
An accounting of the worldwide members of *Mycena* sect. Longisetae

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Eleven species are accepted in a redefined *Mycena* sect. Longisetae. Two species, *M. palmicola* and *M. khonkhem*, are described as new, and *M. clavulifera* is redescribed based on material collected recently in Thailand. *Mycena trichocephala*, previously accepted in sect. Sacchariferae is herein accepted in sect. Longisetae. Two stirps are provisionally accepted to accommodate the 11 species: stirps Brunneisetosa (4 species) and stirps Longiseta (7 species). All members of sect. Longisetae develop primordia covered with numerous, erect, stiff pileosetae that aid to deter animal predation on the immature hymenophore. All included species develop pileipelli with acanthocyst cells and stiptipelli with non-spinulose cortical hyphae. The center of diversity for *Mycena* sect. Longisetae is southeast Asia.

Key words: Agaricales, Basidiomycetes, mycenoid fungi, setae, southeast Asia, taxonomy, Thailand.

Introduction

Mycena sect. Longisetae A.H. Smith ex Maas G. was established by Maas Geesteranus (1983) as a monotypic taxon based on *M. longiseta* Höhn. Desjardin and Horak (2002) redescribed *M. longiseta* from topotypical Javanese material, and indicated that the temperate Northern Hemisphere taxon historically determined as *M. longiseta* represented a distinct species. The epithet *M. aciculata* (A.H. Smith) Desjardin & E. Horak was accepted for the Northern Hemisphere taxon. In addition, Desjardin and Horak (2002) redefined sect. Longisetae to accommodate seven species, viz., *M. aciculata*, *M. breviseta* Höhn., *M. brevisetosa* Corner, *M. brunneisetosa* Corner, *M. indica* Manimohan & Leelavathy, *M. longiseta*, *M. tenuisetosa* Corner. We herein accept four additional species in the section, and provide an accounting of each taxon and a key to aid in their determination. Desjardin (1995) included *M.*

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trichocephala Singer in sect. Sacchariferae stirps Amparoina because of the hymeniform pileipellis of acanthocysts with interspersed cherocytes. No universal veil of detersile acanthocysts was reported in the protologue of *M. trichocephala* (Singer, 1973), and the cherocytes as illustrated by Singer (1983) are indistinguishable from the pileosetae in *M. tenuisetosa* as illustrated by Corner (1994). Accordingly, *M. trichocephala* is better placed in sect. Longisetae. A type study of *M. clavulifera* (Berk. & Broome) Sacc. was provided by Desjardin (1995: 77) where he indicated that the species was allied with, but distinct from sect. Longisetae. Recently collected material of the species from Thailand, in combination with a redefined sect. Longisetae, provide sufficient data to support inclusion of *M. clavulifera* in sect. Longisetae. Moreover, recent fieldwork in Thailand has uncovered two new species that belong to this section, and they are formally described below.

Morphological and ecological observations

Members of *Mycena* sect. Longisetae are unique among the mycenoid fungi in forming pileipelli with erect, thick-walled, needle-shaped cystidia herein termed pileosetae. The pileosetae arise through a layer of densely spinulose hyphae or through a hymeniform layer of acanthocysts (erect, densely spinulose, broadly clavate cells). Similar pileosetae are developed in a few distantly related marasmioid fungi (e.g., *Marasmius hudsonii* (Pers.:Fr.) Fr., *M. purpureosetosus* Corner, *Marasmiellus tenerrimus* var. *setulosus* (Joss. & A.H. Smith) Desjardin), and probably represent convergent adaptations. We suspect that these pileosetae, covering the exposed surfaces of primordia and developing pilei, serve to inhibit predation by mycophagous molluscs and microarthropods during a critical time in basidiospore development. Corner (1994: 181) reported that basidiomes of *M. tenuisetosa* had a life span of 5-8 days, of which 3-5 days were spent in developing the primordia, and 1-4 days spent in the expanded, sporulating stage. Without protection from predation for the first 3-5 days of basidiome development on exposed substrata, many primordia would not survive through sporulation.

