

Some New Records of Loculoascomycetes from Yakushima Island, Southern Japan

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Abstract Six species belonging to Loculoascomycetes were described and the taxonomic notes were provided based on collections from Yakushima Isl. *Byssosphaeria schiedermayeriana*, *Glonium clavisporum*, *Herpotrichia macrotricha*, *Hysterographium fraxini*, and *Rhytidhysterium rufulum* were new to Japan. The teleomorph of *Dendryphiopsis atra*, *K. incrustans* was first found in Japan, and the teleomorph anamorph relationship was confirmed by single ascospore isolation.

Key words: Dothideomycetes, Hysteriales, mycobiota, Patellariales, Pleosporales.

Introduction

In 1993, Yakushima Island in Southern Japan was registered as the world heritage area, because of the geological and biological diversity. The heavy precipitation about 5,000–8,000 mm/year and the geological diversity cause a variety of vegetation on the Island. Due to a potential biodiversity of fungi, the region has received much attention from mycologists in the past (Morimoto, 1953; Hiratsuka et al., 1955; Katamoto, 1958, 1965, 1975; Katsuki, 1965; Otani and Tubaki, 1976; Kobayashi, 1976, 1977), but little is known about the Loculoascomycetes mycobiota. For example, loculoascomycetous taxa account for only 15% of 167 species listed as fungi on woody or vine plants in Yakushima (Kobayashi, 1977). Most of them are parasitic species like sooty molds, with the exception of *Leptosphaeria buddlejae* I. Hino & Katum. and *Trematosphaeria yakushimensis* Tak. Kobsay. belonging to Pleosporales, and there is no information about saprophytic members such as Hysteriales or Patellariales.

In the course of a research program in the Na-

tional Science Museum (Taxonomic research for plants and fungi in areas with remarkable biodiversity in Japan), a survey of microfungi including loculoascomycetes was carried out. In this paper, we present six Loculoascomycetes of Hysteriales, Pleosporales and Patellariales new to Japan with taxonomic notes.

Materials and Methods

Methods of microscopic observation and single ascospore isolation followed Tanaka and Harada (2003). Specimens cited in this paper were kept at the Herbaria of the National Science Museum (TNS) and Hirosaki University (HHUF). All culture strains were deposited at the culture collections of RIKEN BioResource Center (JCM).

Descriptions

1. *Byssosphaeria schiedermayeriana* (Fuckel) M.E. Barr, Mycotaxon 20: 34, 1984. (PLEOSPORALES) (Fig. 1)

Ascomata 520–700×500–780 μm , superficial on subiculum, turbinate, non papillate, with an orange to yellow ostiole, surrounded by numerous brown hyphae of 4–4.5 μm wide. **Ascomatal wall** 50–75 μm thick at sides, 85–100 μm thick at base, composed of 2 zones; inner zone composed of hyaline prismatic cells of 5–15×3.5–7.5 μm ; outer zone 35–50 μm thick, composed of brown globose to rectangular cells. **Pseudoparaphyses** 1–2 μm wide. **Asci** 159–184 (–200)×12.5–15 μm (mean 173.8×13.8 μm , $n=20$), cylindrical to clavate, bitunicate, 8-spored, with a long stipe of 43–68 μm . **Ascospores** 31.5–42×5.5–8 μm (mean 36.8×6.7 μm , $n=50$), L/W 4.5–6.6 (mean 5.5, $n=50$), narrowly fusiform, with a median (0.47–0.53; mean 0.50, $n=50$) septum, hyaline, surrounded by a sheath.

Materials examined: TNS-F-12462=HHUF 29638 (KT 1947), Hirauchi, Isl. Yakushima, Kagoshima Pref., 22-X-2005, on dead culms of *Rhapis excelsa*; single ascospore culture (JCM 14417).

Known distribution: Cosmopolitan in warm regions (Barr, 1984).

Notes: This fungus is readily recognized by the ascomata having orange to yellow ostiole and many brown hyphae. It has a worldwide distribution in warm regions, particularly in the tropics (Barr, 1984; Hyde et al., 1999) and occurs on a wide range of hosts, i.e., various woody plants (Bose, 1961; Sivanesan, 1972), bamboo (Chen and Hsieh, 2004a), and palms such as *Cocos nucifera*, *Archontophoenix alexandrae*, and *Trachycarpus fortunei* (Hyde et al., 1999). *Rhapis excelsa* (palmae) is a new host for this fungus.

