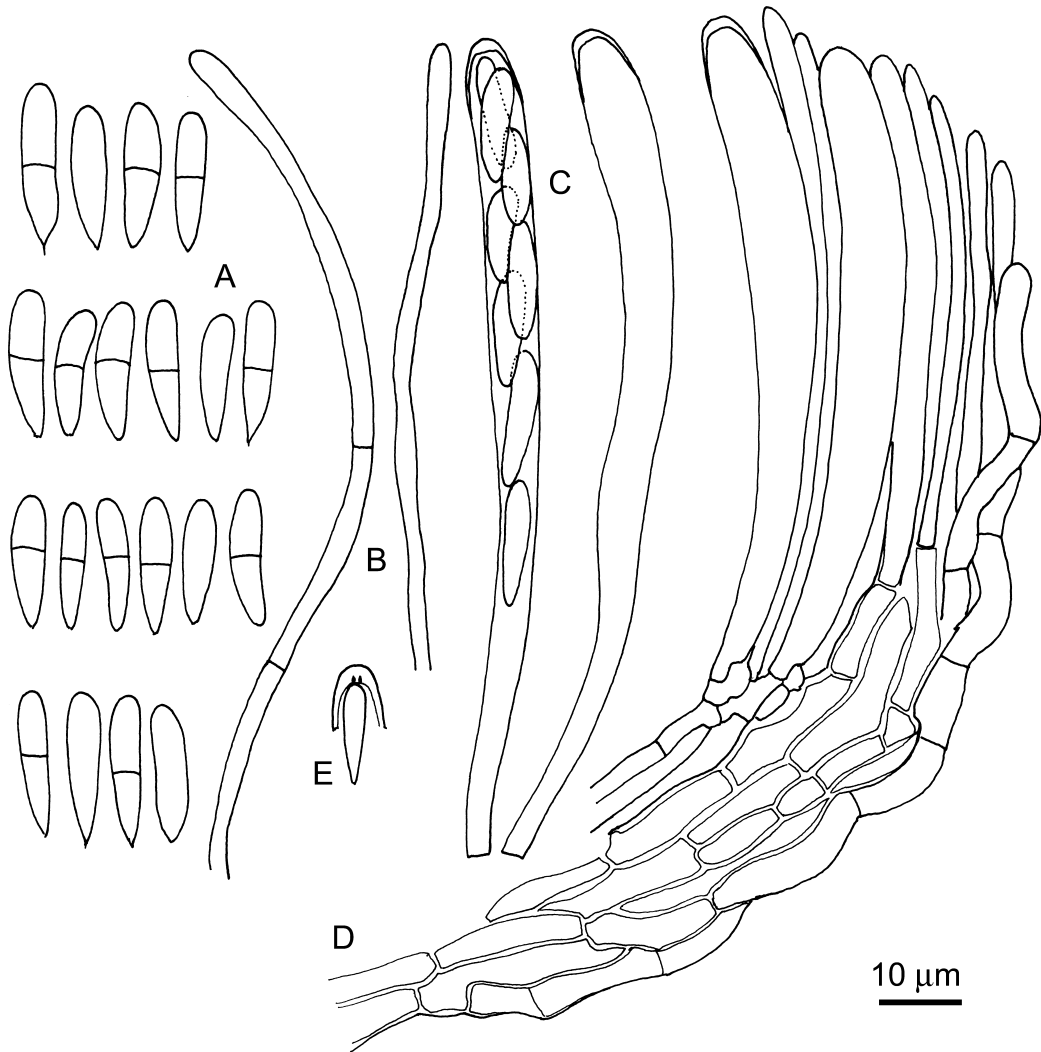


Fig. 4. Camera lucida illustration of *Hymenoscyphus fructigenus* (TNS-F-15233).

A. Ascospores. Note one at the top left having short vestige of a cilium. B. Paraphyses. C. Asci. D. Vertical section of the apothecium at the margin showing the ectal excipular structure. E. Ascus apex showing the pore stained in MLZ.

*Helotium fructigenum* (Bull.) Fuckel, Jahrb. Nass. Ver. Naturk. 23–24: 314. 1870.

*Phialea fructigena* (Bull.) Gillet, Champ. France Discom. p. 99. 1881.

*Helotium virgultorum* var. *fructigenum* (Bull.) Rehm, Rabenhorst's Krypt.-Fl., ed. 2, 1(3): 783. 1893.

*Peziza carpini* Batsch, Elench. Fung. p. 216, tab. 27, fig. 150, 1786.

