

## Fungi from palms XXXVII. The genus *Astrosphaeriella*, including ten new species

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Hyde, K. D. & J. Fröhlich (1997). Fungi from palms. XXXVII. The genus *Astrosphaeriella*, including ten new species. – *Sydowia* 50(1): 81–132.

Collections of fungi from palms and bamboos in Australasia, South East Asia and South America have resulted in the identification of several species of *Astrosphaeriella*. The generic concepts in *Astrosphaeriella* are discussed and the accepted species in the genus are redescribed. Ten species are new to science and these fungi are also described in this paper. A key and pictorial synopsis to accepted species of *Astrosphaeriella* are provided.

*Astrosphaeriella* Syd. & P. Syd. was revived by Hawksworth (1981) who accepted four species: *Astrosphaeriella aosimensis* I. Hino & Katum., *A. stellata* (Pat.) Sacc., *A. trochus* (Penz. & Sacc.) D. Hawksw. and *A. venezuelensis* Barr & D. Hawksw. Six additional species were added by Hawksworth & Boise (1985): *A. africana* D. Hawksw., *A. exorrhiza* Boise, *A. minoensis* (Hara) D. Hawksw., *A. striaspora* (E. Müll.) D. Hawksw. & Boise, *A. tornata* (Berk. & M. A. Curtis) D. Hawksw. & Boise and *A. vesuvius* (Berk. & Broome) D. Hawksw. & Boise, who also provided a key to these ten species. Yue & Eriksson (1986) synonymised *Massarina lageniforme* Teng with *Astrosphaeriella*, while Barr (1990) described a further species, *A. floridana* from *Sabal* in Florida. Later *A. striatispora* (K. D. Hyde) K. D. Hyde; *A. nypae* K. D. Hyde, *A. aquatica* K. D. Hyde, *A. frondicola* J. Fröhl. & K. D. Hyde, *A. papuana* Aptroot and *A. minima* Aptroot were added (Hyde, 1992; 1994a,b; Fröhlich & Hyde, 1995; Aptroot, 1995). Further records of *Astrosphaeriella* were also provided by Eriksson & Yue (1988), Datta (1991), Hyde (1993), Chen & Hsieh (1994) and Courtecuisse & al. (1996).

Hawksworth (1981) circumscribed *Astrosphaeriella* as an exclusively tropical genus occurring on palms and bamboo. It was considered to be closely related to *Trematosphaeria* Fuckel, from which it is distinguished by its relatively narrow and often also paler ascospores as well as its palm and bamboo hosts. The genus *Javaria* Boise (1984) is similar and is treated here as congeneric. It was pre-

viously considered to differ in having hyaline ascospores with sheaths (Boise, 1984). There are presently 17 recognised taxa and it is considered timely to bring together the information on this genus. Our studies on the fungi developing on decaying parts of palms and bamboo throughout Australasia, South East Asia and South America (Ecuador) have widened the distribution records of *Astrosphaeriella*. The genus is therefore reviewed in this paper, including 31 accepted species of which 10 are new to science and five are new combinations.

### Material and methods

Collections of fungi on palms were made in Australia, Brunei, Ecuador, Hong Kong, Indonesia, Malaysia, Papua New Guinea and the Philippines. Type material of *Astrosphaeriella* species were loaned from BRIP, FH, IMI, K, NY, PAD and S. All measurements are made in water. The descriptions of each species include characters that are considered to be important at the species level, while standard characteristics are found in the generic diagnosis which is modified from Hawksworth (1981).

### Taxonomy

*Astrosphaeriella* Syd., Ann. Mycol. 11: 260. 1913.

= *Javaria* Boise, Supl. Acta Amazonica 14: 50. 1984.

For additional synonyms see Hawksworth (1981).

References. – Hawksworth (1981); Hawksworth & Boise (1985); Fröhlich & Hyde (1995).

Ascomata arising singly, scattered, or rarely 2–3 joined together at the base, immersed and subepidermal at first, becoming superficial in some, at maturity either covered by epidermis except in the ostiolar region, or the host tissues rupture and in some remain as scales around the base to give them a stellate appearance from above; in section unilocular, hemispherical to conical, base flattened, ostiolate, dark-purplish brown to almost black. – Peridium relatively thick, carbonaceous, composed of thick-walled dark angular pseudoparenchymatous cells, lumen of cells often occluded, base of ascomatal cavity poorly developed, at the periphery often composed of vertical orientated palisade-like cells. – Ostiole black, mammi-form or elongate, aperiphysate. – Hamathecium composed of numerous narrow (1  $\mu\text{m}$  wide) trabeculae embedded in a gelatinous matrix. – Asci 8-spored, cylindrical, cylindrical-clavate, or narrowly obclavate, bitunicate, pedicellate, with an ocular chamber and some



with a faint ring, arising from the base of the ascomatal cavity. – Ascospores 2–3 seriate, elongate-fusiform, mostly straight, mostly tapering towards the apices, 1–5 septate, hyaline or reddish brown, concolourous, smooth-walled, or with striations, often with a mucilaginous sheath.

Anamorph. – Unknown

Type. – *Astrosphaeriella stellata* (Pat.) Sacc.

Known hosts. – Palms and bamboo.

Distribution. – Pantropical.

Hawksworth (1981) and Hawksworth & Boise (1985) neatly circumscribed *Astrosphaeriella*. *Astrosphaeriella* is included in the Melanommatales, Platystomaceae (*sensu* Barr, 1990) or Melanommataceae (*sensu* Hawksworth & al., 1995). The genus *Javaria* which was introduced by Boise (1984) is very similar to *Astrosphaeriella*. *Javaria* was considered to differ from *Astrosphaeriella* on account of its ascospore pigmentation and structure. Boise (1984) states that “the ascospores in *Astrosphaeriella* species produce brown pigments and lack sheaths or appendages, whereas, in *Javaria* the ascospores are hyaline and sheathed”. With the addition of 10 new species of *Astrosphaeriella* this distinction has become blurred. Many brown-spored species of *Astrosphaeriella* have sheaths and the type species *A. stellata* rarely develops brown ascospores and also has a sheath. Boise (1984) also found that a ring appeared at the apex of the endotunicae of *J. samuelsii* Boise when stained in Congo Red, and thought this may be an additional character to distinguish *Javaria*, but this was not tested in any species of *Astrosphaeriella*. Because of the minor differences between *J. samuelsii* and other species in *Astrosphaeriella*, *Javaria* is regarded as a synonym of *Astrosphaeriella*.

### Key to *Astrosphaeriella* species

- |  |                    |
|--|--------------------|
| 1. Ascospores brown . . . . .  | 2                  |
| 1. Ascospores hyaline at maturity, or some occasionally becoming light brown . . . . . | 19                 |
| 2. Ascospores 1-septate . . . . .  | 3                  |
| 2. Ascospores usually with more than 1-septa . . . . .                                 | 10                 |
| 3. Ascospore wall striate . . . . .  | 4                  |
| 3. Ascospore wall smooth or verrucose . . . . .  | 6                  |
| 4. Ascospores longer than 46 µm [46–57(–64) × 5.5–6.5(–8) µm] . . . . .                | <i>A. africana</i> |
| 4. Ascospores less than 46 µm long . . . . .   | 5                  |

5. Ascospores 34–42 × 6–6.5 µm, distinctly striate, lacking a sheath . . . . . *A. papuana*
5. Ascospores 31–45 × 7–8 µm, minutely striate, fusiform, surrounded by an irregular mucilaginous sheath . . . . . *A. papillata*
6. Ascospore wall verrucose, ascospores 30–34 × 6–8 µm . . . . .  
. . . . . *A. malayensis*
6. Ascospore wall smooth . . . . . 7
7. Ascospores 17.5–25 × 6.25–8.75 µm, ellipsoidal, surrounded by a regular mucilaginous sheath, ascomata superficial . . . . .  
. . . . . *A. frondicola*
7. Ascospores lacking a mucilaginous sheath, or with polar appendages . . . . . 8
8. Ascospores lenticular (fusiform with pointed ends) . . . . . 9
8. Ascospores 26.3–30.5 × 5–5.6 µm, fusiform with rounded ends . . . . . *A. livistonicola*
9. Ascospores 42–63 × 7.5–10 µm, with distinct mucilaginous appendages at the ends . . . . . *A. splendida*
9. Ascospores 37–48 × 7.5–9.5 µm, with minute mucilage drop at the ends . . . . . *A. lenticularis*
10. Ascospore wall striate (or with longitudinal ridges) . . . . . 11
10. Ascospore walls smooth or slightly verrucose . . . . . 13
11. Ascospores 31–38 × 6–9 µm, 3-septate, with a mucilaginous sheath . . . . . *A. striatispora*
11. Ascospores (2–)3(–6)-septate, longer than 60 µm, lacking a mucilaginous sheath . . . . . 12
12. Ascospores 60–62.5 × 10–11 µm, with a few longitudinal ridges, ascomata immersed . . . . . *A. aequatoriensis*
12. Ascospores 65–75 × 7–8 µm, 3–6-septate, ascomata superficial . . . . . *A. striaspora*
13. Ascospores (1–)3-septate . . . . . 14
13. Ascospores (3–)5-septate . . . . . 15
14. Ascospores (70–)72–80(–83) × (5–)6.5–7.5(–8.5) µm, with beak-like or uncinat ends . . . . . *A. venezuelensis*
14. Ascospores less than 70 µm long, lacking beak-like or uncinat ends . . . . . 15
15. Ascospores 46–56 × 6–8 µm, reddish brown, with narrow paler end cells, with a thin 1 µm sheath . . . . . *A. tornata*
15. Ascospores light brown or brown, with mucilage associated with the ends . . . . . 16
16. Ascospores (33–)36–45(–50) × (5.5–)7–8(–9) µm, light brown or brown, with mucilage associated at the ends . . . . . *A. vesuvius*

16. Ascospores mostly longer than 45 $\mu\text{m}$ . . . . .	17
17. Ascospores (68–)74–88 $\times$ 8–10 $\mu\text{m}$ , with inconspicuous mucilage at the ends . . . . .	<i>A. exorrhiza</i>
17. Ascospores mostly less than 68 $\mu\text{m}$ long . . . . .	18
18. Ascospores 44–52 $\times$ 5–7 $\mu\text{m}$ , brown, surrounded by an evanescent sheath with distinct drawn out appendages at the ends . . . . .	<i>A. maquilungiana</i>
18. Ascospores (44–)48–65(–72) $\times$ (5–)6–8(–9) $\mu\text{m}$ , lacking distinct drawn out appendages . . . . .	<i>A. trochus</i>
19. Ascospores mostly longer than 42 $\mu\text{m}$ . . . . .	20
19. Ascospores mostly shorter than 42 $\mu\text{m}$ . . . . .	25
20. Ascospores mostly wider than 8 $\mu\text{m}$ . . . . .	21
20. Ascospores mostly less than 8 $\mu\text{m}$ wide . . . . .	22
21. Ascospores 48–57 $\times$ 10–12 $\mu\text{m}$ , with a narrow mucilaginous sheath . . . . .	<i>A. uberina</i>
21. Ascospores 48–52 $\times$ 8–10 $\mu\text{m}$ , with a wide irregular mucilaginous sheath . . . . .	<i>A. lophiostomopsis</i>
22. Ascospores 50–60 $\times$ 5–6 $\mu\text{m}$ , with a thin sheath drawn out at the ends . . . . .	<i>A. australiensis</i>
22. Ascospores mostly wider than 6 $\mu\text{m}$ . . . . .	23
23. Ascospores 42–58 $\times$ 5.5–7 $\mu\text{m}$ , with a thin sheath which is obtuse at the ends . . . . .	<i>A. stellata</i>
23. Ascospores with a sheath which is drawn out at the ends . . . . .	24
24. Ascospores 57–67 $\times$ 6–9 $\mu\text{m}$ , with a thin sheath which is drawn out at the ends, asci cylindric-clavate . . . . .	<i>A. nipaecola</i>
24. Ascospores (43–)46–58(–62) $\times$ 6.5–8 $\mu\text{m}$ , with a sheath drawn out at the ends, asci obclavate . . . . .	<i>A. samuelsii</i>
25. Ascospores mostly longer than 30 $\mu\text{m}$ . . . . .	26
25. Ascospores mostly shorter than 30 $\mu\text{m}$ . . . . .	28
26. Ascospores 30–42 $\times$ 7–8 $\mu\text{m}$ , surrounded by a wide, distinctive mucilaginous sheath which is drawn out at the ends, an aquatic species . . . . .	<i>A. aquatica</i>
26. Ascospores with or without a mucilaginous sheath, terrestrial species . . . . .	27
27. Ascospores 36–44 $\times$ 5–7(–8) $\mu\text{m}$ , with a mucilaginous sheath . . . . .	<i>A. bakeriana</i>
27. Ascospores 30–37 $\times$ (4–)5–6 $\mu\text{m}$ , lacking a mucilaginous sheath . . . . .	<i>A. floridana</i>
28. Ascospores 24–29 $\times$ 7–8 $\mu\text{m}$ , ascomata immersed, lacking a mucilaginous sheath . . . . .	<i>A. minima</i>

28. Ascospores surrounded by a mucilaginous sheath, or with polar appendages . . . . . 29
29. Ascospores  $25-30 \times 2.3-2.8 \mu\text{m}$ , with appendages at each end . . . . . *A. angustispora*
29. Ascospores wider than  $3 \mu\text{m}$  wide, with a mucilaginous sheath . . . . . 30
30. Ascospores  $25-28 \times 6-7 \mu\text{m}$ , ascomata superficial . . . . . *A. minoensis*
30. Ascospores less than  $6 \mu\text{m}$  wide, ascomata superficial or immersed . . . . . 31
31. Ascospores  $25-28.8 \times 4-5.3 \mu\text{m}$ , a terrestrial species, ascomata superficial . . . . . *A. mauritiae*
31. Ascospores  $18.5-27 \times 4-5.9 \mu\text{m}$ , an intertidal species, ascomata immersed . . . . . *A. nypae*

1. ***Astrosphaeriella aequatoriensis*** K. D. Hyde & J. Fröhl., sp. nov. – Figs. 1–12.

Ascomata immersa,  $490-840 \mu\text{m}$  diam.,  $190-280 \mu\text{m}$  alta, lenticularia vel conica, papillata, solitaria. Asci  $150 \times 18-22 \mu\text{m}$ . Ascosporae  $60-62.5 \times 10-11 \mu\text{m}$ , 2–3-seriatae, fusiformes, brunneae, 5-septatae, striatae.

**Etymology.** – In reference to the equator, Latin *aequator*.

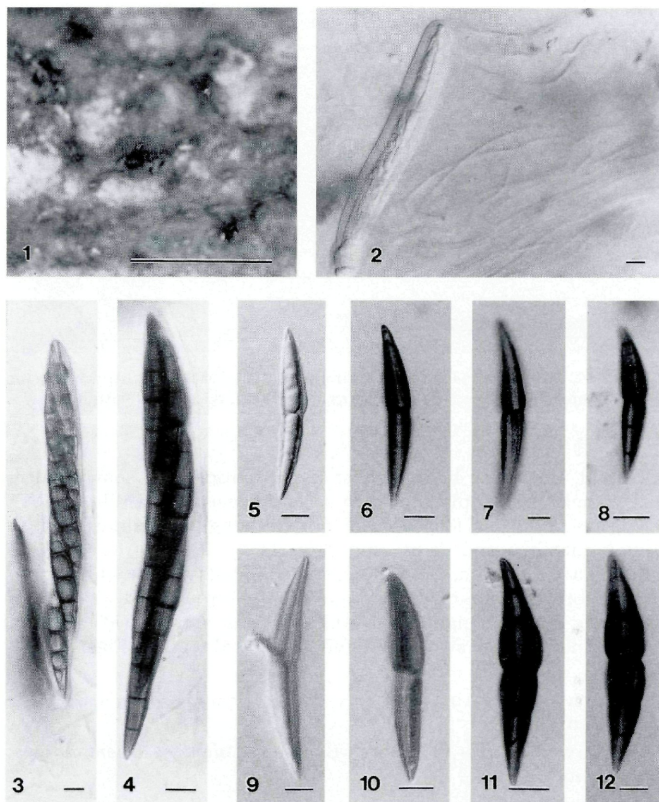
Ascomata arising singly, immersed, erumpent only at the ostiole, or superficial (Fig. 1); in section  $490-840 \mu\text{m}$  diam.,  $190-280 \mu\text{m}$  high, lenticular to conical, papillate, neck slightly raised, brown to black. – Asci  $150 \times 18-22 \mu\text{m}$ , 8-spored, cylindric-clavate, pedicellate, with an ocular chamber and faint ring (Figs. 2–4). – Ascospores  $60-62.5 \times 10-11 \mu\text{m}$ , 2–3-seriate, fusiform, brown, (2–)5-septate, constricted at the central septum, with wide ( $2.5 \mu\text{m}$ ) longitudinal ridges, surrounded by a thin evanescent mucilaginous sheath (Figs. 5–12).