In previous reports (Bose, 1961; Sivanesan, 1972), the appendages of both ends of ascospores were noted for this fungus. Chen and Hsieh (2004a) noted the extra cellular material as “mucilaginous sheath” surrounding ascospores and protruding at ends as appendages. Our collection agrees well with the opinion by Chen and Hsieh (2004a). Particularly, the entire sheath was observed in the ascospores in fresh condition (Fig. 1-E).

2. *Glonium clavisporum* Seaver, *Mycologia* 17: 4, 1925. (HYSTERIALES) (Fig. 2)

Ascomata 800–3800 μm long, 300–420 μm wide, 300–350 μm high, hysterothecoid, carbonaceous, ellipsoid, erumpent to superficial, straight to flexuous, mostly gregarious. **Pseudoparaphyses** ca. 1 μm wide. **Asci** 98–128×9–11 μm (mean 114.5×10.0 μm , $n=20$), bitunicate, cylindrical, short-stalked (5–18 μm long), with 8 uniseriate ascospores. **Ascospores** 22–27×6–7 μm (mean 24.5×6.5 μm , $n=30$), L/W 3.4–4.5 (mean 3.8, $n=30$), caudate to clavate, rounded at the apex and slightly acute at the base, mostly curved, with a primary septum supramedian (0.43–0.49; mean 0.47, $n=30$), constricted, hyaline.

Materials examined: TNS-F-12403=HHUF 29639 (KT 1840), Shiratani-Unsuikyuu, Isl. Yakushima, Kagoshima Pref., 18-X-2005, on bark of *Kalopanax pictus*; TNS-F-12433=HHUF 29640 (KT 1893), Senpiro-waterfall, Isl. Yakushima, Kagoshima Pref., 20-X-2005, on dead wood; single ascospore culture isolated from KT 1893 (JCM 14418).

Known distribution: Nicaragua (Seaver, 1925), China (Teng, 1996).

Notes: We identified the above cited materials as *G. clavisporum* based on the descriptions and detailed illustrations provided by Teng (1996), although the size of ascospores was slightly larger than that in the original description (vs. 20 (–22)×6–7 μm ; Seaver, 1925).

3. *Herpotrichia macrotricha* (Berk. & Broome) Sacc., *Syll. fung.* 2: 213, 1883. (PLEOSPORALES) (Fig. 3)

Ascomata 300–410×280–420 μm , superficial on subiculum, subglobose, non-papillate, with numerous dark brown hyphae of 4–5 μm wide. **Ascomatal wall** 30–35 μm thick at sides, composed of 6–8 layers of polygonal cells of 5–22×5–7.5 μm . **Pseudoparaphyses** 1.5–2 μm wide. **Asci** 115–145×11–13 μm (mean 127.0×11.5 μm , $n=20$), cylindrical to clavate, bitunicate, 8-spored, with a short stipe of 7–17 μm long. **Ascospores** 31–37×4–6 μm (mean 34.0×