The center of diversity for sect. Longisetae is wet, tropical forests of southeast Asia. During times of basidiome formation in these ecosystems, precipitation occurs nearly daily with extended periods of high humidity. All members of sect. Longisetae are saprotrophic litter decomposers that form basidiomes in the uppermost layers of litter, on leaf and twig surfaces. During periods of rainfall, basidiomes are directly exposed to excessive moisture. Because of their pileipellis anatomy (i.e. acanthocyst-type cells, densely spinulose hyphae, and erect pileosetae), water droplets are suspended over the surface of the pileus by the spinulae and setae, and are not absorbed into the

pileus. This allows the tiny basidiomes to withstand excessive moisture and to remain in excellent, non-water-soaked condition, thereby potentially extending their sporulation period. Soon after the daily rains cease, the uppermost layers of litter dry out quickly in these habitats where temperatures average around 30 C. To counter the effects of periodic xeric conditions between episodes of rain fall, most species have gelatinized pileus tissues capable of absorbing moisture directly from the humid air. Accordingly, the tiny basidiomes do not dry out easily during periods of water stress, thereby extending their lifespan and consequent sporulation period. These morphological adaptations confer fitness to members of sect. *Longisetae* in rain forest habitats.

Taxonomy

Where quality macro- and micromorphological descriptions are available, appropriate literature citations are reported and the descriptions are not duplicated herein. For poorly known species and new species, comprehensive descriptions and illustrations are provided below. All measurements and colors reported for microscopic features were made from dried material rehydrated in 100% ethanol followed by distilled water, 3% KOH or Melzer's reagent. Spore statistics include: \bar{x} , the arithmetic mean of the spore length by spore width (\pm standard deviation) for n spores measured in a single collection; Q , the quotient of spore length and spore width in any one spore, indicated as a range of variation in n spores measured; \bar{Q} , the mean of Q -values in a single collection.

Mycena* sect. *Longisetae A.H. Smith ex Maas G., Proc. K. Ned. Akad. Wet. (Ser. C) 86: 418. 1983.

= *Mycena stirps* Longiseta A.H. Smith, N. Amer. Spec. Mycena: 39. 1947 (nomen nudum). Type species: *Mycena longiseta* Höhn. (Maas Geesteranus, 1980: 97).

Basidiomes small. *Pilei* less than 10 mm diam., convex to plano-convex, sometimes umbilicate, pilose from erect setae, white to orangish white or grey. *Lamellae* ascending, narrowly adnate to free, sometimes attached to a pseudocollarium, narrow, white or pale greyish white. *Stipe* filiform, variously pruinose, hispid, hispidulous or puberulous, typically arising from a circular, hispid basal disc, but sometimes merely subbulbous, white at the apex, base ranging from white to orangish white, greyish white or grey. *Basidiospores* ellipsoid, smooth, amyloid or rarely inamyloid. *Basidia* clavate, 4-spored. *Pleurocystidia* absent. *Cheilocystidia* present or absent, sometimes exudative (gloeocystidia). *Pileipellis* ranging from a hymeniform layer of acanthocysts to a cutis of spinulose hyphae with acanthocyst terminal cells, gelatinous or non-gelatinous, through which arise numerous thick-walled, hyaline or pigmented pileosetae; pileus margin often beset with densely spinulose marginal cystidia

that may or may not have a smooth apical prolongation. *Pileus and lamellar trama* dextrinoid. *Stipe cortical and medullary hyphae* smooth, non-gelatinous, dextrinoid. *Caulocystidia* aculeate to acicular, smooth, thin-walled to thick-walled (setoid). *Clamp connections* present or absent.

Synopsis of taxa

Stirps Brunneisetosa Desjardin, nom. prov.

