

SHORT COMMUNICATION

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Bambusicolous fungi in Japan (4): a new combination, *Astrosphaeriella aggregata*

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Abstract *Melanopsamma aggregata*, described on culms of *Phyllostachys bambusoides* in Japan, is transferred to the genus *Astrosphaeriella*, and a new combination, *A. aggregata*, is proposed. *Phyllostachys heterocyclus* var. *pubescens* and *Sasa kurilensis* are newly recorded as host plants of this species. The species produces a *Pleurophomopsis*-like microconidial state in culture media.

Key words Bamboo · *Melanopsamma* · Pleosporales · *Sasa* · Taxonomy

Astrosphaeriella Syd. was originally established for the single species *A. fusispora* Syd. [now *A. stellata* (Pat.) Sacc.] on bamboo collected by K. Hara in Japan in 1912 (Hawksworth 1981). *Astrosphaeriella* species mainly occur on terrestrial palms, bamboo, and stout grasses (Barr 1990) and are known also from freshwater (Cai et al. 2002; Hyde 1994; Tsui et al. 2001) or intertidal (Hyde 1988, 1992) regions.

This genus, a typical member of Melanommataceae (Kirk et al. 2001) or Platystomataceae (Barr 1990) in Pleosporales, is characterized by the cone-shaped large ascomata composed of carbonaceous firm peridium, with starlike flanges of ruptured host tissue around the base; the numerous trabeculate pseudoparaphyses in gel matrix; the bitunicate cylindrical-clavate asci; and the narrowly fusiform ascospores (Barr 1990; Fröhlich and Hyde 2000).

At present, 42 taxa are accepted in *Astrosphaeriella* (Chen and Hsieh 2004; Fröhlich and Hyde 2000; Hyde and Fröhlich 1998; Hyde and Goh 1998; Rogers and Barr 2003;

San Martin and Lavin 1999). In Japan, the following 4 species have been recognized so far: *A. bakeriana* (Sacc.) K.D. Hyde & J. Fröhl. (Hino and Katumoto 1956, as *A. aosimensis* I. Hino & Katum.), *A. minoensis* (Hara) D. Hawksw. (Hara 1913, as *Leptosphaeria minoensis* Hara), *A. stellata* (Hino 1961, as *A. fusispora* and *A. fuscomaculans* W. Yamam.), and *A. trochus* (Penz. & Sacc.) D. Hawksw. (Hino 1938, as *Astrothea nigrocornis* I. Hino).

Astrosphaeriella aggregata (I. Hino & Katum.) Kaz. Tanaka & Y. Harada, comb. nov.

Figs. 1–18

Basionym: *Melanopsamma aggregata* I. Hino & Katum., Bull. Fac. Agric. Yamaguchi Univ., 6:53, 1955.