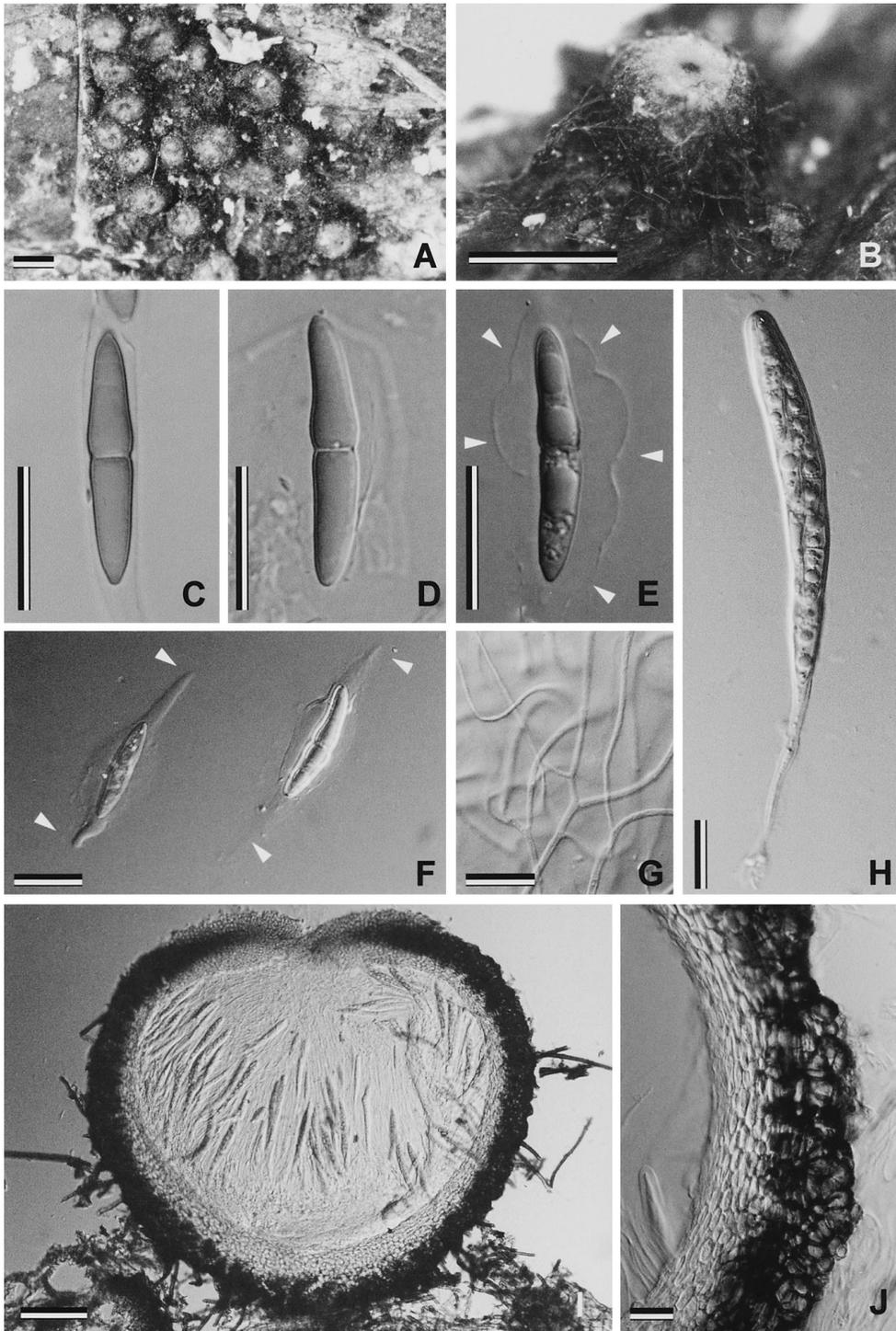


Fig. 1. *Byssosphaeria schiedermayeriana* (TNS-F-12462)

A, Ascomata on host. B, Close-up of ascoma with numerous hyphae. C–E, Ascospores. Note the expanded sheath in E (arrowheads). F, Ascospores with appendage-like sheath elongated at both ends (arrowheads). G, Pseudoparaphyses. H, Ascus with a long stipe. I, Longitudinal section of ascoma. J, Ascomal wall. Scales. A, B, 500 μ m; C–H, J, 20 μ m; I, 100 μ m

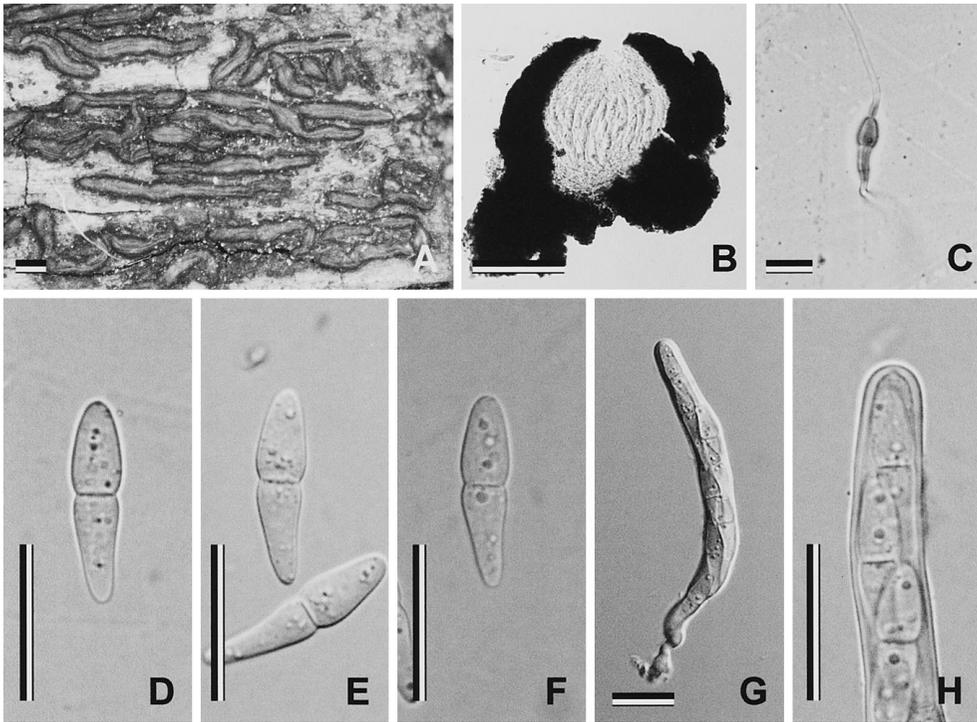


Fig. 2. *Glonium clavisorum* (TNS-F-12433)