- M. brunneisetosa* Corner
- M. indica* Manimohan & Leelavathy
- M. tenuisetosa* Corner
- M. trichocephala* Singer

Stirps Longiseta A.H. Smith

- M. aciculata* (A.H. Smith) Desjardin & E. Horak
- M. breviseta* Höhn.
- M. brevisetosa* Corner
- M. clavulifera* (Berk. & Broome) Sacc.
- M. khonkhem* Desjardin, Boonpratuang & Hywel-Jones
- M. longiseta* Höhn.
- M. palmicola* Desjardin, Boonpratuang & Hywel-Jones

Key to *Mycena* sect. *Longisetae*

- 1. When young, pileipellis a hymeniform layer of erect acanthocysts, remaining so at maturity or developing into a subhymeniform layer of erect acanthocysts with interspersed densely spinulose hyphae2
- 1. Throughout maturity, pileipellis a cutis of densely spinulose hyphae with repent acanthocyst terminal cells.....5
- 2. Pileosetae brown, up to 500 µm long or longer3
- 2. Pileosetae hyaline, less than 300 µm long4
- 3. Cheilocystidia absent; pileosetae up to 2000 µm long; pileus disc orangish white; 1:3 pileus diam. to stipe length ratio..... 1. *M. brunneisetosa*
- 3. Cheilocystidia conspicuous, fusoid with sparsely spinulose central region and smooth, acicular apex, exudative; pileosetae up to 500 µm long; pileus white overall; 1:1 pileus diam. to stipe length ratio 2. *M. indica*
- 4. Caulocystidia smooth; basidiospores 5.0-6.5 µm broad; pileus fuscous grey with paler margin; pileosetae up to 90 µm long3. *M. tenuisetosa*
- 4. Caulocystidia densely spinulose; basidiospores 2.5-3.5 µm broad; pileus white overall; pileosetae up to 300 µm long..... 4. *M. trichocephala*
- 5. Pileosetae up to 500 µm long or longer6
- 5. Pileosetae less than 200 µm long.....8

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6. Pileosetae cylindrical to subclavate, with broadly obtuse apices 8-30 μm diam. 5. *M. clavulifera*
6. Pileosetae aculeate to acicular with sharply acute apices 2-8 μm diam. 7
7. Pileosetae up to 500 μm long; pileus umbilicate, white; marginal cystidia clavate, densely spinulose overall. 6. *M. breviseta*
7. Pileosetae up to 1000 μm long; pileus convex, grey; marginal cystidia fusoid, with densely spinulose lower portion and smooth, acicular apices 7. *M. longiseta*
8. Basidiospores inamyloid; caulocystidia thick-walled (setoid); pileosetae 100-200 μm long 8. *M. aciculata*
8. Basidiospores amyloid; caulocystidia thin-walled; pileosetae 50-150 μm long 9
9. Basidiomes tiny, with white pilei 0.5-1 mm diam. and white stipes 0.5-1 mm long; 1-3 lamellae; cheilocystidia absent; on senescent palm leaves 9. *M. palmicola*
9. Basidiomes larger, with grey to fuscous pilei 0.5-7 mm diam. and white stipes 1.5-20 mm long; 7-16 lamellae; cheilocystidia present; on leaves or bark of dicotyledonous trees 10
10. Pileus 0.5-2 mm diam.; stipe 1.5-7 mm long; 7-11 lamellae; caulocystidia ventricose-filiform; cheilocystidia clavate, smooth; basidiospores 4.5-5.5 μm broad; on bark 10. *M. brevisetosae*
10. Pileus 2-7 mm diam.; stipe 10-20 mm long; 10-16 lamellae; caulocystidia absent; cheilocystidia broadly clavate, densely spinulose; basidiospores 3.5-4.5 μm broad; on leaves 11. *M. khonkhem*

Enumeration of taxa

Stirps *Brunneisetosa* nom. prov.

Pileipellis on primordia and immature basidiomes a hymeniform layer of acanthocysts through which arise numerous pileosetae, at maturity the pileipellis develops (through expansion) into a subhymeniform layer or a cutis of densely spinulose hyphae with scattered, erect acanthocysts.

1. *Mycena brunneisetosa* Corner, Beih. Nova Hedwigia 109: 172. 1994.

Holotype collection: MALESIA, Singapore, Mandai Road, 9 Nov. 1934, Corner s.n. (E).

Descriptions and illustrations: Corner (1994: 172-174, Fig. 3); Desjardin and Horak (2002: in press).