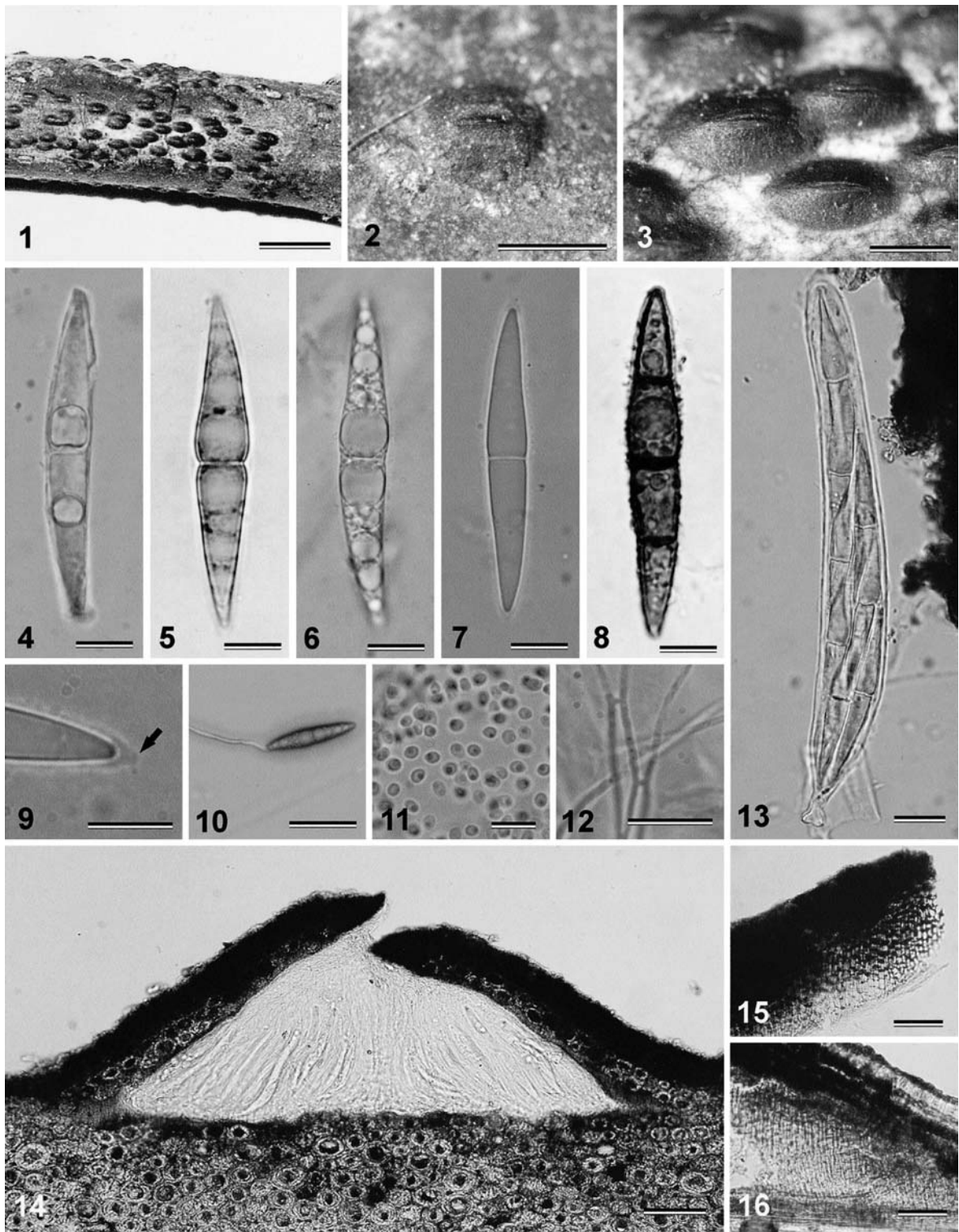
Ascomata 260–350 µm high, 720–1300 µm long, 500–620 µm wide, superficial, scattered or rarely 2–3 together, with a long slitlike ostiole along with long axis of ascomata; in longitudinal section appearing conical, with flattened and poorly developed base. Peridium 70–130 (–200) µm wide at side, rimlike, composed of parallel rows of pale brown to hyaline rectangular cells of 3–10 × 2.5–7.5 µm; in upper region, composed of three zones, outer of black carbonaceous undiscerned cells, center of dark hyphae interspersed within host epidermal cells, inner of hyaline to pale brown rectangular somewhat thickened cells of 2.5–12.5 × 3–6 µm. Pseudoparaphyses trabecular, numerous, about 1 µm thick, branched and anastomosed, with gelatinous coating. Asci 136–198.5 × 14–19.5 µm (type specimen: 143–185 × 15–19.5 µm, mean = 164.5 × 17.3 µm, n = 43), numerous, bitunicate, cylindrical, widest below, rounded at the apex, with an apical chamber, short stalked (6–15 µm long), with 8 ascospores uniseriate above and biseriate below. Ascospores (43–)47–61(–65) × 6–10.5 µm [type specimen: 46–61(–64) × 7–9.5 µm, mean = 55.9 × 8.2 µm, n = 30], L/W (5.1–)5.5–8.0(–8.4) (type specimen: 5.3–8.2, mean = 6.8, n = 30), narrowly fusiform, acute at ends, with a septum nearly median (0.48–0.53) and constricted, hyaline, guttulate when fresh, smooth, with a narrow mucilaginous sheath protruding at both ends, up to 3 µm long. Senescent ascospores brown, 3-septate, appearing echinulate. Ascospores germinating from one or both ends.