*Hymenoscyphus fructigenus* var. *carpini* (Batsch)

Hengstm., Persoonia 12: 489. 1895. — Lizon, Mycotaxon 45: 20. 1992.

(?) *Phialea fructigena* (Bull.) Gillet f. *lignicola* Gonz. Frag., Cong. Coimb. Cienc. Nat. Ass. Espan. 6: 16. 1925.

**Apothecia** scattered, stipitate with long stipes of various length up to 5 mm long, leathery, yellowish white to dull white when fresh, drying ochraceous (C0M10Y40K0); disc concave to flat,

1 mm in diam., flat to cupulate with incurved margin when dry; receptacle smooth when fresh, smooth to a bit fibrous when dry. **Ectal excipulum** textura prismatica, of thick-walled brick-shaped cells of  $10\text{--}30 \times 3\text{--}5 \mu\text{m}$ , arranged parallel to the surface. **Medullary excipulum** textura intricata, composed of thin-walled hyphae  $2 \mu\text{m}$  wide. **Asci**  $78\text{--}125(-150) \times 6\text{--}8 \mu\text{m}$ , narrowly cylindrical clavate, stipitate, arising from croziers; apex flattened, thick-walled; pore MLZ+ without KOH pretreatment. **Ascospores**  $15\text{--}17(-21) \times 3\text{--}4 \mu\text{m}$  ( $16.5 \pm 3.7 \times 3.7 \pm 0.38 \mu\text{m}$  on average  $\pm$  SD,  $n=20$ ), elongate ellipsoid, straight, occasionally flattened at one side, aseptate, 1-septate at maturity, rarely having a vestige of a cilium at the lower end. **Paraphyses** filiform, flexuous, sometimes branched, up to  $2.5 \mu\text{m}$  wide, even in width.

Specimens examined. HONSHU: TNS-F-15233, Sugadaira Pasture, Sugadaira, Ueda-shi, Nagano Pref., on decaying acorns of *Quercus*, 25-IX-2006, col. T. Hosoya; TNS-F-24796, Miyori, Fujiwara-machi, Tochigi Pref., on decaying acorns of *Quercus*, 29-IX-1997, col. Y. Ono.

Known distribution. Europe, North America, Asia.

Notes. This is the lectotype species selected by Dennis (1964) for the genus *Hymenoscyphus*. *Hymenoscyphus fructigenus* occurs on acorns and nuts of various trees, wood and twigs of broad-leaved trees and shrubs, and cones of conifers. It is common on acorns of *Quercus* in central Japan. Lizon (1992) pointed out that ascospores are rarely one-septate. However, in the present specimens, septation occurs frequently while within the asci, and often become one-septate prior to germination. Lizon (1992) described morphological difference based on collection sites.

### 3. *Tapesia fusca*

[Figs. 5 and 6]

*Tapesia fusca* (Pers.) Fuckel., Symb. Myc. p. 302. 1869. — Aebi, Nova Hedwigia 23: 75. 1972. — Remler, Bibl. Mycol., 68: 221. 1980.

[1979]. — Sharma *et al.*, Nova Hedwigia 32: 117. 1980. — Grelet, Rev. Mycol. Paris, N. S., 19: 138. 1954. — Breitenbach et Kränzlin, Fungi Switz. 1: 220. 1984.

*Peziza fusca* Pers.: Obs. Myc. 2: 29. 1800; Fries, Syst. Myc. 2: 109. 1822.

*Mollisia fusca* (Pers.) P. Karst., Myc. Fenn. 1: 207.

*Phialea fusca* (Pers.) Gillet, Champ. de France p. 113. 1879.

*Tapesia fusca* var. *fagi* Feltg., Vorst. Lux. Nachtr. 3: 11. 1903.

*Peziza pruni-avium* Pers., Obs. Myc. 2: 82. 1800 [1799].