**Known distribution.** – Ecuador.

**Known hosts.** – *Phytelephas*, palms.

**Material examined.** – ECUADOR: Oriente, Reserva de Producción Faunística Cuyabeno, Rio Cuyabeno, forest near Laguna Grande, on dead petiole of *Phytelephas* sp., Aug. 1993, K. D. Hyde E107 (HKU(M) 2707, holotype; syntype at QCA). – *Ibid.*, on dead petiole of unidentified palm, Aug. 1993, K. D. Hyde E173 (HKU(M) 2736).

This species has very distinctive ascospores and cannot be confused with other species.



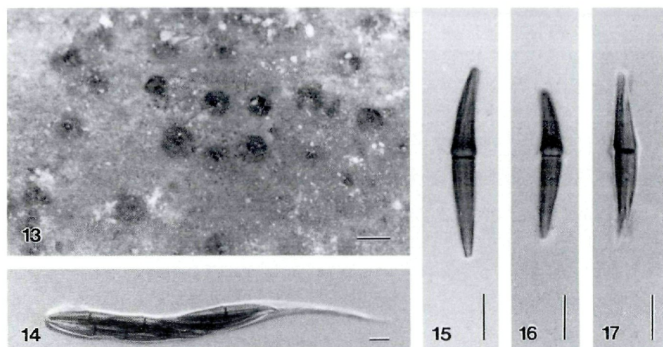
Figs. 1–12. *Astrophaeriella aequatoriensis* (from holotype). – 1. Appearance of ascomata on host surface. – 2. Young ascus and trabeculae. – 3, 4. Mature asci. – 5–12. Ascospores with longitudinal ridges. – Bars: 1 = 1 mm, 2–12 = 10 µm.

2. *Astrophaeriella africana* D. Hawksw., Sydowia 38: 116. 1985. – Figs. 13–17.

Reference. – Hawksworth & Boise (1985).

Ascomata arising singly, immersed, erumpent only at the ostiole, slightly raised (Fig. 13); in section 700–1000 µm diam., hemi-





Figs. 13–17. *Astrosphaeriella africana* (from HKU(M) 1583). – 13. Appearance of ascomata on host surface. – 14. Mature ascus. – 15–17. Ascospores with longitudinal ridges. – Bars: 13 = 1 mm, 14–17 = 10  $\mu$ m.

spherical, immersed beneath host tissue (cuticle and some epidermis), black, base applanate, with a central vertical papilla. – Ascii 120–160  $\times$  12–17  $\mu$ m, 8-spored, cylindrical, long pedicellate, with an ocular chamber and faint ring (Fig. 14). – Ascospores 46–57 (–64)  $\times$  5.5–6.5 (–8)  $\mu$ m, 2–3-seriate, fusiform, pale-yellowish brown to reddish-brown, 1-septate, constricted at the septum and often swollen above it, with longitudinal wall striations, surrounded by a thin mucilaginous sheath swollen around the central septum (Figs. 15–17).

**Known distribution.** – Australia, Brunei, Malaysia, Philippines, Tanzania.

**Known hosts.** – *Arenga*, Bamboo, *Calamus*, *Daemonorops*, ?*Phragmites*, Palm.

**Material examined.** – AUSTRALIA: north Queensland, near Topaz, Bellenden Ker National Park, Mt. Bartle Frere walking track, on dead rattan sheath of *Calamus moti*, Apr. 1995, J. Fröhlich (HKU(M) JF 652). – BRUNEI: Temburong, Batu Apio Forest Reserve, Sungai Belalong, Kuala Belalong Field Studies Centre, Axel's plot, on dead rachis of *Daemonorops* sp., July 1993, K. D. Hyde (HKU(M) 1706). – *Ibid.* Ashton's Trail, on dead rattan of *Calamus conirpstris*, Jan. 1991, J. Fröhlich (HKU(M) JF 241). – Bandar Seri Begawan, Jalan Akar, on dead rachis of *Arenga undulatifolia*, alongside *Astrosphaeriella lophiostomopsis*, Nov. 1992, K. D. Hyde (HKU(M) 1835). – Alongside *Astrosphaeriella lophiostomopsis*, K. D. Hyde (HKU(M) 1836). – MALAYSIA: Pasoh Forest Reserve, on dead frond of an unidentified palm, Oct. 1991, K. D. Hyde (HKU(M) 1583). – Mile 19, 'Old Gombak' on dead frond of an unidentified palm, Oct. 1991, K. D. Hyde (HKU(M) 1592). – PHILIPPINES: Mindanao, Bukidnon, Impalutao, in rainforest on bamboo, Dec. 1993, K. D. Hyde (HKU(M) 1871). – *Ibid.* K. D. Hyde (HKU(M) 1872).

*Astrosphaeriella africana* is previously reported from Tanzania, Africa on Gramineae, ?*Phragmites* (Hawksworth & Boise, 1985) and these collections are the first records from Australia and South East Asia.

3. *Astrosphaeriella angustispora* J. Fröhl. & K. D. Hyde, sp. nov. – Figs. 18–27.

Ascomata 480–656 µm diam., 320–544 µm alta, conica, ostiolata. Asci 85–110 × 5–5.8 µm. Ascospores 25–30 × 2.3–2.8 µm, 2-seriatae, elongatae-fusiformes, hyalinae, 1-septatae, appendiculatae.

Etymology. – from the Latin *angustus*, meaning „narrow“, in reference to the very narrow ascospores.

Ascomata arising singly, initially subepidermal, then superficial (Fig. 18); in section 480–656 µm diam., 320–544 µm high, conical, black, base appanate, with a central ostiole (Figs. 19, 20). – Asci 85–110 × 5–5.8 µm, 8-spored, cylindrical, pedicellate, with an ocular chamber and faint ring (Figs. 21–23). – Ascospores 25–30 × 2.3–2.8 µm, 2-seriate, elongate-fusiform, hyaline, 1-septate, not constricted at the septum, with a small flame-shaped mucilaginous appendage at each end (Figs. 24–27).

Known distribution. – Brunei.

Known hosts. – *Licuala*.

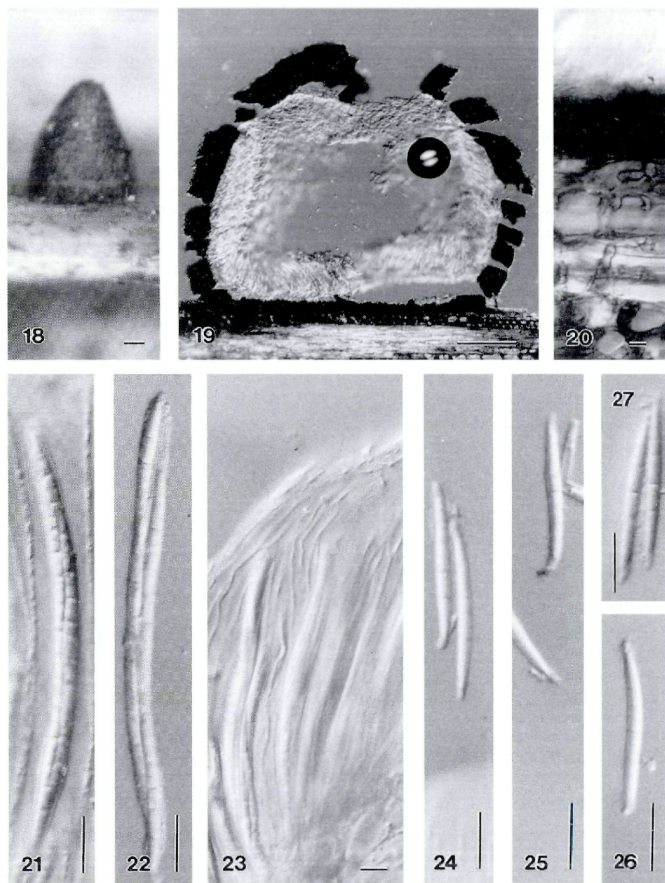
Material examined. – BRUNEI: Temburong, Batu Apio Forest Reserve, Sungai Belalong, Kuala Belalong Field Studies Centre, near start of Ashton's Trail, on veins of dead frond blade of *Licuala* sp. June 1995, J. Fröhlich (HKU(M) JF LI 95, holotype). – On small track leading to Ruth's plot, on veins of dead frond blade of *Licuala* sp., June 1995, J. Fröhlich (HKU(M) JF LII 80). – Ashton's Trail, in valley just south of the Western Ridge, on veins of dead frond blade of *Licuala* sp., Dec. 1994, J. Fröhlich (HKU(M) JF LIII 57).

This species has narrower ascospores than any other species of *Astrosphaeriella*.

4. *Astrosphaeriella aquatica* K. D. Hyde, Mycol. Res. 98: 719. 1994. – Figs. 28–33.

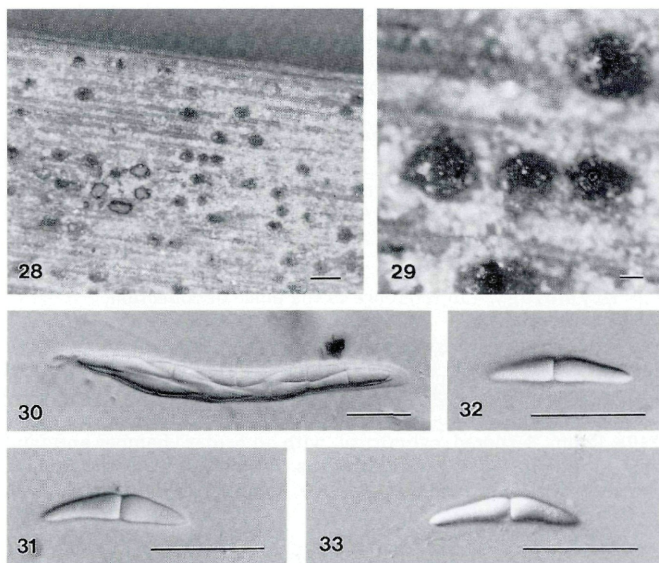
Reference. – Hyde (1994a).

Ascomata arising singly, developing under conical, black, raised projections, 520–650 µm diam., 185–260 µm high (Figs. 28, 29); in section 390–520 µm diam., 186–260 µm high, conical, immersed, with a central vertical short papilla. – Asci 130–164 × 14–16 µm, 8-spored, cylindrical, slightly wider at the base, short pedicellate,



Figs. 18–27. *Astrosphaeriella angustispora* (from holotype). – 18. Appearance of ascoma on host surface. – 19. Section of ascoma. – 20. Base of ascoma. – 21–23. Asci and trabeculae. – 24–27. Ascospores with mucilaginous appendages. – Bars: 18, 19 = 100  $\mu$ m, 20–27 = 10  $\mu$ m.

with an ocular chamber (Fig. 30). – Ascospores 30–42  $\times$  7–8  $\mu$ m, biseriata, fusiform, 1-septate, constricted at the septum, hyaline, smooth-walled, with a wide spreading mucilaginous sheath which is drawn out at the poles (Figs. 31–33).



Figs. 28–33. *Astrosphaeriella aquatica* (from HKU(M) 2727). – 28, 29. Appearance of ascomata on host surface. – 30. Mature ascus. – 31–33. Ascospores with mucilaginous sheath. – Bars: 28 = 1 mm, 29 = 200  $\mu$ m, 30–33 = 10  $\mu$ m.

Known distribution. – Ecuador, Papua New Guinea.

Known hosts. – *Livistona*, Palm.

Material examined. – ECUADOR: Oriente, Reserva de Producción Faunística Cuyabeno, Río Cuyabeno, forest near Laguna Grande, on dead petiole of unidentified palm submerged in a stream, Aug. 1993, K. D. Hyde E152 (HKU(M) 2727). – PAPUA NEW GUINEA: Western Province, Bensbach, Bensbach River, on submerged fronds of *Livistona* sp., May 1992, K. D. Hyde 1373b (BRIP 21390, holotype).

This species was described from submerged *Livistona* fronds in Papua New Guinea (Hyde 1994a). *Astrosphaeriella aquatica* is similar to *A. aosimensis* which is also recorded from *Livistona* sp. (Hawksworth, 1981). The taxa differ in several important characters. In *A. aquatica* the ascospores are shorter and wider and the sheath is drawn out at the ends. The ascospores in *A. aquatica* are also hyaline at maturity (observed in oozing spore masses), while light-brown in *A. aosimensis*. Further, the habitats differ, *A. aquaticus* being found



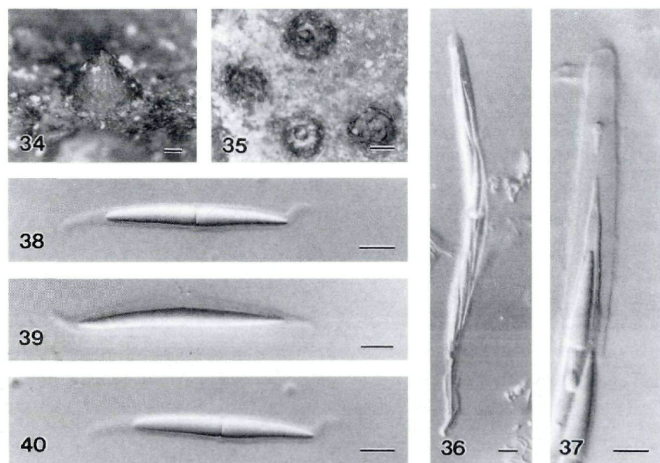
on rachides submerged in freshwater, while *A. aosimensis* is found on decaying terrestrial rachides. *Astrosphaeriella aquatica* was very commonly collected being present on most submerged rachides of *Livistona* sp. examined in Papua New Guinea (Hyde, 1994a).

5. *Astrosphaeriella australiensis* K. D. Hyde & J Fröhl., sp. nov. – Figs. 34–40.

Ascomata solitaria, erumpentia, superficialia, immersa ad basim, conica, brunnea et nigra, papillata, carbonacea, 650–1200  $\mu\text{m}$  diam., 350–500  $\mu\text{m}$  alta. Asci 240  $\times$  12  $\mu\text{m}$ . Ascospores 50–60  $\times$  5–6  $\mu\text{m}$ , 2–3-seriatae, fusiformes, hyalinae, 1-septatae, tunica gelatinosa praeditae.

Etymology. – In reference to the place of collection.