A, Ascomata on host. B, Longitudinal section of ascoma. C, Germinating ascospore. D–F, Ascospores. G, Ascus, H, Ascus apex.

Scales. A, 500 μm ; B, 100 μm ; C–H, 20 μm

5.3 μm , $n=30$), L/W (5.5–) 5.9–7.3 (mean 6.5, $n=30$), fusiform, hyaline, with a septum nearly median (0.49–0.54; mean 0.51, $n=30$), surrounded by a sheath; sheath appendage-like, 7–11 μm long at tips, 1–3 μm wide at sides.

Materials examined: TNS-F-12445=HHUF 29642 (KT 1911), Forest path near Sarugawa gajyumar park, Isl. Yakushima, Kagoshima Pref., 21-X-2005, on dead culm of gramineae; single ascospore culture (JCM 14419).

Known distribution: Widely distributed in temperate regions (Barr, 1984).

Notes: One of the most striking features of *Herpotrichia macrotricha* is the ostiole of ascomata noted as “cap-like apex (Barr, 1984)” or “conical ostiolar cavity (Chen and Hsieh, 2004a).” This feature was quite evident in the specimen we examined (Fig. 3–J). Sivanesan (1972) noted that the ascospores of *H.*

macrotricha were 1-septate and hyaline at first, but later becoming 3–5-septate and brown. However, Chen and Hsieh (2004a) mostly observed 1-septate and hyaline ascospores in Taiwan materials and we also obtained a similar result. It can be assumed that the pigmented ascospores with several septa are senescent spores.

4. *Hysteroglyphium fraxini* (Pers.) De Not., Piren. Ister. 2 (7–8): 22, 1847. (HYSTERIALES) (Fig. 4)

Ascomata 500–1500 μm long, 150–250 μm wide, 200–250 μm high, hysterothecioid, carbonaceous, ellipsoid, erumpent to superficial. **Pseudoparaphyses** 1–2 μm wide. **Asci** 96–120 \times 28.5–37 μm , bitunicate, clavate, 8-spored. **Ascospores** (28.5–) 32–41 \times 12.5–16.5 μm (mean 36.4 \times 14.4 μm , $n=40$), L/W 2.2–3.0 (mean 2.5, $n=40$), ellipsoid to broadly fusiform, with 6–9