**Apothecia** gregarious, wedged into subiculum, flat, grey (COM20Y30K0) when dry; disc 1–1.5 mm in diameter; margin incurving, with fine white denticles at the edge when dry. **Subiculum** of smooth, relatively thick-walled, brown, irregularly curved hyphae of  $3\text{--}5 \mu\text{m}$  wide. **Ectal excipulum** two layered, outer ectal excipulum textura globulosa to textura angularis, several cell layered at the margin, composed of thin, brown walled angular to globular cells of  $7\text{--}10 \times 13\text{--}20 \mu\text{m}$ , becoming paler toward the upper excipulum; uppermost cells becoming hyphoid and hyaline; external cells at the upper ectal excipulum inflated, at lower ectal excipulum giving rise to subiculum; inner ectal excipulum textura porrecta, of hyaline, elongate cells of  $2\text{--}3 \mu\text{m}$  wide. **Medullary excipulum** textura angularis, of compact, hyaline, angular cells of  $2.5\text{--}3 \times 2.5\text{--}5 \mu\text{m}$ . **Asci**  $53\text{--}60(-66) \times 4.5\text{--}6(-7) \mu\text{m}$ , cylindrical clavate, arising from croziers; apex conical, pore MLZ+ without KOH pretreatment. **Ascospores**  $(6\text{--})7\text{--}11(-12) \times (1.5\text{--})2\text{--}2.5 \mu\text{m}$  ( $9.0 \pm 1.3 \times 2.1 \pm 0.19 \mu\text{m}$  on average  $\pm$  SD,  $n=40$ ), ellipsoid to elongate ellipsoid, aseptate, occasionally one-septate. **Paraphyses** filiform, sometimes septate near the middle.

Specimens examined. HONSHU: TNS-F-24784, Iryuda, Odawara-shi, Kanagawa Pref., on decaying *Prunus* log, 29-IV-2002. col. T. Hosoya; TNS-F-24785, Okawa fishing park, Okawa, Yuzawa-machi, Minami-uwonuma-gun,

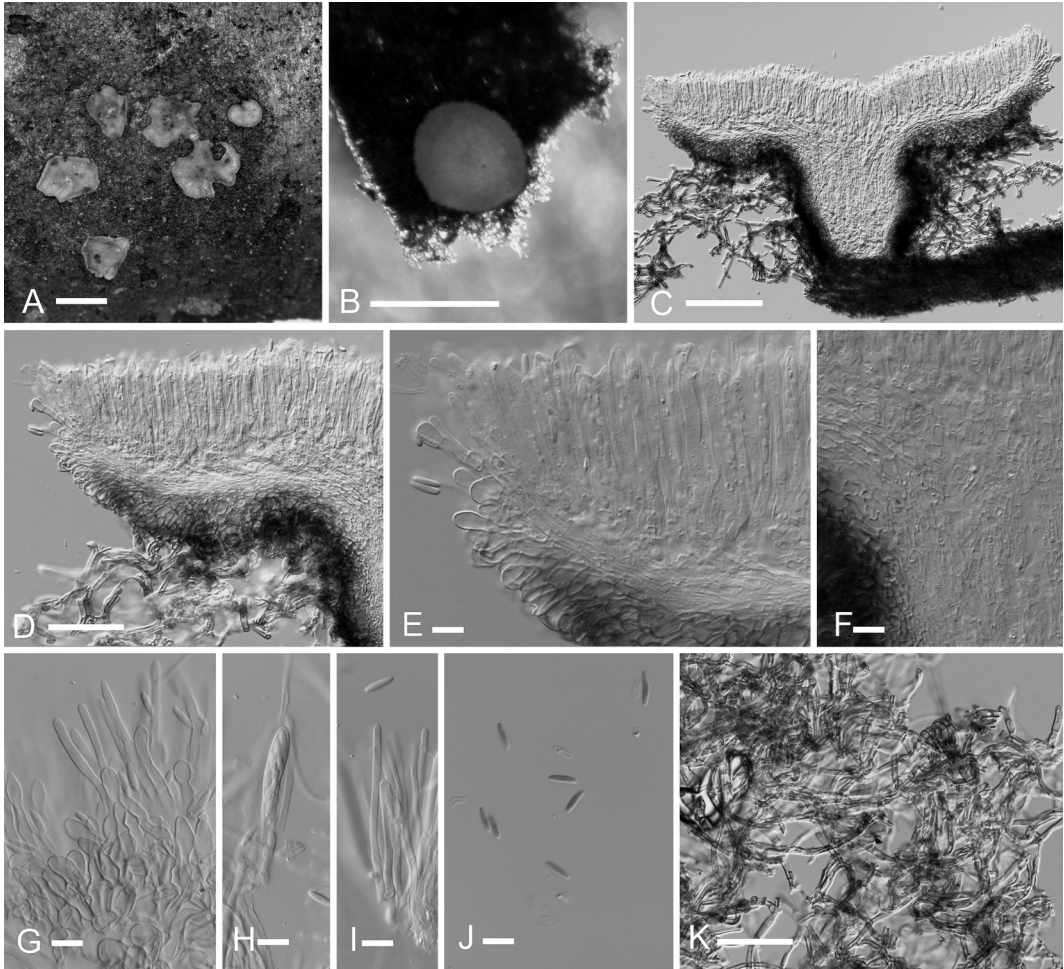


Fig. 5. *Tapesia fusca* (TNS-F-17160).