Ascomata arising singly, erumpent early, becoming superficial, immersed only at the base, lacking teeth-like flanges, lower part brown, upper part black, carbonaceous (Figs. 34, 35); in section 650–1200  $\mu\text{m}$  diam., 350–500  $\mu\text{m}$  high, steeply conical, papillate. – Asci 240  $\times$  12  $\mu\text{m}$ , 8-spored, cylindrical, with an ocular chamber and faint ring (Figs. 36, 37). – Ascospores 50–60  $\times$  5–6  $\mu\text{m}$ , 2–3-seriate, narrowly fusiform, hyaline, 1-septate, some (rare) light-brown with



Figs. 34–40. *Astrosphaeriella australiensis* (from holotype). – 34, 35. Appearance of ascomata on host surface. – 36, 37. Mature asci. – 38–40. Ascospores with mucilaginous sheath which is drawn out at the ends. – Bars: 34 = 500  $\mu\text{m}$ , 35 = 200  $\mu\text{m}$ , 36–40 = 10  $\mu\text{m}$ .



age, surrounded by a thin mucilaginous sheath with drawn out appendages at the ends (Figs. 38–40).

Known distribution. – Australia.

Known host. – *Calamus* spp.

Material examined. – AUSTRALIA: Cairns, Saddle Hill, on dead stem of *Calamus* sp. Feb. 1992, K. D. Hyde & J. Fröhlich (HKU(M) 1058, holotype; syntype in BRIP). – Freshwater Creek State Forest, on dead stem of *Calamus* sp., Feb. 1992, K. D. Hyde (HKU(M) 1063).

This species has narrowly fusiform hyaline ascospores and has only been recorded on *Calamus* sp. in Australia.

6. *Astrosphaeriella bakeriana* (Sacc.) K. D. Hyde & J. Fröhl., comb. nov. – Figs. 41–49.

= *Winterina bakeriana* Sacc, Boll. Orto Bot. Univ. Napoli 6: 45. 1918.

= *Astrosphaeriella aosimensis* I. Hino & Katum., Bull. Fac. Agric. Yamaguti Univ. 7: 262. 1956.

= *Microthelia aosimensis* (I. Hino & Katum.) E. Müll., Beitr. Kryptogamfl. Schweiz 11(2): 286. 1962.

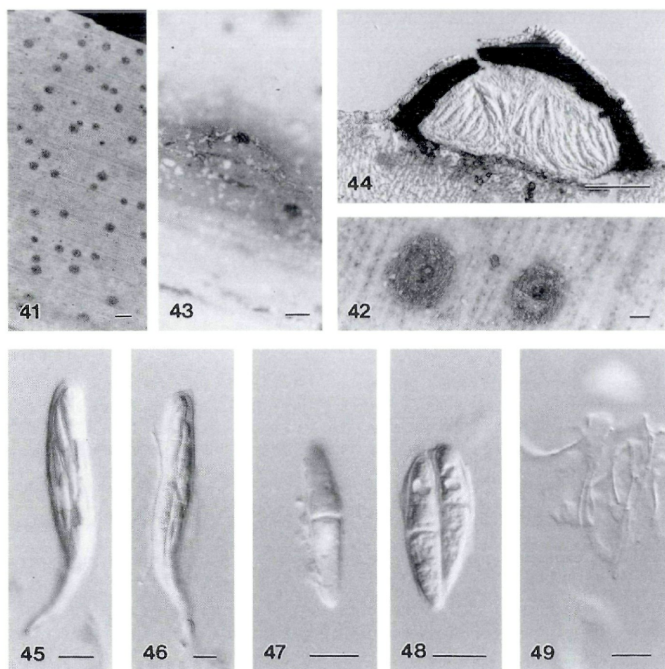
References. – Hawksworth (1981); Hyde (1994b).

Ascomata arising singly, developing under hemispherical projections, up to 650 µm diam., scattered (Figs. 41–43); in section 150–282 µm high, 325–520 µm diam., hemispherical, immersed beneath host tissue (cuticle and some epidermis), black, base appanate, with a central vertical short papilla (Fig. 44). – Asci 110–140 × 12–16 µm, 8-spored, cylindric-clavate, long pedicellate, with an ocular chamber (Figs. 45, 46). – Ascospores 36–44 × 5–7(–8) µm, 2–3-seriate, fusiform, 1-septate, upper cell slightly larger, constricted at the septum, hyaline, old spores brown, smooth-walled, with an inconspicuous mucilaginous sheath (Figs. 47, 48).

Known distribution. – Hong Kong, Japan, Singapore, Papua New Guinea.

Known hosts. – *Calamus*, *Livistona*.

Material examined. – HONG KONG: Hong Kong Island, Pok Fu Lam, Grounds of The University of Hong Kong, on rachis of *Livistona chinensis*, Sept. 1996, Yanna (HKU(M) 5309); *ibid.*, (HKU(M) 5310); *ibid.* (HKU(M) 5311); *ibid.*, (HKU(M) 5312); Pok Fu Lam Country Park, Victoria Peak, on dead petiole of *Livistona chinensis*, Aug. 1993, J. Fröhlich (HKU(M) JF177); *ibid.*, (HKU(M) JF189); Sept. 1993, J. Fröhlich & J. R. Fellowes (HKU(M) JF196); *ibid.*, July 1994, J. Fröhlich (HKU(M) JF 403); *ibid.*, June 1994, J. E. Taylor & K. D. Hyde (HKU(M) JP400); Deep Water Bay, Forest behind the Royal Hong Kong Golf Club, on dead rattan of *Calamus tetradactylus*, July 1995, J. Fröhlich (HKU(M) JF790); *ibid.*, on



Figs. 41–49. *Astrosphaeriella bakeriana* (from holotype of *Winterina bakeriana*). – 41–43. Appearance of ascomata on host surface. – 44. Section of ascoma. – 45, 46. Mature asci. – 47, 48. Ascospores. – 49. Trabeculae. – Bars: 41 = 1mm, 42 = 200  $\mu$ m, 43, 44 = 100  $\mu$ m, 45–49 = 10  $\mu$ m.

dead flagella of *Calamus walkerii*, July 1995, J. Fröhlich (HKU(M) JF829); Tai Tam, Tai Tam Country Park, near Reservoir near Tai Tam Road, on dead rattan sheath of *Calamus tetradactylus*, Aug. 1995, J. Fröhlich (HKU(M) JF842); Po Toi Island, on dead rattan sheath of *Calamus tetradactylus*, Sep. 1995, J. Fröhlich, P. Crawford & J. R. Fellowes (HKU(M) JF907). – PAPUA NEW GUINEA: Western Province, Bensbach, on fronds of *Livistona* sp., May 1992, K. D. Hyde 1365c (BRIP 22260); *ibid.*, K. D. Hyde 1373 (BRIP 22261). – SINGAPORE: Botanical Gardens, on dead leaves of *Livistona chinensis*, Aug. 1917, C. F. Baker 5124 (PAD, holotype of *Winterina bakeriana*).

Ascospores of *Winterina bakeriana* (36–40  $\times$  7–8  $\mu$ m) are slightly wider than those reported for *A. aosimensis* by Hawksworth (1981) and Hawksworth & Boise (1985): (28–)32–40(–42)  $\times$  (4.5–)5–7(–8)  $\mu$ m. The ascoma with an erumpent ostiole, and browning of some asco-

spores and the host *Livistona*, however, leave no doubt in our mind that these are the same species. The trabeculae are illustrated in Fig. 49. This species is most similar to *A. floridana*, which may be a synonym. In introducing *A. floridana*, Barr (1990) compares *A. aosiensis*, and concludes that this species has shorter and wider asci. In the illustration (and description) of *A. floridana* provided by Barr (1990), however, ascospores lack a mucilaginous sheath, while those of *A. bakeriana* have a distinct mucilaginous sheath. *A. floridana* is maintained in this paper, but further collections may prove it to be a synonym.

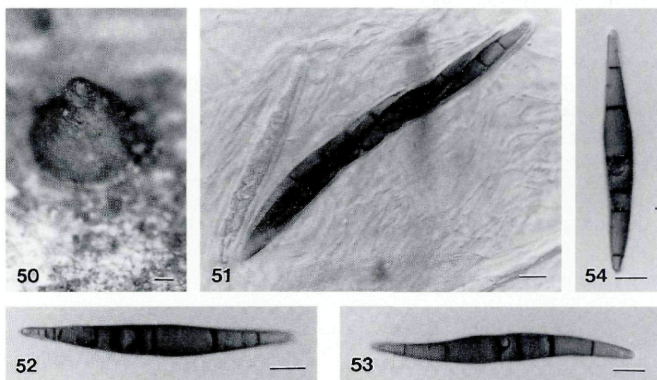
7. *Astrosphaeriella exorrhiza* Boise, Sydowia 38: 117. 1985 - Figs. 50-54.

Reference. - Hawksworth & Boise (1985).

Ascomata arising singly, erumpent, becoming almost superficial, dark brown to black (Fig. 50); in section 1-1.5 mm diam., conical, minutely papillate. - Asci 230 x 12 µm, 8-spored, cylindrical, short pedicellate, with an ocular chamber and faint ring (Fig. 51). - Ascospores (68-)74-88 x 8-10 µm, 2-seriate, long fusiform, cinnamon brown, (3-)5 septate, slightly constricted at the septa, smooth walled, with mucilaginous drawn out at each end (Figs. 52-54).

Known distribution. - Ecuador, Venezuela.

Known hosts. - *Iriartia* sp., Palm.



Figs. 50-54. *Astrosphaeriella exorrhiza* (from isotype). - 50. Appearance of ascoma on host surface. - 51. Young and mature asci and trabeculae. - 52-54. Ascospores with appendages at the ends. - Bars: 50 = 200 µm, 51-54 = 10 µm.

Material examined. – ECUADOR: Oriente, Reserva de Producción Faunística Cuyabeno, Rio Cuyabeno, forest near Laguna Grande, Canangucho, on submerged dead petiole of unidentified palm in a stream, Aug. 1993, K. D. Hyde E159 (HKU(M) 2731). – VENEZUELA: Cerro de la Neblina, valley north of the base of Pico Phelps, cloud forest between 1250–2000 m, 0°49' N 66°0' W, on rachis of *Iriartia* sp., 13 Apr. 1984, G. J. Samuels 1266 (NY, isotype).

*A. exorrhiza* is most similar to *A. venezuelensis* but the ascospores are 5-septate at maturity and the tips of the ascospores do not show any tendency to become strongly attenuated or uncinately (Hawksworth & Boise, 1985), but do contain mucilage.

8. *Astrophaeriella floridana* Barr, North Amer. Fl. Ser. II. 13: 27. 1990.

Reference. – Barr (1990).

Ascomata arising singly, immersed; in section 385–550  $\mu\text{m}$  diam., 220–330  $\mu\text{m}$  high, conical, papillate. – Asci 80–100  $\times$  12–15  $\mu\text{m}$ , 8-spored, cylindrical, pedicellate, with an ocular chamber and faint ring. – Ascospores 30–37  $\times$  (4–)5–6  $\mu\text{m}$ , 1–2-seriate, fusiform, hyaline to yellow, 1-septate.

Known distribution. – USA (Florida).

Known hosts. – *Sabal*.

9. *Astrophaeriella frondicola* J. Fröhl. & K. D. Hyde [as *fronsicola*], Mycol. Res. 99: 453. 1995.

Reference. – Fröhlich & Hyde (1995).

Ascomata arising singly, or occasionally 2–3 coalescing at the base, loosely aggregated, erumpent, becoming largely superficial, black; in section 260–754  $\mu\text{m}$  diam., 180–267.5  $\mu\text{m}$  high, conical, dimidiate, with an applanate base. – Asci 70–125  $\times$  12–25  $\mu\text{m}$ , 8-spored, obclavate, pedicellate, with an ocular chamber and faint ring. – Ascospores 17.5–25  $\times$  6.25–8.75  $\mu\text{m}$ , 1–3-seriate, ellipsoidal, dark-brown, 1-septate, slightly constricted at the central septum, guttulate, usually with a single guttule per cell, minutely verrucose, surrounded by a distinct mucilaginous sheath.

Known distribution. – Australia, Brunei, Hong Kong.

Known hosts. – *Calamus*, *Daemonorops*, *Oraniopsis*, *Laccospadix*.

Material examined. – AUSTRALIA: north Queensland, Mount Lewis, on leaves of *Oraniopsis appendiculata*, Aug. 1992, K. D. Hyde & J. Fröhlich, KDH



1511 (BRIP 20421, holotype); on living leaf of *Laccospadix australasicus*, Aug. 1992, J. Fröhlich & K. D. Hyde 1515 (BRIP 20420); Cairns, Freshwater Creek State Forest, on dead stem of *Calamus* sp., Feb. 1992, K. D. Hyde 1068 (BRIP 21410). – BRUNEI: Temburong, Batu Apio Forest Reserve, Sungai Belalong, Kuala Belalong Field Studies Centre, Belalong Trail, East Ridge, on dead sheathing base of *Daemonorops oxycarpa*, Jan. 1995, J. Fröhlich (HKU(M) JF 507). – HONG KONG: New Territories, Sek Kong, Tai Lam Country Park, Kap Lung Forest trail, on dead rattan of *Daemonorops margaritae*, July 1995, J. Fröhlich (HKU(M) JF 775); Fan Ling, Wo Hop Shek Stream, on dead rattan of *D. margaritae*, Aug. 1995, J. Fröhlich (HKU(M) JF 860); Sheung Kwai Chung, Shing Mun Country Park, on dead petiole base of *D. margaritae*, Aug. 1995, J. Fröhlich, D. Allan & J. Fellowes (HKU(M) JF 869).

*A. frondicola* was described associated with leaf spots of *Oranopsis* from Mt Lewis north Queensland and *Calamus* stems, also from north Queensland. It is distinct from other *Astrosphaeriella* species in having obclavate asci and brown ellipsoidal ascospores with a wide spreading sheath.

10. *Astrosphaeriella lenticularis* K. D. Hyde & J. Fröhl., sp. nov. – Figs. 55–75.

Ascomata 840–1120 µm diam., 800–1000 µm alta, mammiformia. Asci 170–250 × 11–16 µm. Ascospores 37–48 × 7.5–9.5 µm, 2-seriatae, lenticulares, brunneae, 1-septatae, verrucosae, attenuatae, appendiculatae.

**Etymology.** – From the Latin *lenticularis* in reference to the shape of the ascospores (fusiform with pointed ends).

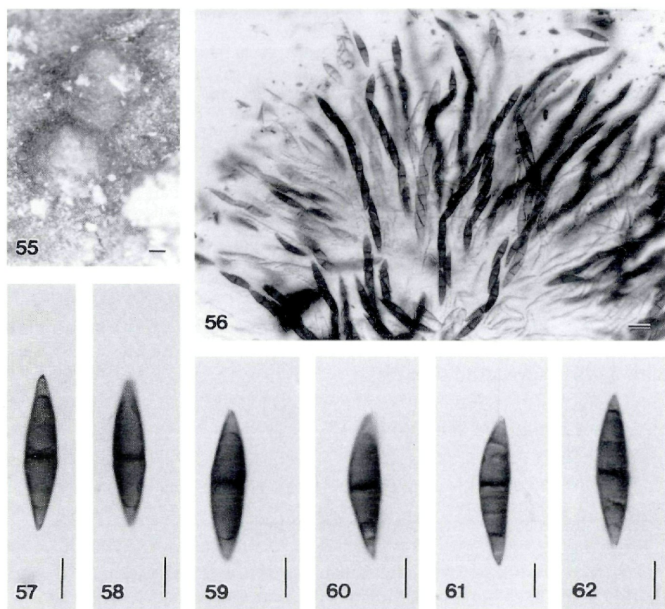
Ascomata arising singly or in small groups, erumpent when mature, immersed only at the base, brown or black, carbonaceous (Figs. 55, 63, 71, 72); in section 840–1120 µm diam., 800–1000 µm high, mammiform, papillate. – Asci 170–250 × 11–16 µm, 8-spored, cylindrical, pedicellate, with an ocular chamber and faint ring (Figs. 56, 69, 70, 73). – Ascospores 37–48 × 7.5–9.5 µm, 2-seriate, fusiform with pointed ends, brown, 1-septate, slightly constricted at the septum, minutely verrucose, pointed towards the ends which are provided with a minute drop of mucilage (Figs. 57–62, 64–68, 74, 75).