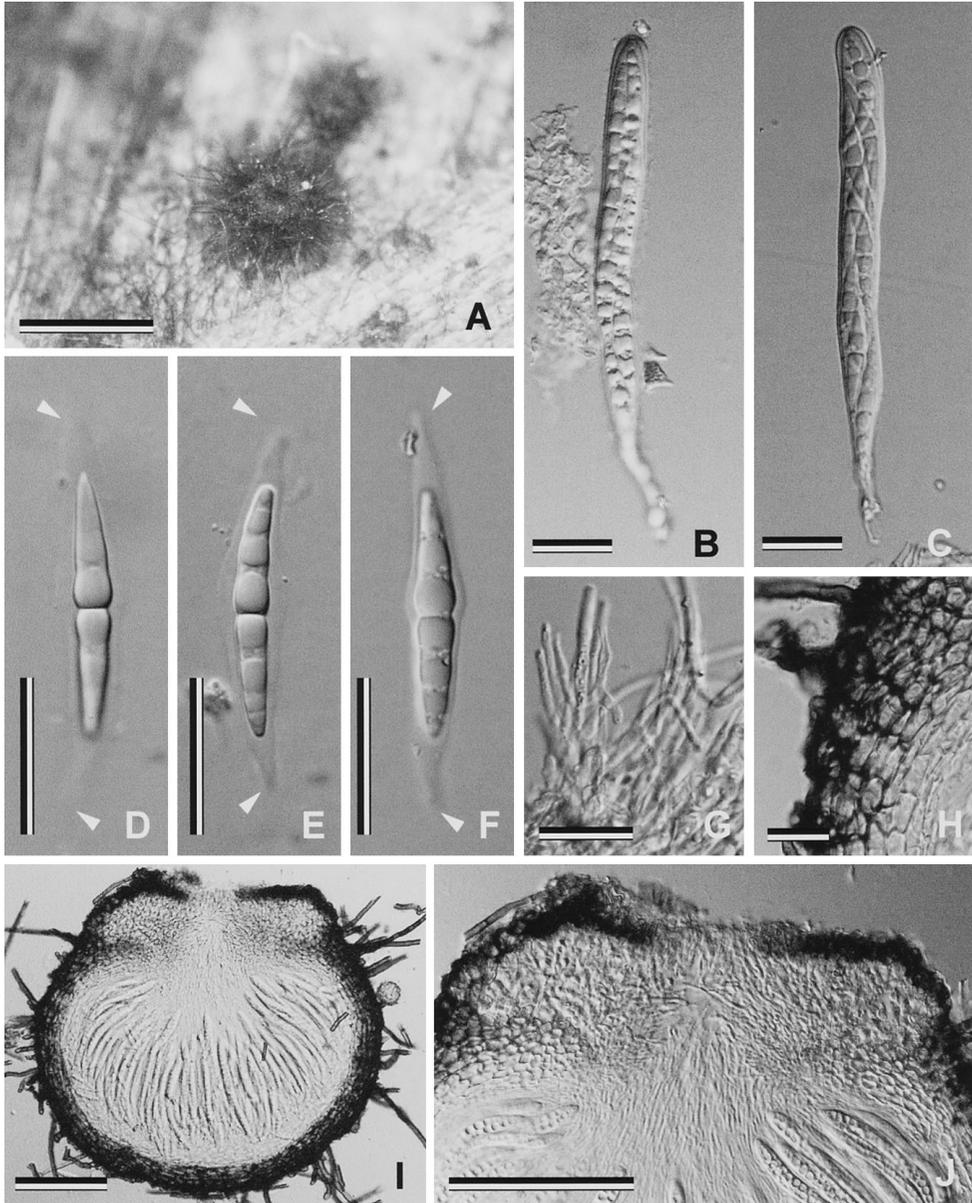


Fig. 3. *Herpotrichia macrotricha* (TNS-F-12445)

A, Ascomata on host. B, C, Asci. D–F, Ascospores with appendage-like sheath elongated at both ends (arrowheads). G, Pseudoparaphyses. H, Ascomal wall. I, Longitudinal section of ascoma. J, Neck of ascoma. Note conical ostiolar cavity.

Scales. A, 500 μm ; B–H, 20 μm ; I, J, 100 μm

(–10) transverse and 1–3 vertical septa, slightly constricted at the submedian (0.50–0.57; mean 0.54, $n=38$) primary septum, brown, smooth.

Materials examined: TNS-F-12416=HHUF

29644 (KT 1867), Nunobiki waterfall park, Isl. Yakushima, Kagoshima Pref., 19-X-2005, on dead wood; single ascospore culture (JCM 14420).