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Figs. 1–16. Micrographs of *Astrosphaeriella aggregata*. **1–3** Ascomata on host surface (note the slitlike ostiole in **2, 3**). **4–8** Ascospores (senescent ascospore in Fig. 8). **9** Short appendage-like sheath of ascospore (indicated with an *arrow*). **10** Germinating ascospore. **11** Microconidia. **12** Anastomosed trabeculate pseudoparaphyses. **13** Ascus with ascospores. **14** Ascoma in longitudinal section (along with ostiole). **15**

Carbonaceous peridial cells around the ostiole. **16** Parallel peridial cells at the side of ascoma. (**1, 3, 5, 8, 15, 16** from HHUF 28232; **2, 4, 13** from YAM 20365, holotype of *Melanopsamma aggregata*; **6, 7, 9, 10, 12** from HHUF 28235; **11** from MAFF 239485; **14** from HHUF 28233). Bars **1** 5 mm; **2, 3** 1 mm; **4–9, 11, 12** 10 μ m; **10, 15, 16** 50 μ m; **13** 20 μ m; **14** 100 μ m

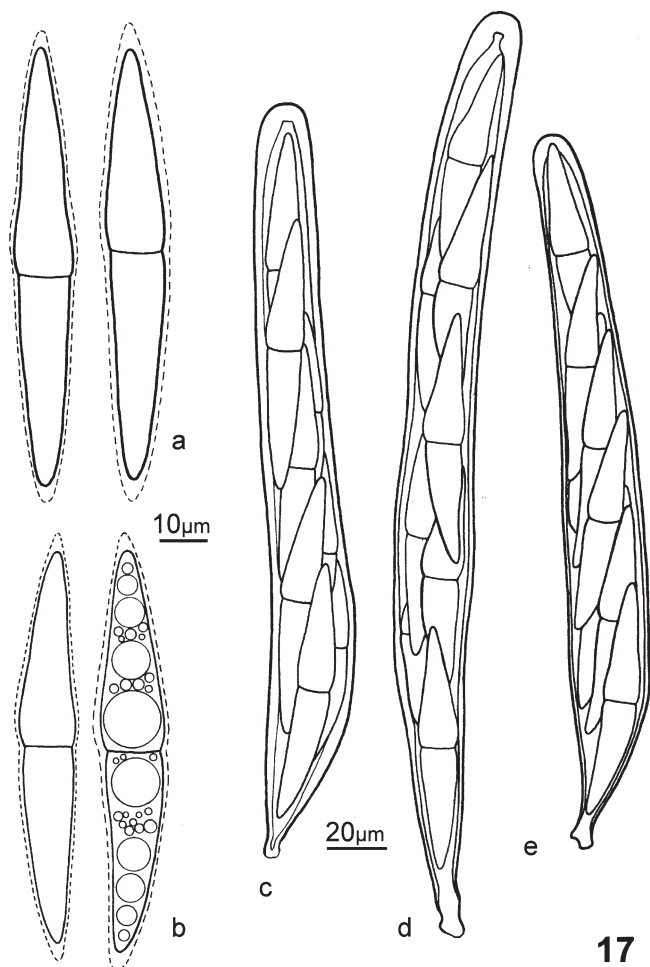


Fig. 17. Line drawings of *Astrosphaeriella aggregata*. **a, b** ascospores; **c–e** asci (**a, c** from YAM 20365, holotype of *Melanopsamma aggregata*; **b, e** from HHUF 28235; **d** from HHUF 28232)

Cultural characteristics: colonies on potato dextrose agar (Difco, Detroit, MI, USA) 26 mm in diameter after 4 weeks at 20°C in the dark, Medium-Grey (1E1; Kornerup and Wanscher 1978) in the center, Dark-Green (28F3) in other parts, with irregular margin; reverse similar; no pigment produced. On rice straw agar (Tanaka and Harada 2003) microconidial state (*Pleurophomopsis* Petr.-like) formed on the surface of rice straws within 3 months. Conidiomata 80–170 µm high, 100–230 µm diameter, globose to subglobose. Wall 12–25 µm thick at sides. Conidiophores (3–)7–15(–23) × 1.5–3 µm, cylindrical, simple to branched, 0–1-septate. Conidiogenous cells phialidic. Conidia 2.2–3.0 × 1.7–2.2 µm, globose, hyaline.