C–K mounted in CB/LA. A. Dried apothecia. B. Rehydrated apothecium. C. Vertical section of the apothecium. Note the apothecium is wedged into the subiculum. D. Vertical section of the apothecium at the margin to show subicular hyphae connected to the lower part of the apothecium. E. Close up of the vertical section of the apothecium at the margin. Note the outermost cells ending up as inflated cells at the upper excipulum, and hyphoid cells at the margin. Scales. A, 1 mm; B, 0.5 mm; C and D, 50  $\mu\text{m}$ ; E–I, 10  $\mu\text{m}$ ; K, 50  $\mu\text{m}$ .

Niigata Pref., on unidentified wood, 16–VIII–2002. col. T. Hosoya; TNS-F-17160, Ikaho-cho, Kita-gunma-gun, Gunma Pref., 5–VIII–2004. col. T. Hosoya; TNS-F-17463, Tsukuba University Sugadaira Montane Research Center, Uedashi, Nagano Pref. (36°31' 9.61"N, 138°21'11"E, alt. 1,269 m), on unidentified log, 29–IV–2005. col. T. Hosoya; TNS-F-17762, Mikuniyama, Yozuku, Ashigarakami-gun, Kanagawa Pref., on unidentified log, 2–VII–2005. col. T. Hosoya; TNS-F-17764, Mikuniyama, Yozuku, Ashigara-

kami-gun, Kanagawa Pref., on unidentified log, 2–VII–2005. col. T. Hosoya.

Known distribution. Europe, North America, Asia.

Notes. There is a wide variety of morphology in *T. fusca*. In the present paper the author has followed Aebi (1972) who defined *T. fusca* having no hair-like protrusions at the excipulum, texura porrecta inner ectal excipulum, without subicular hyphae attached to the margin, and occurring on wood. Apparently, the species is

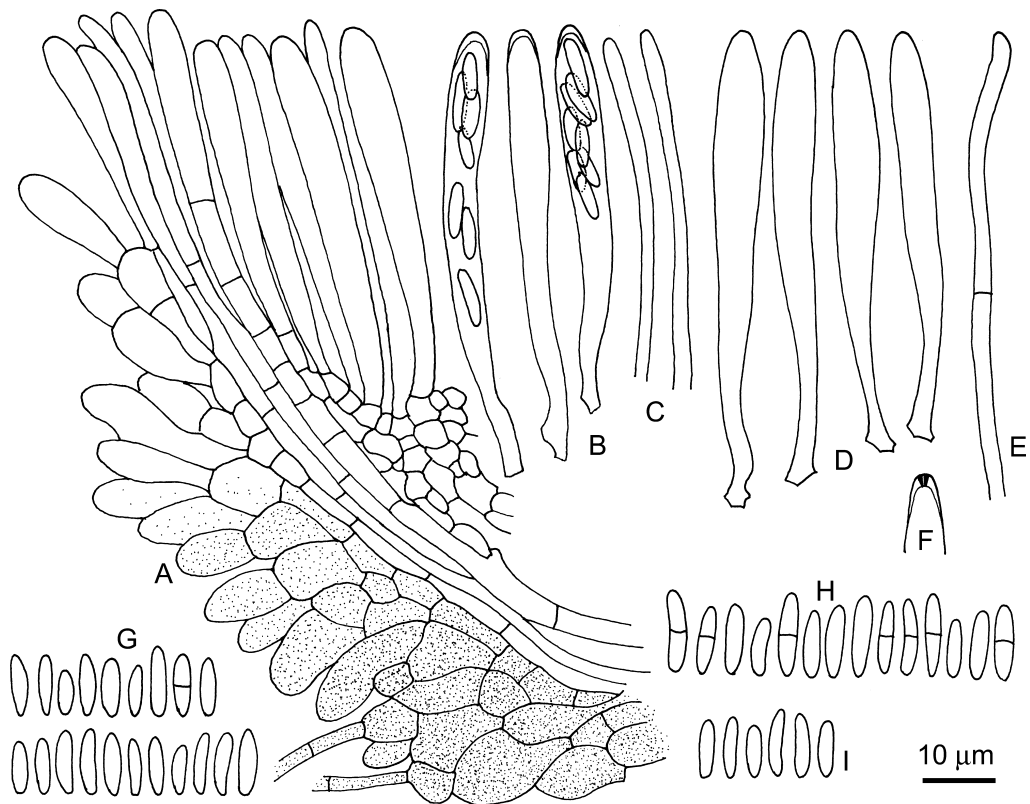


Fig. 6. Camera lucida illustration of *Tapesia fusca* (A–C, F and G: TNS-F-17160, D, E and H: TNS-F-24784, I: TNS-F-24785).