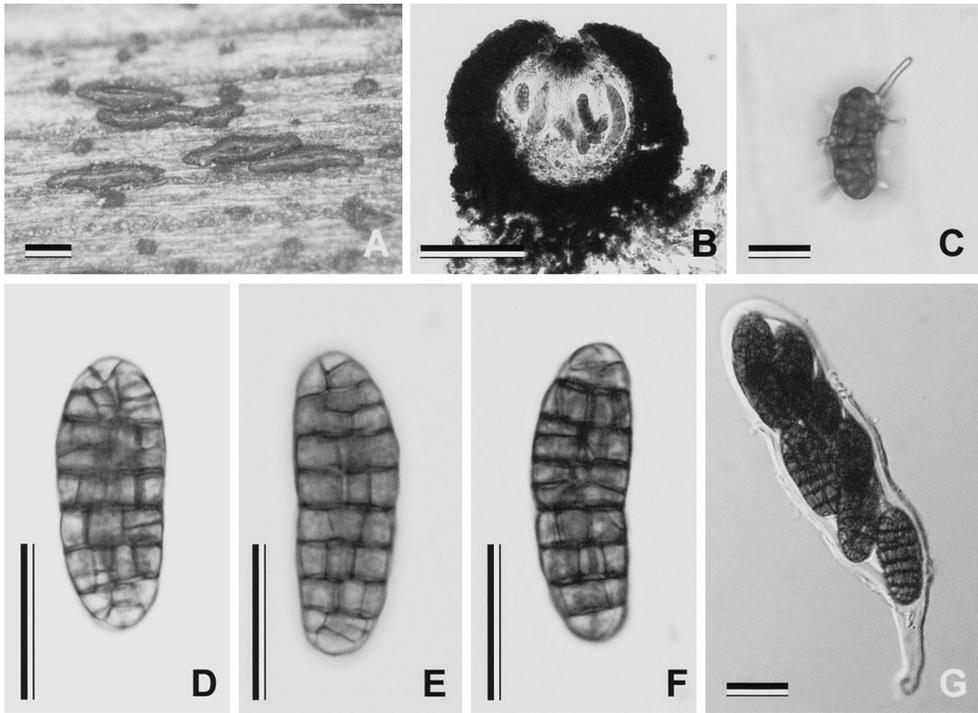


Fig. 4. *Hysteroglyphium fraxini* (TNS-F-12416)
 A, Ascomata on host. B, Longitudinal section of ascoma. C, Germinating ascospore. D–F, Ascospores. G, Ascus.
 Scales. A, 500 μm ; B, 100 μm ; C–G, 20 μm

Known distribution: Cosmopolitan (Barr, 1990).

Notes: This fungus is a cosmopolitan species and has been recorded from various woody plants. The primary septum of the ascospores is noted as “median” by Barr (1990) and Checa (2004), but our material showed slightly “submedian” septum. Amano (1979) reported *H. fraxini* on braches of broad-leaves trees in Japan, but later he re-identified the material as *Gloniopsis macrospora* Amano (Amano, 1983).

5. *Kirschsteiniothelia incrustans* (Ellis & Everh.) Chi Y. Chen & W.H. Hsieh, *Sydowia* 56: 232, 2004. (PLEOSPORALES) (Fig. 5)

Ascomata 210–300 μm diam, globose, superficial, scattered. **Pseudoparaphyses** 2 μm wide. **Asci** 95–110 \times 16–17 μm , broadly cylindrical, bitunicate, 8-spored. **Ascospores** 22–26.5 \times

8–12 μm (mean 24.8 \times 9.5 μm , $n=30$), L/W (2.1–) 2.5–2.9 (–3.1) (mean 2.6, $n=30$), ellipsoid to broadly fusiform, with a submedian (0.51–0.59; mean 0.56, $n=30$) septum, slightly constricted at the septum, mostly inequilateral in the upper cell, brown, without sheath or appendages.

Materials examined: TNS-F-12439=HHUF 29645 (KT 1901), Yudomari forest path, Isl. Yakushima, Kagoshima Pref., 20-X-2005, on dead wood; single ascospore culture (JCM 14421).

Known distribution: The anamorphic state has been recorded from the temperate or tropical regions as follow; Europe, Kenya, New Zealand, North America (Ellis, 1971), Solomon Islands (Matsushima, 1971), Japan (Otani and Tubaki, 1976), Cuba (Mercado, 1984), and India (Subramanian and Sekar, 1987).