Materials examined (Japan): on culms of *Phyllostachys bambusoides* Siebold & Zucc. [= *P. reticulata* (Rupr.) C. Koch], Tokuyama, Yamaguchi, Nov. 28, 1954, I. Hino (YAM 20365, holotype of *Melanopsamma aggregata*); Shimoarahari, Utsunomiya, Tochigi, 139°49'E, 36°33'N, Dec. 15, 2002, N. Asama 984 [Herbarium Hirosaki University, Fungi (HHUF) 28233; single ascospore isolate MAFF 239486]. On culms of *Phyllostachys heterocycla* (Carrière) Mitford var. *pubescens* (Mazel) Ohwi: Buttuji, Kousaka, Mihara, Hiroshima, 133°01'E, 34°27'N, Nov. 23, 2003, H. Araki 1585 (HHUF 28235). On culms of *Sasa kurilensis* (Rupr.) Makino & Shibata: Maruyama, Sapporo, Hokkaido, 141°18.35'E, 43°02.42'N, Sept. 2, 2001, K. Tanaka 767 (HHUF 28232; single ascospore isolate MAFF 239485). On culms of an unidentified bamboo: Nijinoko, Syounai, Kuroishi, Aomori, 140°41.3'E, 40°34.4'N, May 3, 2003, K. Tanaka and N. Asama 1128 (HHUF 28234).

Notes: this fungus was originally described as a species of *Melanopsamma* by Hino and Katumoto (1955), but the placement is not suitable, because this genus is characterized by collabent ascomata, reddish-brown peridium of two- or three-layered, unitunicate asci, and ellipsoid ascospores.

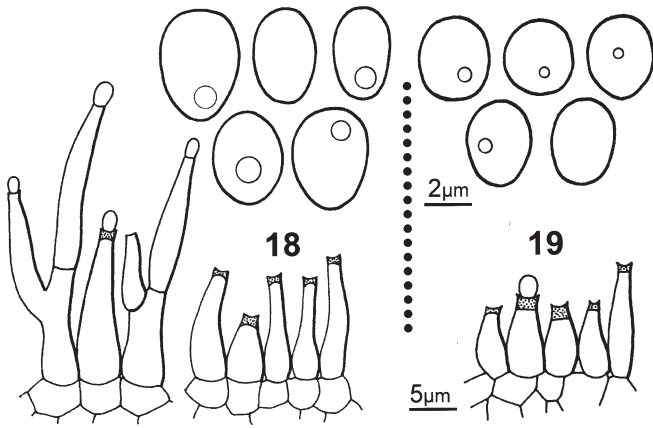
Table 1. Comparison of *Astrosphaeriella aggregata* with similar species

Taxa	Host	Ascospores				
		Length (µm)	Width (µm)	Mean (µm)	L/W mean	Sheath
<i>A. aggregata</i>						
YAM 20365 holotype	Bamboo	46–61(–64)	7–9.5	55.9 × 8.2, <i>n</i> = 30	6.8	Protruding at both ends
HHUF 28232	Bamboo	(43–)49–61.5 (–65)	6–10.5	55.8 × 8.8, <i>n</i> = 50	6.4	Protruding at both ends
HHUF 28233	Bamboo	47–63	7–10.5	55.4 × 8.3, <i>n</i> = 50	6.7	Protruding at both ends
HHUF 28234	Bamboo	46–61	6.5–10	52.6 × 7.8, <i>n</i> = 50	6.7	Protruding at both ends
HHUF 28235	Bamboo	(45–)50–59 (–63)	6.5–9	54.4 × 8.1, <i>n</i> = 50	6.8	Protruding at both ends
<i>A. fissuristoma</i> ^a	Palms	45.5–52	6.5–8.5	49 × 7.5, <i>n</i> = 50	6.5 ^b	Protruding at both ends
<i>A. mangrovis</i> ^c	Mangroves in intertidal region	(36–)37.6–55.2	(6.3–)6.9–11.1	44.7 × 8.8, <i>n</i> = 1000	5.1 ^b	Even