A. Vertical section of the apothecium at the margin showing outer and inner ectal excipulum as well as part of the medullary excipulum and part of the subiculum. B. Asci. C. Paraphyses. D. Asci. E. Paraphyses. F. Ascus apex showing the pore stained in MLZ. G–I. Ascospores.

widespread, and various morphological variations have been reported (Grelet, 1954; Aebi, 1972; Remler, 1979; Sharma *et al.*, 1980; Dennis, 1985).

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#### References

- Aebi, von B. 1972. Untersuchungen über Discomyceten aus der Gruppe *Tapesia-Trichobelonium*. *Nova Hedwigia* **23**: 49–112.
- Anonymous, 2002. Color chart. Dainippon Ink & Chemicals, Tokyo.
- Dennis, R. W. G. 1964 [1963]. Remarks on the genus *Hymenoscyphus* S. F. Gray, with observation on sundry species referred by Saccardo and others to the genus *Helotium*, *Pezizella* or *Phialea*. *Persoonia* **3**: 29–80.
- Dennis, R. W. G. 1985. Some ascomycetes from the Maghrib, North Africa. *Kew Bulletin* **39**: 759–770.
- Grelet, L. J. 1954. Les discomycètes de France d'après la classification de Boudier. *Revue de Mycologie* **19**: 138–166.
- Hosoya, T. 2004. Enumeration of remarkable Japanese discomycetes (1): Three helotialean members new to Japan. *Bulletin of the National Science Museum, Series B* **30**: 155–163.
- Hosoya, T. 2005. Enumeration of remarkable Japanese discomycetes (2): Two inoperculate discomycetes rarely known in Japan. *Bulletin of the National Science Museum, Series B* **31**: 49–55.
- Hosoya, T. and Otani, Y. 1997. Hyaloscyphaceae in Japan (1): Non-glassy-haired members of the tribe Hyaloscyphaeae. *Mycoscience* **38**: 171–186.



- Huhtinen, S. and Santesson, R. 1997. A new lichenicolous species of *Polydesmia* (Leotiales: Hyaloscyphaceae). *Lichenologist* **29**: 205–208.
- Korf, R. P. 1978. Revisionary studies in Arachnopezizoideae: a monograph of the Polydesmieae. *Mycotaxon* **7**: 457–492.
- Korf, R. P. 1981. A preliminary discomycete flora of Macaronesia: Part 2, Hyaloscyphaceae subf. Arachnopezizoideae. *Mycotaxon* **13**: 137–144.
- Lizon, P. 1992. The genus *Hymenoscyphus* (Helotiales) in Slovakia, Czechoslovakia. *Mycotaxon* **54**: 1–59.
- Raitviir, A. and Galán, R. 1995. The genus *Polydesmia* in Spain. *Mycotaxon* **53**: 447–454.
- Remler, P. 1979. Ascomyceten auf Ericaceen in der Ostalpen. *Bibliotheca Mycologica* **68**: 1–322.
- Sharma, M. P., Thind, K. S. and Narula, A. M. 1980. The genus *Tapesia* (Pers. ex Fr.) Fuck. in India. *Nova Hedwigia* **32**: 113–119.
- Svrček, M. 1967. Species novae discomycetum (Helotiales) e montibus belanske Tatry, Slovakiae. *Česá Mykologie* **21**: 146–150.
- Verkley G. J. M. 2005. *Brefeldochium pruinosum*, gen. et sp. nov., the anamorph of *Polydesmia pruinosus* (Hyaloscyphaceae, Helotiales, Ascomycota). *Nova Hedwigia* **80**: 503–509.
- Zhuang, W-y. 1999. Fungal flora of tropical Guangxi, China: Discomycetes of tropical China IV. More fungi from Guangxi. *Mycotaxon* **72**: 325–337.
- Zhuang, W-y. 2000. Hyaloscyphaceous discomycetes from Ningxia Province, China. *Mycologia* **92**: 593–597.