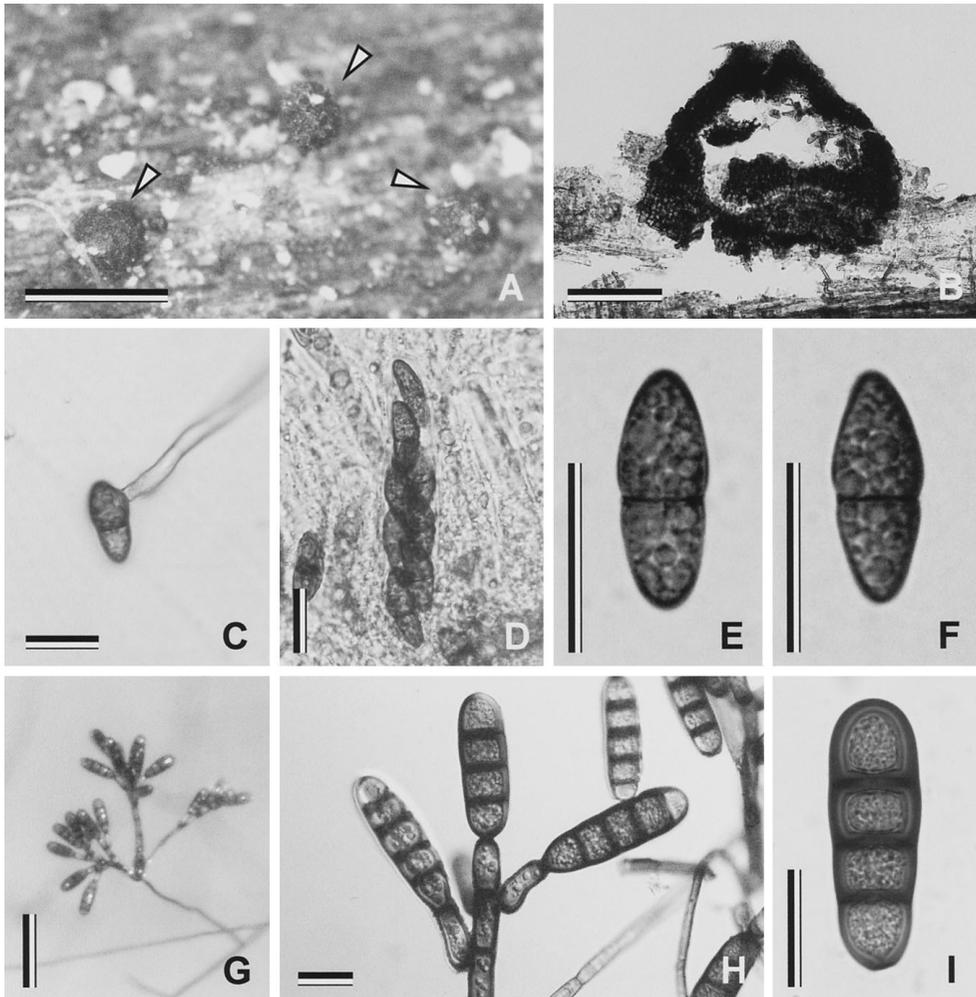


Fig. 5. *Kirschsteiniothelia incrustans* (A–F, TNS-F-12439; G–I, JCM 14421)

A, Ascomata on host (arrowheads). B, Longitudinal section of ascoma. C, Germinating ascospore. D, Ascus and pseudoparaphyses. E, F, Ascospores. G, H, Conidia and conidiophores. I, Conidium.

Scales. A, 500 μm ; B, 100 μm ; C–F, H, I, 20 μm ; G, 100 μm

Notes: The single ascospore isolate of this fungus produced a dematiaceous hyphomycete with $(33\text{--}) 40\text{--}55.5 \times (11.5\text{--}) 13\text{--}18.5 \mu\text{m}$ (mean $47.8 \times 14.8 \mu\text{m}$, $n=30$) and 3–4-septate poroconidia in culture, and the morphology of the anamorph agrees well with that of *Dendryphiopsis atra* (Corda) Hughes. The teleomorph of *D. atra* has been recognized long time as *K. aethiops* (Berk. & M.A. Curtis) *D. Hawksw.* (Chen and Hsieh, 2003) based on the broad species concept of *K. aethiops* provided by

Hawksworth (1985). Although Hawksworth (1985) treated *K. incrustans* as a synonym of *K. aethiops*, Chen and Hsieh (2004b) restricted the species having equilateral ascospores as *K. aethiops*, and retained the species having inequilateral ascospores and the *Dendryphiopsis* anamorph as *K. incrustans*. According to this circumscription, our material is consistent with *K. incrustans*.

In Japan, the anamorph of this species has been recorded for several times (Tubaki, 1969;

Matsushima, 1975; Otani and Tubaki, 1976), but the teleomorph was firstly found in this study.

6. *Rhytidhysteron rufulum* (Spreng.) Speng., Boletín de la Academia Nacional de Ciencias de Córdoba 25: 79, 1921. (PATELLARIALES)

(Fig. 6)

Ascomata 1.4–2.8 mm long, 0.5–1 mm wide, 0.5–1 mm high, apothecioid, naviculate, erumpent to superficial, scattered to gregarious, attached to substrate by hypostroma of ca. 200–300 μm high, with striate greenish lips. **Paraphysoides** 1.5–2.5 μm wide, slightly swollen

(2–3.5 μm) and brownish at the tips. **Asci** 176–220 \times 13–15.5 μm , cylindrical, bitunicate, with 8 uniseriate ascospores. **Ascospores** 29–35 \times 10–12 μm (mean 31.7 \times 10.8 μm , $n=30$), L/W 2.7–3.4 (mean 2.9, $n=30$), broadly fusiform to ellipsoid, 3-septate, dark brown.