**Known distribution.** – Brunei, Ecuador.

**Known hosts.** – *Geonoma*, *Mauritia*.

**Material examined.** – BRUNEI: Temburong, Batu Apio Forest Reserve, Sungai Belalong, Kuala Belalong Field Studies Centre, Ruth Levy's plot, on dead petiole of *Licuala* sp., July 1993, J. Fröhlich (HKU(M) JF 109). – ECUADOR: Oriente, Reserva de Producción Faunística Cuyabeno, Rio Cuyabeno, forest near Laguna Grande, canangucho, on dead petiole of *Mauritia flexuosa*, Aug. 1993, K. D. Hyde E147 (HKU(M) 2723); forest on Tropitour's side of Laguna Grande, Terra





Figs. 55–62. *Astrophaeriella lenticularis* (from holotype). – 55. Appearance of ascinata on host surface. – 56. Squash mount of asci and trabeculae. – 57–62. Ascospores. – Bars: 55 = 200  $\mu\text{m}$ , 56 = 20  $\mu\text{m}$ , 57–62 = 10  $\mu\text{m}$ .

Firme, on dead petiole of *Geonoma*, Aug. 1993, K. D. Hyde E166 (HKU(M) 2733, holotype; syntype at QCA).

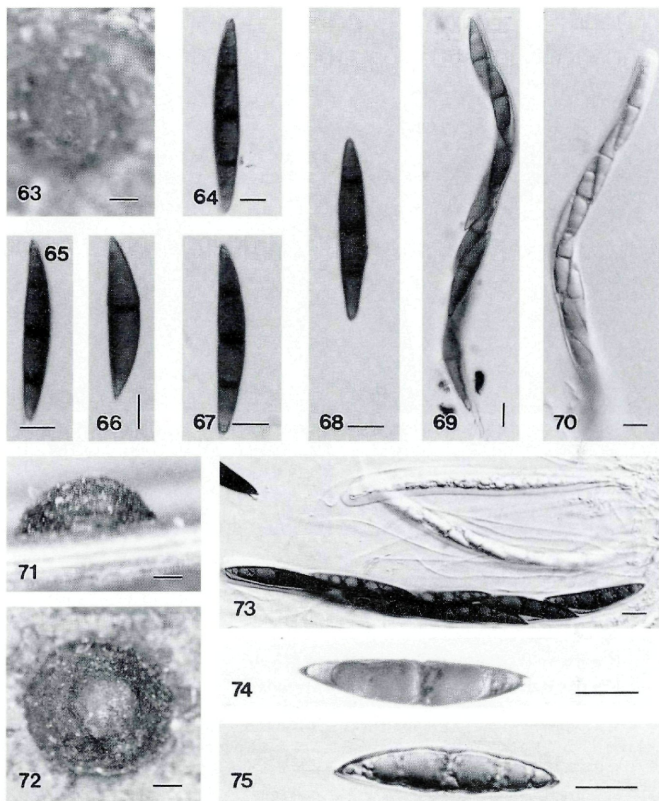
This species differs from other *Astrophaeriella* species as its ascospores have pointed ends.

11. *Astrophaeriella livistoncola* K. D. Hyde & J. Fröhl., sp. nov. – Figs. 76–82.

Ascomata 273–363  $\mu\text{m}$  diam., ca 142  $\mu\text{m}$  alta, lenticularia. Asci 75–97.5  $\times$  15–22.5  $\mu\text{m}$ . Ascospores 26.3–30.5  $\times$  5–5.8  $\mu\text{m}$ , 1–3-seriatae, elongate-fusiformes, atrobunneae, 1-septatae.

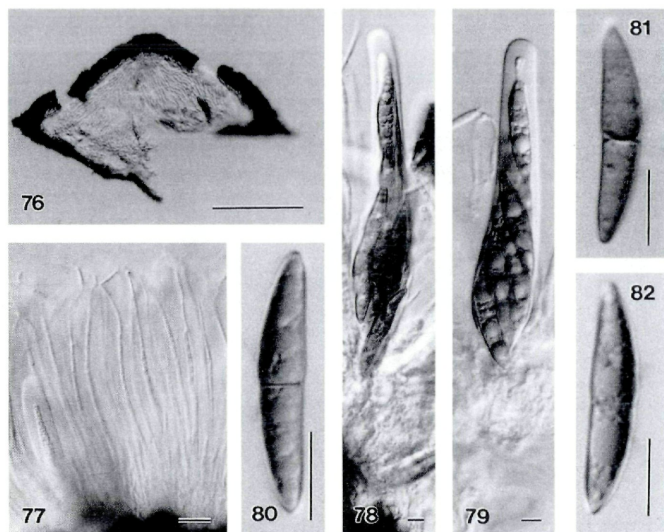
**Etymology.** – In reference to the host genus.

Ascomata arising singly, erumpent early and becoming entirely superficial, black, carbonaceous; in section 273–363  $\mu\text{m}$  diam.,



Figs. 63–75. *Astrophaeriella lenticularis* (63–70 from HKU(M) 3348; 71–75 from HKU(M) 2723). – 63, 71, 72. Appearance of ascomata on host surface. – 73. Squash mount of asci and trabeculae. – 69, 70. Asci. – 64–68, 74, 75. Ascospores. – Bars: 63, 71, 72 = 200  $\mu$ m, 64–70, 73–75 = 10  $\mu$ m.

ca 142  $\mu$ m high, lenticular, with a central ostiole (Fig. 76). – Asci 75–97.5  $\times$  15–22.5  $\mu$ m, 8-spored, obclavate, short pedicellate, with an ocular chamber and faint ring (Figs. 77–79). – Ascospores 26.3–30.5  $\times$  5–5.8  $\mu$ m, 1–3-seriate, elongate-fusiform, with tapering ends, dark brown, 1-septate, smooth-walled, lacking a mucilaginous sheath (Figs. 80–82).



Figs. 76–82. *Astrosphaeriella livistonicola* (from holotype). – 76. Section of ascoma. – 77. Squash mount of immature ascus and trabeculae. – 78, 79. Mature obclavate asci. – 80–82. Ascospores. – Bars: 76 = 100  $\mu\text{m}$ , 77 = 20  $\mu\text{m}$ , 78–82 = 10  $\mu\text{m}$ .

Known distribution. – Hong Kong.

Known hosts. – *Livistona chinensis*.

Material examined. – HONG KONG: Hong Kong Island, Pok Fu Lam, Pok Fu Lam Country Park, Victoria Peak, on dead petiole base of *Livistona chinensis*, Aug. 1993, J. Fröhlich (HKU(M) JF176, holotype).

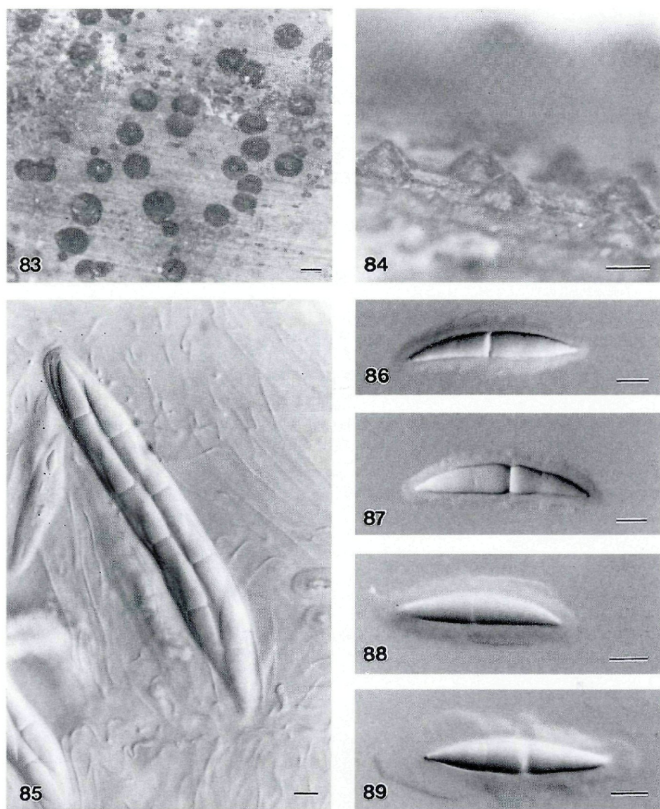
This species is unusual in having obclavate asci.

12. *Astrosphaeriella lophiostomopsis* K. D. Hyde & J. Fröhl., sp. nov.  
– Figs. 83–89.

Ascomata 650–860  $\mu\text{m}$  diam., 340–510  $\mu\text{m}$  alta, hemisphaerica. Asci 140–180  $\times$  22–30  $\mu\text{m}$ . Ascospores 48–52  $\times$  8–10  $\mu\text{m}$ , 2–3-seriatae, fusiformes, hyalinae, 1-septatae, tunica gelatinosa praeditae.

Etymology. – In reference to the likeness of its ascospores to some *Lophiostoma* species.

Ascomata arising singly, erumpent early and becoming superficial, immersed only at the base, lacking teeth-like flanges, brown-



Figs. 83–89. *Astrosphaeriella lophiostomopsis* (from holotype). – 83, 84. Appearance of ascomata on host surface. – 85. Squash mount of asci and trabeculae. – 86–89. Ascospores with mucilaginous sheath. – Bars: 83, 84 = 500  $\mu$ m, 85–89 = 10  $\mu$ m.

black, carbonaceous (Figs. 83, 84); in section 650–860  $\mu$ m diam., 340–510  $\mu$ m high, hemispherical, with a rounded papilla. – Asci 140–180  $\times$  22–30  $\mu$ m, 8-spored, cylindric-clavate, short pedicellate, with an ocular chamber and faint ring (Fig. 85). – Ascospores 48–52  $\times$  8–10  $\mu$ m, 2–3-seriate, fusiform with acute ends, hyaline, some pale brown at maturity, 1-septate, surrounded by a complex mucilaginous sheath (Figs. 86–89).



Known distribution. – Brunei.

Known hosts. – *Arenga*.

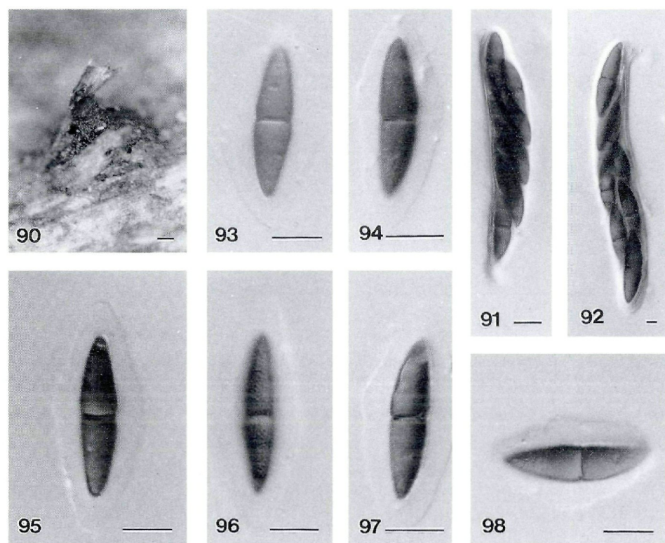
Material examined. – BRUNEI: Bandar Seri Begawan, Jalan Akar, on rachis of *Arenga undulatifolia*, Nov. 1992, K. D. Hyde [HKU(M) 1835, holotype – on same samples as *Astrosphaeriella africana*]; Temburong, Batu Apio Forest Reserve, Sungai Belalong, Kuala Belalong Field Studies Centre, on dead rachis of *Arenga undulatifolia*, July 1993, K. D. Hyde (HKU(M) 1708a); *ibid.*, (HKU(M)2763).

This species has an elaborate sheath (Figs. 86–89).

13. *Astrosphaeriella malayensis* K. D. Hyde & J. Fröhl., sp. nov. – Figs. 90–98.

Ascomata 600–850  $\mu\text{m}$  diam., 510–680  $\mu\text{m}$  alta, subhemisphaerica. Asci 90–120  $\times$  14–18  $\mu\text{m}$ . Ascospores 30–34  $\times$  6–8  $\mu\text{m}$ , 2–3-seriatae, fusiformes, brunneae, 1-septatae, verrucosae, tunica gelatinosa praeditae.

Etymology. – In reference to the location of the collection.



Figs. 90–98. *Astrosphaeriella malayensis* (from holotype). – 90. Appearance of ascomata on host surface. – 91, 92. Asci. – 93–98. Ascospores. – Bars: 90 = 100  $\mu\text{m}$ , 91–98 = 10  $\mu\text{m}$ .



Ascomata arising singly, erumpent when mature, immersed only at the base, with remnants of host remaining at the base and often attached to the ascomata, lacking teeth-like flanges, brown to black, carbonaceous (Fig. 90); in section 600–850  $\mu\text{m}$  diam., 510–680  $\mu\text{m}$  high, subhemisphaerical, papillate, beaked. – Asci 90–120  $\times$  14–18  $\mu\text{m}$ , 8-spored, cylindric-clavate, short pedicellate, with an ocular chamber and faint ring (Figs. 91, 92). – Ascospores 30–34  $\times$  6–8  $\mu\text{m}$ , 2–3-seriate, fusiform, brown, 1-septate, slightly constricted at the septum, wall verrucose and surrounded by a mucilaginous sheath (Figs. 93–98).

Known distribution. – Malaysia.

Known hosts. – *Daemonorops*.

Material examined. – MALAYSIA: Pasoh Forest Reserve, on dead stem of *Daemonorops* sp., Nov. 1992, K. D. Hyde [HKU(M) 1828, holotype].

This species is unique in having ascomata with relatively long necks, and brown verrucose ascospores.

14. *Astrosphaeriella maquilingiana* (Rehm) K. D. Hyde & J. Fröhl., comb. nov. – Figs. 99–114.

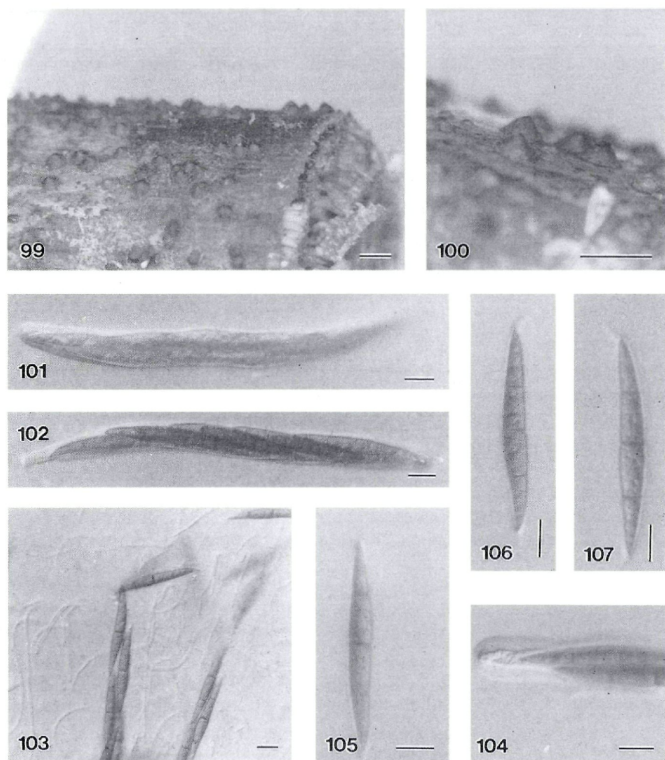
= *Trematosphaeria maquilingiana* Rehm, Leaflet. Phil. Bot. 8: 2952. 1916.