^aData from Hyde et al. (2000)

^bEstimated from the mean value of ascospores

^cData from Kohlmeyer and Vittal (1986)



Figs. 18, 19. Microconidia (upper) and conidiophores (lower) of *Astrophaeriella* spp. **18** *A. aggregata* (MAFF 239485). **19** *A. stellata* (MAFF 239487 isolated from HHUF 28494)

At present, *Melanopsamma* is arranged in Niessliaceae in Hypocreales (Samuels and Barr 1997) or Chaetosphaeriaceae in Sordariales (Kirk et al. 2001).

The morphological features of this species are in accordance with the concept of *Astrophaeriella*, although it is unusual among the genus as the ostiole opening by a long slit, resembling those of species in *Lophiostoma* Ces. & De Not. Most *Astrophaeriella* species, typically in *A. stellata* and *A. trochus*, have conical ascomata appearing starlike with some ruptured host tissue remaining around the base of ascomata.

Hyde et al. (2000) expanded the concept of *Astrophaeriella* to encompass species with a slitlike ostiole, whereas Chen and Hsieh (2004) recognized three elements in this genus. Those characteristics are (1) typical *Astrophaeriella* species (e.g., *A. stellata*), (2) *Trematosphaeria* Fuckel-like species with striate ascospores (e.g., *A. africana* D. Hawksw.), and (3) *Massarina* Sacc.-like species with immersed ascomata (e.g., *A. bakeriana*), and they proposed a strict generic concept excluding *Massarina*-like species. *Astrophaeriella aggregata* may belong to “*Massarina*-like species” sensu Chen and Hsieh (2004), but the morphological features of this species, such as carbonaceous firm ascomata, trabeculate hamathecium, bitunicate asci, and slender ascospores are quite identical to those of *A. stellata*, the type species of the genus, rather than *Massarina* having clypeate ascomata, cellular pseudoparaphyses, and ellipsoid ascospores (Hyde 1995).

Astrophaeriella fissuristoma J. Fröhl., K.D. Hyde & Aptroot (Hyde et al. 2000) may be conspecific with *A. aggregata* as it also has ascomata with a slitlike ostiole. The ascospores in *A. fissuristoma* are slightly smaller than those of *A. aggregata*, but there is a wide range of overlapping, and the L/W value and ascospore sheath feature in both species are very similar (Table 1). *Astrophaeriella fissuristoma* was originally described from palms in the tropics, such as Australia, Brunei Darussalam, Ecuador, and Papua New Guinea (Hyde et al. 2000). However, the host differences in *Astrophaeriella* species may not have taxo-

nomic value because there are several taxa known from both bamboos and palms. If *A. fissuristoma* was definitely shown to be a synonym of *A. aggregata* based on a type study, the species would be characterized as a bambusicolous and palmicolous species having a wide distribution from the tropics to cool temperate zones.

Astrophaeriella mangrovis (Kohlm. & Vittal) Aptroot & K.D. Hyde also has unusual ascomata with a long slitlike ostiole, but it differs from *A. aggregata* in its shorter ascospore length with low L/W value and in the entire ascospore sheath (Kohlmeyer and Vittal 1986; see Table 1).

Cultural characteristics of *Astrophaeriella* species are poorly known. Tsui et al. (2001) and Yamamoto et al. (1954; as *A. fuscomaculans*) reported the colony features of *A. stellata*, but they did not find any anamorphs. Guo et al. (1998) reported that the isolate of *A. bakeriana* formed the teleomorph by incubating it in a flask with a sterilized palm petiole and malt extract agar. We found a *Pleurophomopsis*-like microconidial state of *A. aggregata* previously undescribed (Fig. 18). This anamorph was very similar to that of *A. stellata*, in our observation (Fig. 19).

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