Materials examined: TNS-F-12419=HHUF 29657 (KT 1871), Tomarikawa Birou Park (Kairou Park), Kamiyaku, Isl. Yakushima, Kagoshima Pref., 19-X-2005; TNS-F-12434=HHUF 29658 (KT 1895), *ibid*, 20-X-2005; TNS-F-12444=HHUF 29660 (KT 1909), Forest path near Kurio river, Isl. Yakushima, Kagoshima

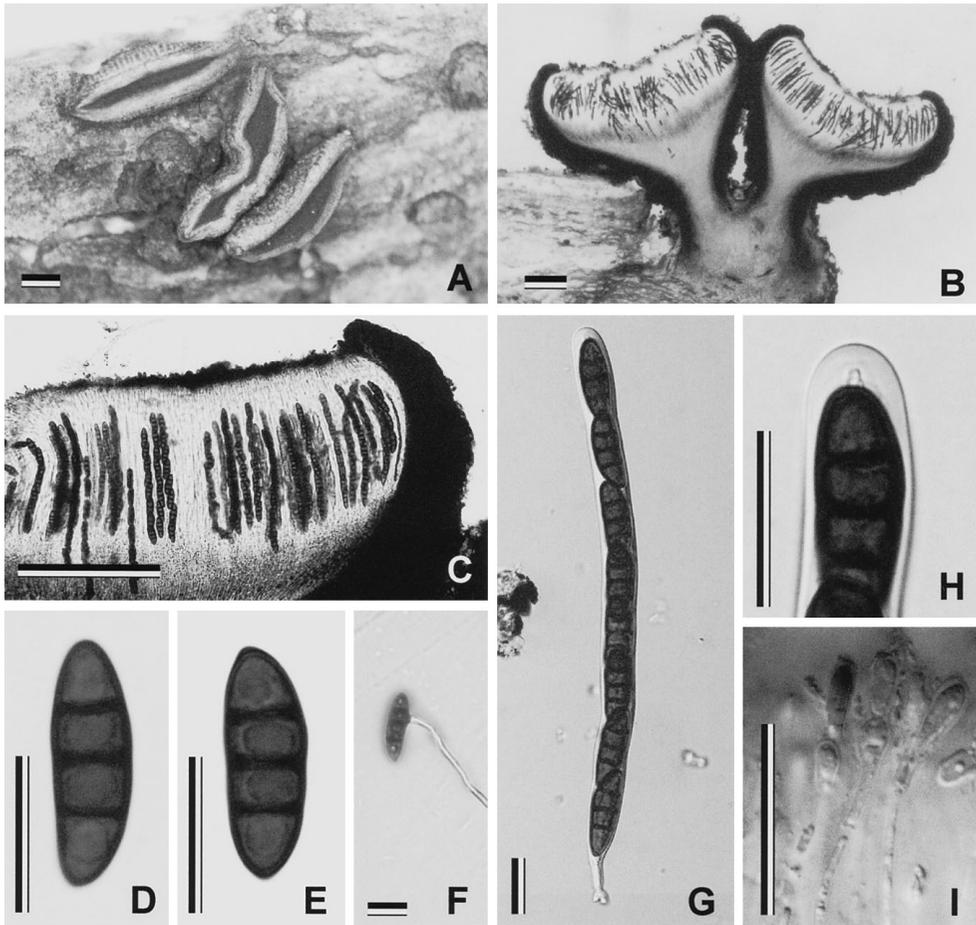


Fig. 6. *Rhytidhysteron rufulum* (TNS-F-12444)

A, Ascomata on host. B, Longitudinal section of ascomata. C, Close-up of hymenium. D, E, Ascospores. F, Germinating ascospore. G, Ascus. H, Ascus apex with a sharow ocular chamber. I, Paraphysoides. Scales. A, 500 μm ; B, C, 200 μm ; D–I, 20 μm

Pref., 21-X-2005; TNS-F-12449=HHUF 29659 (KT 1919), Forest path near Sarugawa gajyumaru park, Isl. Yakushima, Kagoshima Pref., on dead wood; single ascospore culture isolated from KT 1909 (JCM 14423).

Known distribution: Worldwide in warm tropical and subtropical climates (Samuels and Müller, 1979).

Notes: This is a common species and occurs on dead twigs of various woody plants in the tropics (Chen and Hsieh, 1996; Teng, 1996). In this survey, we obtained it from three different sites. Although the species in *Rhytidhysterion* have not been reported from Japan so far, Amano (1983) suggested that *Hysterium citricolum* and *H. photinae*, both described by Naito (1933), may belong in *Rhytidhysterion*, based on the original descriptions and illustrations.

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