Ascomata arising singly, superficial, immersed only at the base, lacking teeth-like flanges, black, carbonaceous (Figs. 99, 100, 108); in section 500–750  $\mu\text{m}$  diam., 375–500  $\mu\text{m}$  high, subhemisphaerical to conical, ostiolate. – Asci 138–160  $\times$  11–14  $\mu\text{m}$ , 8-spored, cylindrical, short pedicellate, with an ocular chamber and surrounded by a ring (Figs. 101–104, 109, 110). – Ascospores 44–52  $\times$  5–7  $\mu\text{m}$ , 2-seriate, fusiform, brown, 1–3 septate, slightly constricted at the septum, some slightly verrucose, surrounded by a evanescent narrow sheath with drawn out appendages at the ends (Figs. 105–107, 111–114).

Known distribution. – Australia, Ecuador, Philippines.

Known hosts. – *Calamus*, *Iriartia*.

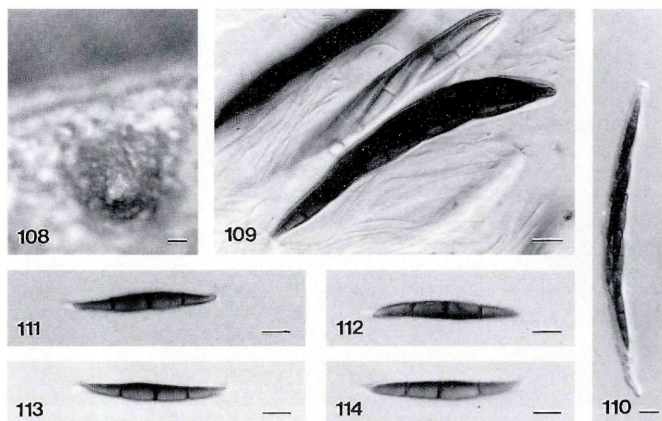
Material examined. – AUSTRALIA: north Queensland, Cairns, Kuranda, on stem of *Calamus* sp., July 1991, K. D. Hyde (HKU(M) 815); Saddle Mountain, near stream near Salome Road, Gregory Terrace intersection, on dead rattan of *Calamus moti*, Mar. 1995, J. Fröhlich (HKU(M) JF677); Palmerston, Palmerston National Park, on dead rattan of *C. moti*, Mar. 1994, J. Fröhlich (HKU(M) JF334); Palmerston Highway, Goolagan Creek, on dead rattan of *Calamus caryotooides*, Apr. 1995, J. Fröhlich (HKU(M) JF662); near Topaz, Bellenden Ker National Park, Mt. Bartle Frere walking track, on dead rattan sheath of *Calamus moti*, Apr. 1995, J. Fröhlich (HKU(M) JF648); *ibid.*, (HKU(M) JF673); *ibid.*, on dead petiole and rattan of *Calamus australis*, Apr. 1995, J. Fröhlich (HKU(M) JF660; *ibid.*,



Figs. 99–107. *Astrosphaeriella maquilungiana* (from HKU(M) 815). – 99, 100. Appearance of ascomata on host surface. – 101, 102. Asci. – 103. Squash mount of asci and trabeculae. – 104. Apex of ascus. – 105–107. Ascospores with appendages drawn out at the ends. – Bars: 99, 100 = 1 mm, 101–107 = 10  $\mu$ m.

(HKU(M) JF698. – ECUADOR: Oriente, Reserva de Producción Faunística Cuyabeno, Rio Cuyabeno, forest near Laguna Grande, canangucho, on dead petiole of *Iriartia* sp., Aug. 1993, K. D. Hyde E20 (HKU(M) 2644); *ibid.*, (HKU(M) 2731). – PHILIPPINES: Mt. Maquilung, on dead stem of *Calamus* sp., June 1914, C. F. Baker 3420 (S, holotype of *Trematosphaeria maquilungiana*).

*Astrosphaeriella maquilungiana* is somewhat similar to *A. trochus* and *A. tornata*. In *A. trochus* the ascospores are 3–5 septate, 48–65  $\times$  6–8  $\mu$ m and lack a gelatinous sheath. In *A. tornata* ascospores are 50–55  $\times$  8–9  $\mu$ m, reddish-brown with paler ends, with a thin (ca.



Figs. 108–114. *Astrophaeriella maquilungiana* (from HKU(M) 2731). – 108. Appearance of ascomata on host surface. – 109. Squash mount of asci and trabeculae. – 110. Ascus. – 111–114. Ascospores with appendages drawn out at the ends. – Bars: 108 = 200  $\mu$ m, 109–114 = 10  $\mu$ m.

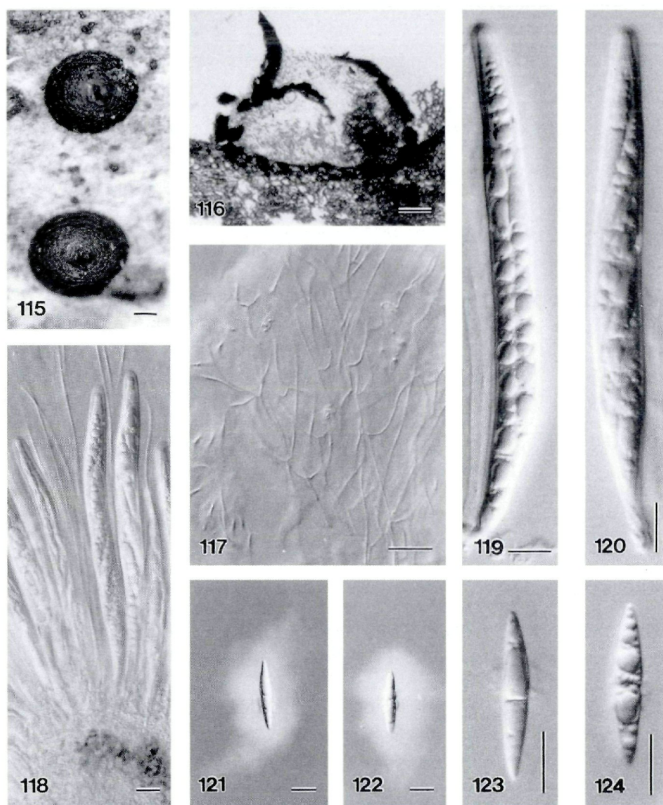
1  $\mu$ m) mucilaginous sheath that is not drawn out at the ends to form appendages (Hawksworth, 1985). The collections from Ecuador have smaller asci (110–140  $\times$  8–11  $\mu$ m) and ascospores (33–40  $\times$  4.5–5  $\mu$ m) than the type collections from the Philippines and may require to erect a new species when further collections are made.

15. *Astrophaeriella mauritiae* K. D. Hyde & J. Fröhl., sp. nov. – Figs. 115–124.

Ascomata 550–820  $\mu$ m diam., 200–400  $\mu$ m alta, conica. Asci 100–122.5  $\times$  9.5–11.3  $\mu$ m. Ascospores 25–28.8  $\times$  4–5.3  $\mu$ m, 2-seriatae, elongatae-fusiformes, attenuatae, hyalinae, 1-septatae, tunica gelatinosa praeditae.

**Etymology.** – In reference to the host.

Ascomata arising singly, superficial, immersed only at the base, brown or black, carbonaceous (Fig. 115); in section 550–820  $\mu$ m diam., 200–400  $\mu$ m high, conical, ostiolate (Fig. 116). – Asci 100–122.5  $\times$  9.5–11.3  $\mu$ m, 8-spored, cylindrical, pedicellate, with an ocular chamber and surrounded by a ring (Figs. 118–120). – Ascospores 25–28.8  $\times$  4–5.3  $\mu$ m, 2-seriate, elongate-fusiform, tapering towards the ends, hyaline, 1-septate, constricted at the septum, surrounded by a large spreading mucilaginous sheath (in India Ink) (Figs. 121–124).



Figs. 115–124. *Astrosphaeriella mauritiae* (from holotype).—115. Appearance of ascocmata on host surface. — 116. Section of ascocoma. — 117, 118. Squash mounts of asci and trabeculae. — 119, 120. Asci. — 121–124. Ascospores with mucilaginous sheath. — Bars: 115 = 200  $\mu$ m, 116 = 100  $\mu$ m, 117–124 = 10  $\mu$ m.

Known distribution. — Ecuador.

Known hosts. — *Mauritia*.

Material examined. — ECUADOR: Oriente, Reserva de Producción Faunística Cuyabeno, Rio Cuyabeno, forest near Laguna Grande, Path A, Canangucho, on dead petiole of *Mauritia flexuosa*, Aug. 1993, J. A. I. Chapman (HKU(M) JF151, holotype; syntype at QCA); *ibid.*, K. D. Hyde E150 (HKU(M) 2725).



This species has small hyaline ascospores with a wide spreading mucilaginous sheath.

16. *Astrophaeriella minima* Aptroot, Nova Hedwigia 60: 333. 1995.

Reference. – Aptroot (1995).

Ascomata immersed, 400–700  $\mu\text{m}$  diam., conical. – Ascospores 24–29  $\times$  7–8  $\mu\text{m}$ , fusiform, 1-septate, slightly constricted at the septum, very pale brown, smooth walled, no sheath reported.

Known distribution. – China, Indonesia.

Known hosts. – *Bambusa*.

We have not seen material of this species which occurs on bamboo. The above description is taken from the brief description provided by Aptroot (1995). It represents the smallest spored species of *Astrophaeriella*. For synonyms see Aptroot (1995).

17. *Astrophaeriella minoensis* (Hara) D. Hawksw., Sydowia 38: 118. 1985.

Reference. – Hawksworth (1981); Hawksworth & Boise (1985).

Ascomata arising singly, developing under hemispherical projections, scattered; in section 150–220  $\mu\text{m}$  high, 400–600  $\mu\text{m}$  diam., hemispherical, immersed beneath host tissue (cuticle and some epidermis), black, base applanate, with a central vertical short papilla. – Asci 80–95  $\times$  12–14  $\mu\text{m}$ , 8-spored, cylindrical, pedicellate, with an ocular chamber. – Ascospores 25–28  $\times$  6–7  $\mu\text{m}$ , 2-seriate, broadly fusiform, somewhat attenuated at the ends, (1–)3(–5)-septate, markedly constricted at the septum, hyaline, rarely pale brown, smooth-walled, rarely granular, with a mucilaginous sheath.

Known distribution. – Australia, French Guiana, Japan.

Known hosts. – *Licuala*, *Phyllostachys*.

Material examined. – AUSTRALIA: north Queensland, Kuranda, Saddle Mountain, on dead petiole of *Licuala ramseyi*, Mar. 1994, J. Fröhlich (HKU(M) JF331); near corner block at intersection between Salome Road and Gregory Terrace, on dead petiole of *L. ramseyi*, Mar. 1994, J. Fröhlich (HKU(M) JFLVI 17).

We have not seen type material, but the above description is modified from Hawksworth (1981) and Hawksworth & Boise (1985). Courtecuisse & al. (1996) have collected this species in French Gui-

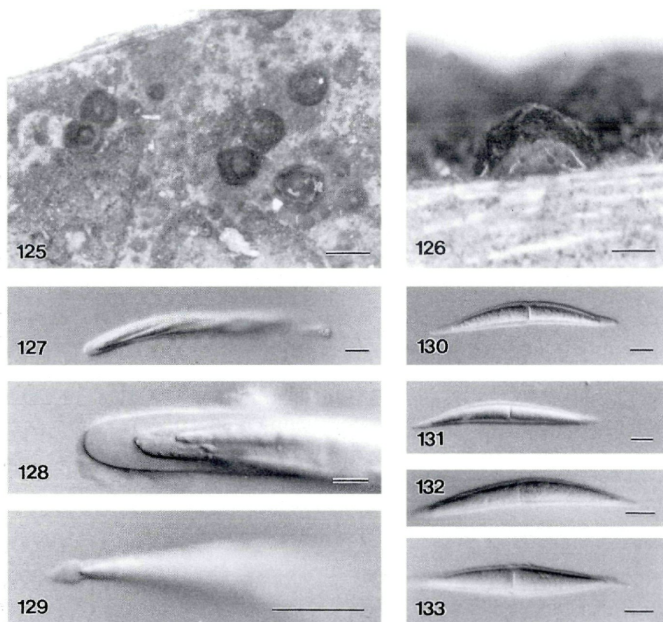


ana. For additional synonyms see Hawksworth (1981), Hawksworth & Boise (1985) and Aptroot (1995).

18. *Astrosphaeriella nipaecola* (Cooke & Masee) K. D. Hyde & J. Fröhl., comb. nov. – Figs. 125–133.

= *Melanopsamma nipaecola* Cooke & Masee, Grevillea 16: 92. 1888.

Ascomata arising singly, superficial, immersed only at the base, lacking teeth-like flanges, black, carbonaceous (Figs. 125, 126); in section 750–1250  $\mu\text{m}$  diam., 500–750  $\mu\text{m}$  high, subhemispherical to conical, ostiolate. – Asci 200–220  $\times$  17–18  $\mu\text{m}$ , 8-spored, cylindrical or cylindric-clavate, short pedicellate, with an ocular chamber and faint ring (Figs. 127, 128). – Ascospores 52–67  $\times$  6–9  $\mu\text{m}$ , 2–3-seriate, fusiform with tapering ends, curved, hyaline, 1-septate, surrounded by a distinct thin mucilaginous sheath (Figs. 129–133).



Figs. 125–133. *Astrosphaeriella nipaecola* (from HKU(M) 1586). – 125, 126. Appearance of ascomata on host surface. – 127, 128. Asci. – 129–133. Ascospores, with sheath drawn out at the ends. – Bars: 125, 126 = 1 mm, 127 = 20  $\mu\text{m}$ , 128–133 = 10  $\mu\text{m}$ .

Known distribution. – Brunei, Indonesia, Malaysia.

Known hosts. – *Elaeis*, *Licuala*, *Nypa*.

Material examined. – BRUNEI: Temburong, Batu Apio Forest Reserve, Sungai Belalong, Kuala Belalong Field Studies Centre, Ruth Levy's plot, on dead petiole of *Licuala* sp., July 1993, J. Fröhlich (HKU(M) JF108). – INDONESIA: Java, on *Nypa fruticans*, Nov. 1860, Herb. Berk. 1879, (K, holotype of *Melanopsamma nipaeicola*). – MALAYSIA: Banting oil palm plantation, on dead petiole of *Elaeis guineensis*, 13 Oct. 1991, K. D. Hyde (HKU(M) 1586).

The type species from Indonesia is not in good condition and therefore the specimen from Malaysia is illustrated.

19. *Astrosphaeriella nypae* K. D. Hyde, Bot. J. Linn. Soc. 110: 96. 1992.

Reference. – Hyde (1992).

Ascomata arising singly or clustered, erumpent only at the ostiole; in section 240–400  $\mu\text{m}$  diam., 215–310  $\mu\text{m}$  high, subglobose, or conical with a rounded base. – Asci 110–147  $\times$  7–11.5  $\mu\text{m}$ , 8-spored, cylindrical, short pedicellate, with an ocular chamber. – Ascospores 18.5–27  $\times$  4–5.9  $\mu\text{m}$ , overlapping uniseriate or 2-seriate, fusiform with tapering apices, 1-septate, strongly constricted at the septum, hyaline or pale-yellow and surrounded by a mucilaginous sheath.

Known distribution. – Brunei.

Known hosts. – *Nypa*.

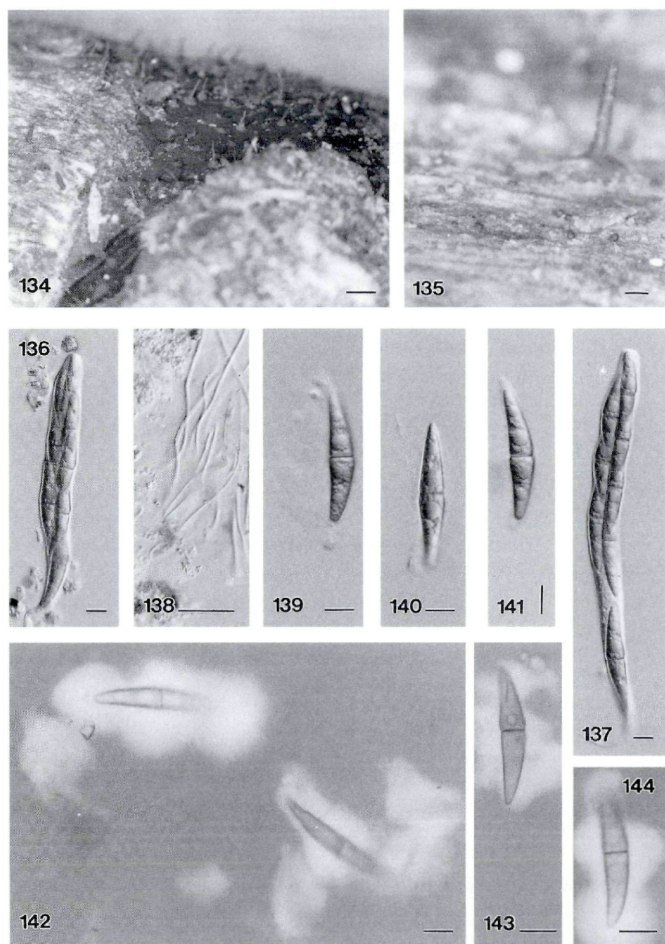
Material examined. – BRUNEI: Tungit Api Api, submerged decaying intertidal fronds of *Nypa fruticans*, 14 June 1987, K. D. Hyde (BRIP 17108); Kampung Tutong mangrove, from decaying intertidal fronds of *Nypa fruticans*, Dec. 1988, K. D. Hyde (BRIP 17107).

*Astrosphaeriella nypae* has distinctively shaped hyaline ascospores and its host is intertidal *Nypa* palm.

20. *Astrosphaeriella papillata* K. D. Hyde & J. Fröhl., sp. nov. – Figs. 134–144.

Ascomata immersa, 300–700  $\mu\text{m}$  diam., 200–300  $\mu\text{m}$  alta, lenticularia, longa papillata. Asci 90–120  $\times$  10–12  $\mu\text{m}$ , cylindrici. Ascosporae 31–45  $\times$  7–8  $\mu\text{m}$ , 2–3-seriatae, fusiformes, brunneae, 1-septatae, striatae, tunica gelatinosa praeditae.

Etymology. – From the Latin *papillata*, in reference to the long necks.



Figs. 134–144. *Astrosphaeriella papillata* (from holotype). – 134, 135. Appearance of ascomata on host surface. – 136, 137. Asci. – 138. Squash mount of asci and trabeculae. – 139–144. Ascospores. Note the sheath in India Ink in Figs. 142–144. – Bars: 134 = 1mm, 135 = 100  $\mu$ m, 136–144 = 10  $\mu$ m.

Ascomata immersed, with long necks, black, carbonaceous (Figs. 134, 135); in section 300–700  $\mu\text{m}$  diam., 200–300  $\mu\text{m}$  high, lenticular, long papillate. – Asci 90–120  $\times$  10–12  $\mu\text{m}$ , 8-spored, cylindrical, pedicellate, with an ocular chamber and faint ring (Figs. 136, 137). – Ascospores 31–45  $\times$  7–8  $\mu\text{m}$ , 2–3-seriate, fusiform, brown, 1-septate, constricted at the central septum, minutely striate, with a wide irregular mucilaginous sheath (Figs. 139–144).

Known distribution. – Brunei.

Known hosts. – Bamboo.

Material examined. – BRUNEI: Temburong, Batu Apio Forest Reserve, Sungai Belalong, Kuala Belalong Field Studies Centre, Sungai Esu, on dead submerged bamboo, Feb. 1994, K. D. Hyde (HKU(M)2018, holotype).

This species has immersed ascomata and ascospores with a wide spreading sheath, which distinguishes it from other species.

21. *Astrosphaeriella papuana* Aptroot, Nova Hedwigia 60: 333. 1995.

Reference. – Aptroot (1995).

Ascomata immersed, 500–1000  $\mu\text{m}$  diam., conical. – Ascospores 34–42  $\times$  6–6.5  $\mu\text{m}$ , fusiform, 1-septate, constricted at the septum, pale brown, with broad longitudinal striations.

Known distribution. – Papua New Guinea.

Known hosts. – Bamboo.

We have not seen material of this species which occurs on bamboo. The above description is taken from the brief description provided by Aptroot (1995). It represents the smallest striated spored species of *Astrosphaeriella*.

22. *Astrosphaeriella samuelsii* (Boise) K. D. Hyde & J. Fröhl., comb. nov.

= *Javaria samuelsii* Boise, Supl. Acta Amazonica, 14: 50. 1984.

Reference. – Boise (1984).

Ascomata arising singly, erumpent, becoming superficial, immersed at the base, with teeth-like flanges, dark-brown, black around the ostiole, carbonaceous; in section 750–1000  $\mu\text{m}$  diam., conical, papillate. – Asci 170  $\times$  20  $\mu\text{m}$ , 8-spored, obclavate, short pedicellate, with an ocular chamber and faint ring. – Ascospores (43–)46–58(–62)  $\times$  6.5–8  $\mu\text{m}$ , 2–3-seriate, fusiform, hyaline, 1(–3)-sep-



tate, constricted at the central septum, surrounded by a mucilaginous sheath which is drawn out at the ends.

Known distribution. – Brazil.

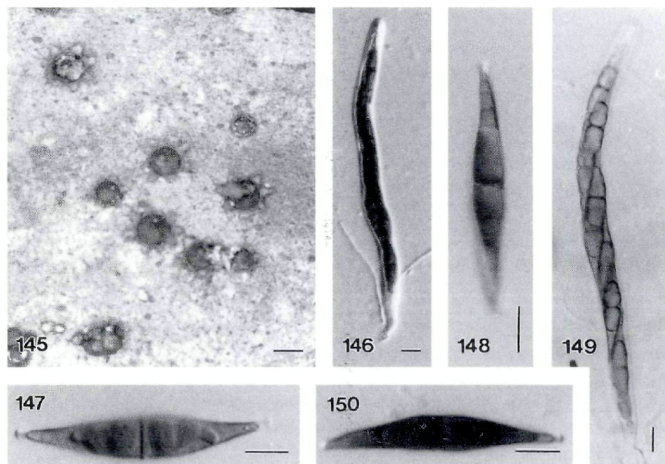
Known host. – Palm.

Material examined. – BRAZIL: Amazonas, Serra Araca, 60 m, open forest, deep litter, on decaying palm petiole, 10–13 Mar. 1994, G. J. Samuels 797 (NY, isotype).

The above description is modified from Boise (1984). This species was described in the new genus *Javaria* which was considered to differ from *Astrosphaeriella* based on the lack of pigmentation and sheath in the ascospores of the former. With the description of several new species and the widening of the generic concepts in *Astrosphaeriella* collected we do not feel that *Javaria* warrants its own genus.

23. *Astrosphaeriella splendida* K. D. Hyde & J. Fröhl., sp. nov. – Figs. 145–150.

Ascomata 850–1200 µm diam., 350–420 µm alta, conica. Asci 158–263 × 10–12 µm. Ascospores 42–63 × 7.5–10 µm, 2–3-seriatae, fusiformes, brunneae, 1(–3)-septatae, appendiculatae.



Figs. 145–150. *Astrosphaeriella splendida* (from holotype). – 145. Appearance of ascomata on host surface. – 146, 149. Asci. – 147, 148, 150. Ascospores. – Bars: 145 = 1 mm, 146–150 = 10 µm.

**Etymology.** – In reference to the splendid appendages at each end of the ascospore.

**Ascomata** arising singly, erumpent when mature, immersed only at the base, with teeth-like flanges, black, carbonaceous (Fig. 145); in section 850–1200  $\mu\text{m}$  diam., 350–420  $\mu\text{m}$  high, conical, papillate. – **Asci** 158–263  $\times$  10–12  $\mu\text{m}$ , 8-spored, cylindrical, short pedicellate, with an ocular chamber and faint ring (Figs. 146, 149). – **Ascospores** 42–63  $\times$  7.5–10  $\mu\text{m}$ , 2–3-seriate, fusiform, brown, 1(–3)-septate, constricted at the central septum, smooth-walled, with an appendage at each end. Appendage a short hyaline cylindrical tube c. 2.5  $\mu\text{m}$  long  $\times$  2  $\mu\text{m}$  diam., with a drop of mucilage released from the tip (Figs. 147, 148, 150).

**Known distribution.** – Ecuador.

**Known hosts.** – *Astrocaryum*, *Iriartia*, *Jessenia*, *Mauritia*, Palm.

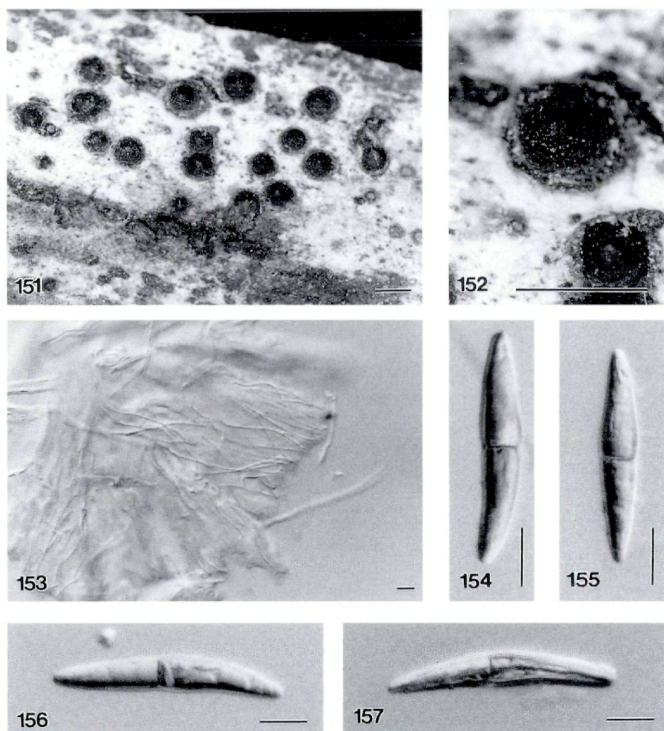
**Material examined.** – ECUADOR: Oriente, Reserva de Producción Faunística Cuyabeno, Rio Cuyabeno, forest near Laguna Grande, Path A, Canangucho, Path B, on dead petiole of unidentified palm, Aug. 1993, K. D. Hyde E160 (HKU(M) 2732, holotype; syntype at QCA); Terra Firme, on petiole of *Astrocaryum* sp., K. D. Hyde E102 (HKU(M) E2702); *ibid.*, E54 (HKU(M) 2668); *ibid.*, E54 (HKU(M) 2669); on petiole of *Iriartia* sp., K. D. Hyde E3, (HKU(M) 2632); Canangucho, on dead petiole of *Mauritia flexuosa*, Aug. 1993, J. Fröhlich (HKU(M) JF110); on dead petiole of *Jessenia bataua*, Aug. 1993, J. Fröhlich (HKU(M) JF166).

This species differs from other *Astrosphaeriella* species as its ascospores have unusual appendages at each end.

24. ***Astrosphaeriella stellata*** (Pat.) Sacc., Syll. Fung. 24: 938. 1928. – Figs. 151–167.

**Reference.** – Hawksworth (1981).

**Ascomata** arising singly, erumpent, becoming superficial, immersed at the base, with teeth-like flanges, brown, carbonaceous (Figs. 151, 152, 158); in section 750–1000  $\mu\text{m}$  diam., 175–250  $\mu\text{m}$  high, hemispherical, ostiolate. – **Asci** 120–140  $\times$  14–18  $\mu\text{m}$ , 8-spored, cylindrical-clavate, pedicellate, with an ocular chamber and faint ring (Figs. 159, 160). – **Ascospores** 42–58  $\times$  5.5–7  $\mu\text{m}$ , 2–3-seriate, elongate-fusiform, straight or slightly curved, hyaline or becoming pale brown with age, 1-septate, slightly constricted at the central septum, with a persistent sheath surrounding the ascospores. Sheath appearing hollow at the ends and releasing spreading mucilage in some specimens (Figs. 154–157, 161–167).

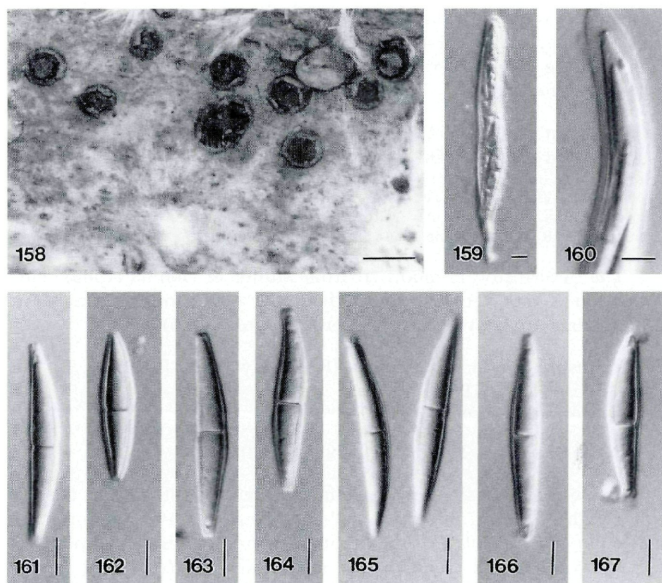


Figs. 151–157. *Astrosphaeriella stellata* (from holotype of *Amphisphaeria stellata*). – 151, 152. Appearance of ascomata on host surface. – 153. Squash mount of trapeculae. – 154–157. Ascospores. – Bars: 151, 152 = 1 mm, 153–157 = 10  $\mu$ m.

**Known distribution.** – Australia, China, French Guiana, India, Indonesia (Java), Japan, Papua New Guinea, Philippines, Vietnam.

**Known hosts.** – Bamboo, *Calamus*.

**Material examined.** – AUSTRALIA: north Queensland, Kuranda, on dead stem of *Calamus* sp., Feb. 1992, K. D. Hyde & J. Fröhlich (HKU(M) 1018b); Palmerston, Palmerston National Park, on dead rattan of *Calamus radicalis*, Mar. 1994, J. Fröhlich (HKU(M) JF309); Palmerston Highway, Goolagan Creek, on dead rattan of *C. radicalis*, Apr. 1995, J. Fröhlich (HKU(M) JF707). – PHILIPPINES: Mindanao, Bukidnon, Impalutao, in rainforest on bamboo, Dec. 1993, K. D. Hyde (HKU(M) 1868); *ibid.*, K. D. Hyde (HKU(M) 1896). – VIETNAM: Hanoi, 'sur Bambou', 17 Apr. 1911, M. Duport 451 (FH-Pat 5521, holotype of *Amphisphaeria stellata*).



Figs. 158–167. *Astrospphaeriella stellata* (from HKU(M) 1018b). – 158. Appearance of ascomata on host surface. – 159, 160. Asci. – 161–167. Ascospores, with mucilage covering. – Bars: 158 = 1 mm, 159–167 = 10  $\mu$ m.

*Astrospphaeriella stellata* is described from bamboo in India, Japan, Java, Philippine Islands and Vietnam (Hawksworth, 1981) and is rather common in western Japan (Hino & Katumoto, 1956). This is the first record from palms. Some additional collections are provided by Eriksson & Yue (1988), Aptroot (1995) and Courtecuisse & al. (1996). For synonyms see Hawksworth (1981). There is a wide range of ascospore size in this species.

25. *Astrospphaeriella striaspora* (E. Müll.) D. Hawksw. & Boise, Sydowia 38: 119. 1985.

= *Trematosphaeria striaspora* E. Müll., Kew Bull. 19: 384. 1965.

Reference. – Müller & Dennis (1965).

Ascomata arising singly or in small groups, superficial, immersed only at the base, ostiole slightly raised; in section 400–500  $\mu$ m diam., conical. – Asci 150–180  $\times$  15–20  $\mu$ m, 8-spored, cylindrical,



pedicellate, with an ocular chamber and surrounded by faint ring. – Ascospores  $65\text{--}75 \times 7\text{--}8 \mu\text{m}$ , 1–3-seriate, fusiform, light brown, 3(–6)-septate, constricted at the central septum, with 5–6 longitudinal wall striations.

Known distribution. – Venezuela.

Known hosts. – On dead grass [*Valota insularis*].

Type. – VENEZUELA: roadside in the Guatopo forest between Ocumare del Tuy and Altagracia de Orituco, Edo Miranda, on dead grass [*Valota insularis*], 25 June 1958, R. W. G. Dennis 1306 (K, holotype, non vide).

The description is modified from Müller & Dennis (1965). This collection is reported to be in rather poor condition, but excellent illustrations are provided by Müller & Dennis (1965).

26. ***Astrosphaeriella striataspora*** (K. D. Hyde) K. D. Hyde, Bot. J. Linn. Soc. 110: 97. 1992.

= *Trematosphaeria striataspora* K. D. Hyde, Bot. J. Linn. Soc. 98: 142. 1988.

References. – Hyde (1988, 1992, 1993).

Ascomata arising singly, immersed, erumpent only at the ostiole, slightly raised; in section  $352\text{--}528 \mu\text{m}$  diam.,  $176\text{--}355 \mu\text{m}$  high, lenticular. – Asci  $99\text{--}173 \times 11\text{--}23 \mu\text{m}$ , 8-spored, cylindrical, pedicellate, with an ocular chamber and surrounded by faint ring. – Ascospores  $31\text{--}38 \times 6\text{--}9 \mu\text{m}$ , 1–2-seriate, fusiform, pale-yellowish brown, 3(–6)-septate, constricted at the septa, with longitudinal wall striations and surrounded by a mucilaginous sheath.

Known distribution. – Brunei, Indonesia (North Sumatra), Malaysia.

Known hosts. – *Nypa*.

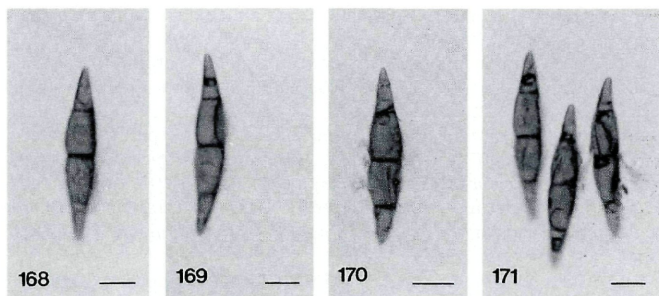
Material examined. – BRUNEI: Bandar Seri Begawan, Kampong Danau mangrove, submerged decaying intertidal fronds of *Nypa fruticans*, 8 July 1985, K. D. Hyde 0238, 0239. – MALAYSIA: Kuala Selangor, on intertidal *Nypa fruticans*, 22 Oct 1991, K. D. Hyde 853 (BRIP 19879). – INDONESIA: North Sumatra, Kampong Nelayan mangrove, on intertidal frond of *Nypa fruticans*, 23 Sep. 1986 (IMI 312390).

*Astrosphaeriella striataspora* was described from intertidal fronds of *Nypa fruticans*. It is distinct from *A. africana* which has 1-septate ascospores.

27. ***Astrosphaeriella tornata*** (Berk. & M.A. Curtis) D. Hawksw. & Boise, Sydowia 38: 119. 1985. – Figs. 168–171.

= *Sphaeria tornata* Berk. & M.A. Curtis, J. Acad. Nat. Sci. Philadelphia ser. 2, 2: 277. 1853.

= *Trematosphaeria tornata* (Berk. & M.A. Curtis) Cooke, Grevillea 16: 91. 1888.



Figs. 168–171. *Astrophaeriella tornata* (from holotype of *Sphaeria tornata*). – 168–171. Ascospores. – Bars = 10  $\mu$ m.

Reference. – Hawksworth & Boise (1985).

Ascomata arising singly, erumpent when young, immersed only at the base, with teeth-like flanges, brown or black, carbonaceous, in section 1000–1600  $\mu$ m diam., 1000  $\mu$ m high, mammiform to conical, ostiolate. – Asci 8-spored, cylindrical, pedicellate, with an ocular chamber and ring. – Ascospores 46–56  $\times$  6–8  $\mu$ m, 1–2-seriate, broadly fusiform, reddish-brown, paler end cells, 3–(–5)-septate, slightly constricted at the septa, narrow at the ends, smooth-walled, with a thin (ca 1  $\mu$ m thick) gelatinous sheath (Figs. 168–171).

Known distribution. – French Guiana, Surinam.

Known hosts. – Palm.

Material examined. – SURINAM: on palm petiole, Herb. Schwein., (K, holotype, as *S. stellulata* Schwein.).

The type material of this species is not in good condition. The description is partly modified from Hawksworth & Boise (1985). The ascospores differ from other *Astrophaeriella* species, as the ends of the spores are narrow and lighter in colour. For a discussion of the differences between this species and *A. vesuvius* see under the latter species. Courtecuisse & al. (1996) have collected this species in French Guiana.

28. *Astrophaeriella trochus* (Penz. & Sacc.) D. Hawksw., Bot. J. Linn. Soc. 82: 46. 1981.

= *Leptosphaeria trochus* Penz. & Sacc., Malpighia 11: 401. 1897.

References. – Hawksworth (1981); Hawksworth & Boise (1985); Chen & Hsieh (1994); Hyde & al. (1997).

Ascomata arising singly, 2–3 rarely united at the base, erumpent when young, immersed only at the base, some with teeth-like flanges, brown or black, carbonaceous, in section (225–)600–800(–1000)  $\mu\text{m}$  diam., (295–)500–800(–1000)  $\mu\text{m}$  high, conical, ostiolate. – Asci 160–220  $\times$  10–20  $\mu\text{m}$ , 8-spored, cylindrical, short pedicellate, with an ocular chamber and ring. – Ascospores (44–)48–65(–72)  $\times$  (5–)6–8(–9)  $\mu\text{m}$ , 2-seriate, elongate fusiform, sometimes tending to be arcuate, gradually tapering towards the apices, reddish-brown, sometimes with paler end cells, 3–5-septate, constricted at the septa, smooth-walled, with inconspicuous mucilage at the tips.

Known distribution. – Chile, China, Colombia, Ecuador, French Guiana, Japan, Indonesia (Java), South Africa, Taiwan, Uganda.

Known hosts. – Old bamboo stems and stout grasses.

Material examined. – SOUTH AFRICA: Durban, Palmiet River, on submerged *Phragmites*, Nov. 1994, T. S. Steinke & K. D. Hyde (HKU(M) 2170).

The above description is modified from Hawksworth (1981). This species is most similar to *A. tornata*, but differs in having longer ascospores with more septa. Eriksson & Yue (1988) lists this species as having been recorded in China, and Courtecuisse & al. (1996) have collected it in French Guiana. For further synonyms see Hawksworth (1981), Hawksworth & Boise (1985), Eriksson & Yue (1988) and Chen & Hsieh (1994).

29. ***Astrosphaeriella uberina*** (Mont.) K. D. Hyde & J. Fröhl., comb. nov. – Figs. 172–182.

≡ *Sphaeria uberina* Mont., Ann. Sci. Nat. Ser 4 3: 132 (1855).

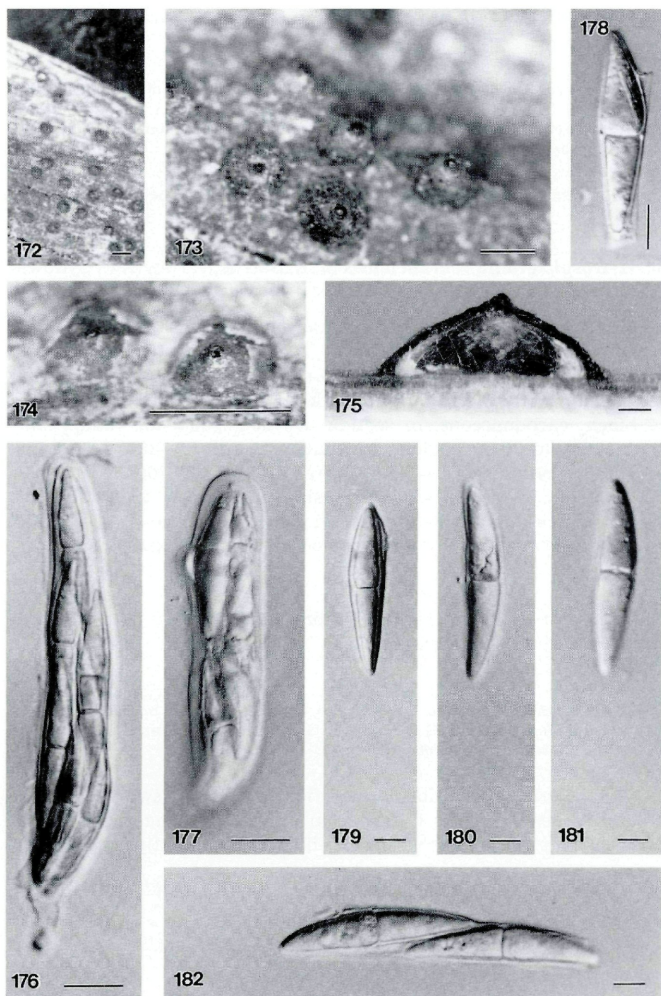
≡ *Didymella uberina* (Mont.) Sacc., Syll. Fung. 1: 560 (1882).

≡ *Melanopsamma shimekii* Ellis & Everh., Bull. Lab. Nat. Hist. Univ. Iowa 2: 402 (1893).

≡ *Javaria shimekii* (Ellis & Everh.) M.E. Barr, N. Amer. Flora II, 13: 27 (1990).

Reference. – Barr (1990).

Ascomata arising singly, erumpent, becoming superficial, immersed at the base, without teeth-like flanges, dark-brown, black around the ostiole, carbonaceous (Figs. 172–174); in section 700–840  $\mu\text{m}$  diam., 450–560  $\mu\text{m}$  high, hemispherical to conical (Fig. 175). – Asci 150–180  $\times$  12–15  $\mu\text{m}$ , 8-spored, cylindric-clavate, pedicellate, with an ocular chamber and faint ring (Figs. 176, 177). – Ascospores 48–57  $\times$  10–12  $\mu\text{m}$ , 2–3-seriate, fusiform, straight or slightly curved, hyaline or becoming pale yellow with age, 1-septate, constricted at the central septum, lacking a sheath (Figs. 179–182).



Figs. 172–182. *Astrophaeriella uberina* (172, 173, 178, from holotype of *Melanopsamma shimckii*; 174–177, 179–182 from holotype of *Sphaeria uberina*). – 172–174. Appearance of ascomata on host surface. – 175. Section of ascoma. – 176, 177. Asci. – 178–182. Ascospores – Bars: 172–174 = 1 mm, 175 = 100  $\mu$ m, 176–182 = 10  $\mu$ m.



Known distribution. – French Guiana, Nicaragua.

Known host. – Wood.

Material examined. – FRENCH GUIANA: Cayenne, on petiole of palm, Leprieur 571 (P, holotype of *Sphaeria uberina*). – NICARAGUA: Ometepe, on old wood, Jan.–Feb. 1893, B. Shimek, C.L. Smith Central Amer. Fungi 12 (NY, holotype of *Melanopsamma shimekii*).

Courtecuisse & al. (1996) have collected this species in French Guiana.

30. *Astrosphaeriella venezuelensis* M. E. Barr & D. Hawksw., Sydowia 38: 51. 1985.

Reference. – Hawksworth & Boise (1985).

Ascomata arising singly or in small groups, erumpent, finally superficial, with or without teeth-like flanges, dark purplish brown to black, carbonaceous; in section 600–800(–1000)  $\mu\text{m}$  diam., 500–1000(1500)  $\mu\text{m}$  high, conical, papillate. – Asci 160–200  $\times$  14–16  $\mu\text{m}$ , 8-spored, cylindrical. – Ascospores (70–)72–80(–83)  $\times$  (5–)6.5–7.5(–8.5)  $\mu\text{m}$ , 2-seriate, elongate-fusiform, abruptly tapered at the apices which are beak-like or uncinata, pale brown, 3-septate, slightly constricted at the septa, smooth-walled, lacking a mucilaginous sheath.

Known distribution. – Venezuela.

Known hosts. – Bamboo?.

Material examined. – VENEZUELA: Edo. Sucre, Arriba, trail from Los Pocitos through La Roma to town of Rio Grande, on dead bamboo-like stem, 13 July 1972, K. P. Dumont, G. J. Samuels, G. Morillo & J. Farfan [Dumont, Fungi Venezuela VE-5030] (IMI 251061, holotype).

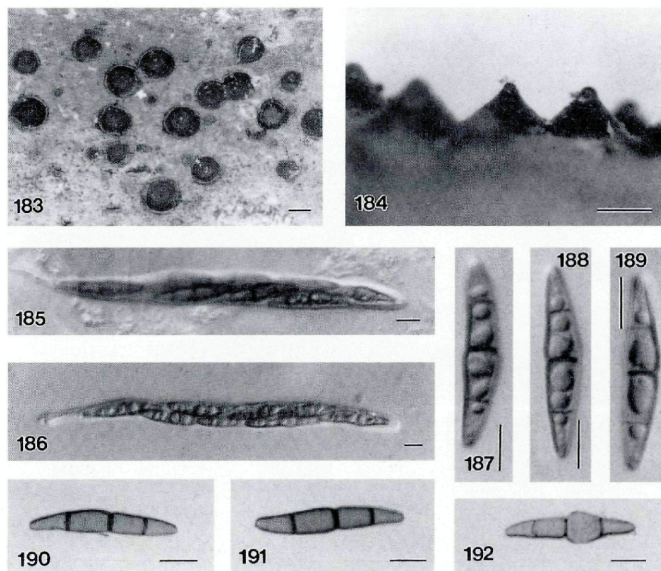
The above description is modified from Hawksworth & Boise (1985). *A. venezuelensis* differs from other *Astrosphaeriella* species as it has long ascospores with beak-like or uncinata tips.

31. *Astrosphaeriella vesuvius* (Berk. & Broome) D. Hawksw., Sydowia 38: 122. 1985. – Figs. 183–201.

= *Sphaeria vesuvius* Berk. & Broome, J. Linn. Soc. Bot. 14: 127. 1875.

Reference. – Hawksworth & Boise (1985).

Ascomata arising singly or in small groups, erumpent when mature, immersed only at the base, with or without teeth-like flanges, black, carbonaceous (Figs. 183, 184, 193, 194); in section 750–



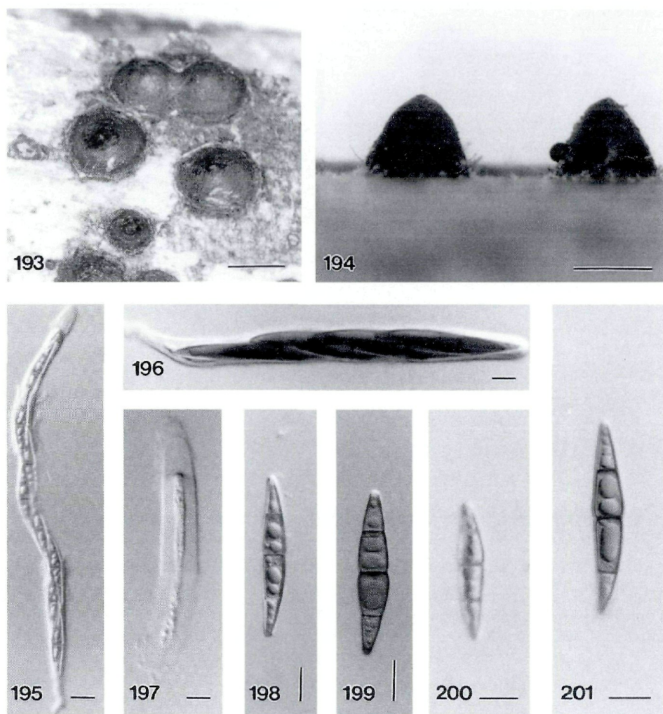
Figs. 183–192. *Astrophaeriella vesuvius* (183–189, from HKU(M) 1364; 190–192 from holotype of *Sphaeria vesuvius*). – 183, 184. Appearance of ascomata on host surface. – 185, 186. Asci. – 187–192. Ascospores. – Bars: 183, 184 = 1 mm, 185–192 = 10  $\mu$ m.

1800  $\mu$ m diam., 800–1200  $\mu$ m high, conical to mammiform, papillate, beaked. – Asci 180–210  $\times$  14–17  $\mu$ m, 8-spored, cylindrical, pedicellate, with an ocular chamber and faint ring (Figs. 185, 186, 195–197). – Ascospores (33–)36–45(–50)  $\times$  (5.5–)7–8(–9)  $\mu$ m, 2–3-seriate, fusi-form, light brown or brown, 3-septate, slightly constricted at the septa, smooth-walled, with a sticky layer which appears to be swollen at the spore ends (Figs. 187–192, 198–201).

Known distribution. – Australia, Brunei, China, French Guiana, Indonesia, Malaysia, Papua New Guinea, Philippines, Sri Lanka.

Known hosts. – Bamboo, *Calamus*, *Daemonorops*, *Korthalsia*, *Licuala*, Palm.

Material examined. – AUSTRALIA: north Queensland, Palmerston, Palmerston National Park, on dead rattan sheath of *Calamus australis*, Mar. 1994, J. Fröhlich (HKU(M) JF320; Palmerston Highway, Goolagan Creek, on dead rattan



Figs. 193–201. *Astrosphaeriella vesuvius* (from HKU(M) 1135a). – 193, 194. Appearance of ascocysts on host surface. – 195–197. Asci. – 198–201. Ascospores. – Bars: 193, 194 = 1 mm, 195 = 20  $\mu$ m, 196–201 = 10  $\mu$ m.

of *Calamus radicalis*, Apr. 1995, J. Fröhlich (HKU(M) JF703). – BRUNEI: Temburong, Batu Apio Forest Reserve, Sungai Belalong, Kuala Belalong Field Studies Centre, Anak Esu Tributary, Right hand side as proceeding upstream, on dead rachis of *Calamus conirostris*, July 1993, J. Fröhlich (HKU(M) JF101); Ashton's Trail, on dead rachis base of *C. conirostris*, Jan. 1994, J. Fröhlich (HKU(M) JF237); on dead rattan sheath of *Daemonorops oxycarpa*, Jan. 1995, J. Fröhlich (HKU(M) JF503); *ibid.*, (HKU(M) JF513); Belalong Trail, East Ridge, on dead rattan sheath of *Calamus comptus*, June 1995, J. Fröhlich (HKU(M) JF734). – INDONESIA: Java, Cibodas, on dead stem of *Calamus* sp., Mar. 1992, K. D. Hyde (HKU(M) 1135a). – MALAYSIA: Negiri Sembilan, Pasoh Forest Reserve, on dead rachis of *Licuala* sp., Oct. 1992, K. D. Hyde (HKU(M) 1829); *ibid.*, K. D. Hyde (HKU(M) 1744); *ibid.*, K. D. Hyde (HKU(M) 1702). – PAPUA NEW GUINEA: Green River, on dead stem of *Korthalsia* sp., May 1992, K. D. Hyde (HKU(M) 1364). – PHILIPPINES: Mindanao, Bukidnon, Impalutao, in rainforest on bamboo, Dec. 1993, K. D. Hyde (HKU(M)

1873); *ibid.*, K. D. Hyde (HKU(M) 1869a); *ibid.*, K. D. Hyde (HKU(M) 1869b). – SRI LANKA: on dead palm rachis, Nov. 1867, Herb. Berk. 1879 (K, holotype of *Sphaeria vesuvius*).

Three species *A. tornata*, *A. trochus* and *A. vesuvius* are similar and there is confusion surrounding their characters. Hawksworth & Boise (1985) separate these species in their key based on *A. vesuvius* having smaller ascospores. In *A. tornata* and *A. trochus* ascospores mainly exceed 50  $\mu\text{m}$ , whereas ascospores in the former are 5, as compared to 3-septate in the latter. The situation is confounded by the fact that the type material of *A. tornata* and *A. vesuvius* are both in poor condition. In this paper *A. vesuvius* is treated as different from *A. tornata*, the latter having ascospores with more pointed ends and lighter coloured end cells. However, as Hawksworth & Boise (1985) state, these species „may prove to be conspecific ... when more information is available on its range of variation“. Eriksson & Yue (1988) list this species from China and Courtecuisse & al. (1996) have collected *A. tornata* in French Guiana. For other synonyms see Hawksworth & Boise (1985).

### ***Trematosphaeria* species from palms**

***Trematosphaeria abuensis*** Panwar, Srivastava & Gehlot, *Curr. Sci.* 41: 227. 1972. – Figs. 202–212.

Reference. – Panwar & al. (1972).

Ascomata arising singly, erumpent when mature, immersed only at the base, with remnants of host remaining at the base, black, carbonaceous (Figs. 202, 203); in section conical, papillate. – Ascii 8-spored, cylindrical, with an ocular chamber and ring (Figs. 204–207). – Ascospores 72–94  $\times$  14–18.5  $\mu\text{m}$ , 2–3-seriate, clavate or broad-fusiform, brown, (3–)6(–7)-septate, not constricted at the septa, with a fine verrucose ornamentation, lacking a sheath (Figs. 208–212).

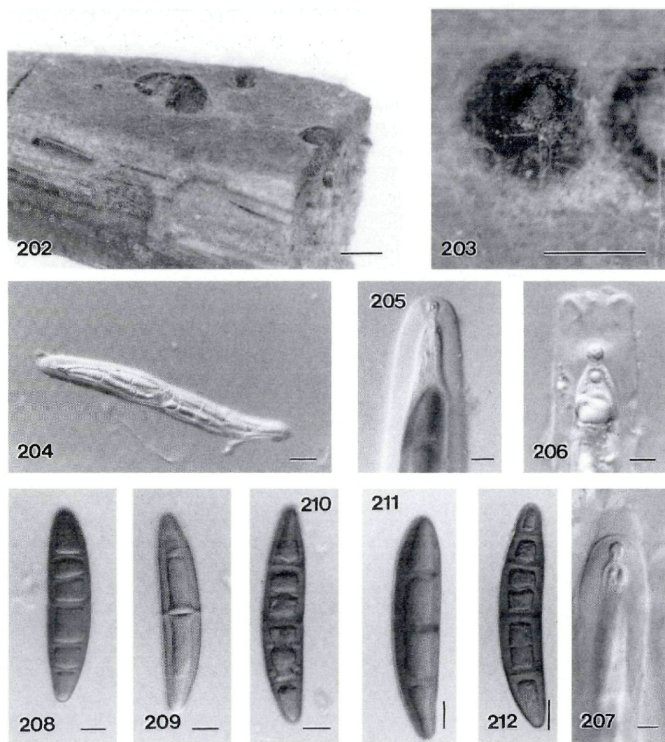
Known distribution. – India.

Known hosts. – *Phoenix*.

Material examined. – INDIA: Jodhpur, on *Phoenix sylvestris*, 31 Aug. 1971, K. S. Panwar (IMI 159622, holotype of *Trematosphaeria abuensis*).

Although this *Trematosphaeria* species is described from palms, it has many characters typical of *Trematosphaeria* and is therefore retained in this genus.















Figs. 202–212. *Trematosphaeria abuensis* (from holotype). – 202, 203. Appearance of ascomata on host surface. – 204–207. Asci. – 208–212. Ascospores. – Bars: 202, 203 = 1 mm, 205–207 = 20  $\mu$ m, 204, 208–212 = 10  $\mu$ m.

### Species excluded from *Astrophaeriella*


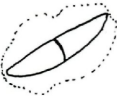





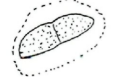

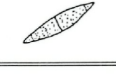
- Massarina corticola*** (Fuckel) Holm, Symb. Bot. Upsal. 14: 147. 1957.  
= *Rhynchostoma lageniforme* Teng, Sinesia 7: 508. 1936.  
= *Astrophaeriella lageniformis* (Teng) J.-Z. Yue & O. Erikss., Mycotaxon 27: 94. 1986.

For further information on this synonymy see Hyde & Aptroot (1997).


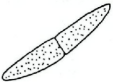





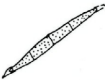

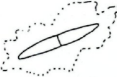
Tab. 1. Pictorial synopsis of *Astrosphaeriella* species.

Species	Habit	Ascospore size ( $\mu\text{m}$ )	Ascospore shape	Host	Reference
<i>Astrosphaeriella aequatoriensis</i> K. D. Hyde & J. Fröhl.		60–62.5 $\times$ 10–11		Palm	This paper
<i>Astrosphaeriella africana</i> D. Hawksw.		46–57 $\times$ 5.5–6.5 (–8)		Palm & Grass	Hawksworth & Boise (1985), this paper
<i>Astrosphaeriella angustispora</i> K. D. Hyde & J. Fröhl.		25–30 $\times$ 2.3–2.8		Palm	This paper
<i>Astrosphaeriella aquatica</i> K. D. Hyde		30–42 $\times$ 7–8		Submerged palm	Hyde (1994a)
<i>Astrosphaeriella australiensis</i> K. D. Hyde & J. Fröhl.		50–60 $\times$ 5–6		Palm	This paper

Tab. 1 (cont.) Pictorial synopsis of *Astrosphaeriella* species.






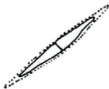




Species	Habit	Ascospore size ( $\mu\text{m}$ )	Ascospore shape	Host	Reference
<i>Astrosphaeriella bakeriana</i> (Sacc.) K. D. Hyde & J. Fröhl.		36–44 $\times$ 5–7(–8)		Palm	This paper
<i>Astrosphaeriella exorrhiza</i> Boise		(68–)74–88 $\times$ 8–10		Palm	Hawksworth & Boise (1985)
<i>Astrosphaeriella floridana</i> M. E. Barr		30–37 $\times$ (4–)5–6		Palm	Barr (1990)
<i>Astrosphaeriella frondicola</i> J. Fröhl. & K. D. Hyde		17.5–25 $\times$ 6.25– 8.75		Palm	Fröhlich & Hyde (1995)
<i>Astrosphaeriella lenticularis</i> K. D. Hyde & J. Fröhl.		37–48 $\times$ 7.5–9.5		Palm	This paper

Tab. 1 (cont.) Pictorial synopsis of *Astrosphaeriella* species.






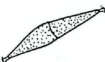




Species	Habit	Ascospore size ( $\mu\text{m}$ )	Ascospore shape	Host	Reference
<i>Astrosphaeriella livistoncola</i> K. D. Hyde & J. Fröhl.		26.3–30.5 $\times$ 5–6		Palm	This paper
<i>Astrosphaeriella lophiostomopsis</i> K. D. Hyde & J. Fröhl.		48–52 $\times$ 8–10		Palm, bamboo	This paper
<i>Astrosphaeriella malayensis</i> K. D. Hyde & J. Fröhl.		30–34 $\times$ 6–8		Palm	This paper
<i>Astrosphaeriella maquilingiana</i> (Rehm) K. D. Hyde & J. Fröhl.		44–52 $\times$ 5–7		Palm	This paper
<i>Astrosphaeriella mauritiae</i> K. D. Hyde & J. Fröhl.		25–28.8 $\times$ 4–5.3		Palm	This paper










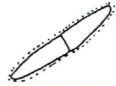



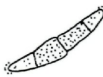
Tab. 1 (cont.) Pictorial synopsis of *Astrosphaeriella* species.

Species	Habit	Ascospore size ( $\mu\text{m}$ )	Ascospore shape	Host	Reference
<i>Astrosphaeriella minima</i> Aptroot		24–29 × 7–8		Bamboo	Aptroot (1995)
<i>Astrosphaeriella minoensis</i> (Hara) D. Hawksw.		25–28 × 6–7		Bamboo	Hawksworth (1981)
<i>Astrosphaeriella nipaecola</i> (Cooke & Masee) K. D. Hyde & J. Fröhl.		52–67 × 6–9		Palm	This paper
<i>Astrosphaeriella nypae</i> K. D. Hyde		18.5–27 × 4–5.9		Intertidal palm	Hyde (1992)
<i>Astrosphaeriella papillata</i> K. D. Hyde & J. Fröhl.		31–45 × 7–8		Palm	This paper

Tab. 1 (cont.) Pictorial synopsis of *Astrosphaeriella* species.

Species	Habit	Ascospore size ( $\mu\text{m}$ )	Ascospore shape	Host	Reference
<i>Astrosphaeriella papuana</i> Aptroot		34–42 $\times$ 6–6.5		Bamboo	Aptroot (1995)
<i>Astrosphaeriella samuelsii</i> (Boise) K. D. Hyde & J. Fröhl.		(43–)46–58(–62) $\times$ 6.5–8		Palm	Boise (1984)
<i>Astrosphaeriella splendida</i> K. D. Hyde & J. Fröhl.		42–63 $\times$ 7.5–10		Palm	This paper
<i>Astrosphaeriella stellata</i> (Pat.) Sacc.		42–58 $\times$ 5.5–7		Bamboo, palm	Hawksworth (1981)
<i>Astrosphaeriella striaspora</i> (E. Müll.) D. Hawksw. & Boise		65–75 $\times$ 7–8		Grass	Müller & Dennis (1965)

Tab. 1 (cont.) Pictorial synopsis of *Astrosphaeriella* species.

Species	Habit	Ascospore size ( $\mu\text{m}$ )	Ascospore shape	Host	Reference
<i>Astrosphaeriella striataspora</i> (K. D. Hyde) K. D. Hyde		31–38 × 6–9		Intertidal palm	Hyde (1988)
<i>Astrosphaeriella tornata</i> (Berk. & Curtis) D. Hawksw & Boise		46–56 × 6–8		Bamboo, palm	Hawksworth & Boise (1985)
<i>Astrosphaeriella trochus</i> (Penz. & Sacc.) D. Hawksw.		(44–)48–65 (–72) × (5–)6–8 (–9)		Bamboo	Hawksworth (1981)
<i>Astrosphaeriella uberina</i> (Ellis & Everh.) K. D. Hyde & J. Fröhl.		48–57 × 10–12		Wood	Barr (1990)
<i>Astrosphaeriella venezuelensis</i> M. E. Barr & D. Hawksw.		(70–)72–80 (–83) × (5–)6.5– 7.5(–8.5)		Bamboo?	Hawksworth & Boise (1985)
<i>Astrosphaeriella vesuvius</i> (Berk. & Broome) D. Hawksw.		(33–)36–45 (–50) × 5.5–)7– 8(–9)		Bamboo	Hawksworth & Boise (1985)

## Acknowledgments

Thanks are extended to the follow organisations for funding this research or providing laboratory facilities: Department of Primary Industries, Mareeba; Northern Australian Quarantine Strategy, Canberra; Australian Quarantine and Inspection Service, Queensland; Department of Botany, University of Brunei Darussalam; Department of Botany, University of Malaya; Department of Applied Science, City Polytechnic, Hong Kong; Department of Agriculture and Livestock, Papua New Guinea; Indonesia. The curators of BRIP, FH, IMI, K, NY, PAD and S are thanked for their help in locating specimens. Mr. A. Y. P. Lee is thanked for photographic and Ms H. Leung for technical assistance. Sabine Huhndorf is thanked for discussion on the genus *Astrosphaeriella* and T. K. Goh is thanked for his presubmission review.

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(Manuscript accepted 1st November 1997)

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