Corner (1994) described and illustrated *M. brunneisetosa* based on material collected from a dead branch of *Diospyros* from Singapore. Desjardin and Horak (2002) redescribed the species from analyses of fresh material collected on undetermined dicotyledonous twigs and on *Castanopsis* leaves from Java and Bali. *Mycena brunneisetosa* is most closely allied with *M. indica*, but differs by the features indicated in the Key. The pileus marginal cystidia of the latter two species, and the cheilocystidia of *M. indica*, are similar in morphology and unique in the section. Neither Corner (1994: 174)

nor Manimohan and Leelavathy (1988: 861) reported these structures as being exudative, but in all specimens of both species that we examined, these structures had orange to orangish brown, refractive, globular contents and the apices of many cystidia had orange globules adhered to them. The pileus marginal cystidia of *M. longisetata* are similar in shape, but they are not exudative. These gloeocystidia may inhibit hymenophoral predation by microarthropods on young basidiomes.

2. *Mycena indica* Manimohan & Leelavathy, Mycologia 80: 861. 1988.

Holotype collection: INDIA, Kerala State, Calicut University campus, 6 Jul. 1987, Manimohan #M383 (TRTC 50991; Isotypes K, NY!).

Description and illustrations: Manimohan and Leelavathy (1988: 861-862, Fig. 1).

Mycena indica, described from material collected on the bark of *Artocarpus heterophyllus* Lamk., is known at present from a single collection from India (Isotype: NY!). Manimohan and Leelavathy (1988) placed the species in sect. Sacchariferae because at the time of publication, sect. Longisetatae was characterized by inamyloid basidiospores, gelatinized pileipellis and absence of clamp connections, features not shared by *M. indica*. The recent redefinitions of sect. Sacchariferae (Desjardin, 1995) and sect. Longisetatae (Desjardin and Horak, 2002), supported by the inclusion of numerous taxa, clearly indicates that *M. indica* is better accommodated in sect. Longisetatae where it is closely allied with *M. brunneisetata*.

3. *Mycena tenuisetata* Corner, Beih. Nova Hedwigia 109: 174. 1994.

Holotype collection: MALAYSIA, Johore, Mawai, Sep. 1934, Corner s.n. (E).

Description and illustrations: Corner (1994: 174-181, Figs. 4-8).

This lignicolous species is known at present only from Malaysia. Corner (1994) reported the basidiomes of *M. tenuisetata* as having a strong nitrous odor, a feature not shared by any other member of the section. He reported raising 20 basidiomes on a log collected from Johore, Malaysia, and he provided an excellent discussion and illustrations of basidiome development. Pileipellis anatomy of *M. tenuisetata* is very similar to that of members of sect. Sacchariferae, although a universal veil, characteristic of all members of sect. Sacchariferae, is not produced by *M. tenuisetata*. The pileosetae of the latter species have a swollen base that is often covered with small spinulae. Within section Longisetatae, this feature is shared only by *M. trichocephala*, suggesting a close affinity of these two species.

4. *Mycena trichocephala* Singer, Beih. Sydowia 7: 47. 1973.

Holotype collection: Brazil. Pará, Estancia Pirelli, 7 Jun. 1966, Singer #B4232 (reported as deposited in BAFC; type no longer extant).

Descriptions and illustrations: Singer (1973: 47; 1983: 114, Figs. 4, 5); Desjardin (1995: 34).

Mycena trichocephala is one of only two species belonging to sect. Longisetae known from the New World. Singer (1973) described the species from material collected on dead leaves from Pará, Brazil and subsequently reported several other collections from Manaus, Brazil (Singer, 1983). Because of pileipellis anatomy and the presence of thick-walled pileocystidia (i.e. cheroocytes), Desjardin (1995) accepted the species in sect. Sacchariferae. A re-evaluation of the protologue (no type material is extant) and of the morphology of the pileocystidia suggest that *M. trichocephala* is better accommodated in sect. Longisetae. Singer (1973) described and illustrated (Singer, 1983) the pileocystidia (which he termed acanthocytes) as having a bulb-shaped base (23-29 μm diam.) that was sometimes covered with spinulae ('setulis') and had a single needle-like apical projection 80-314 μm long with walls 1-4 μm thick. Such cells are similar to the pileosetae formed by all members of sect. Longisetae, and if covered basally with spinulae they are indistinguishable from the pileosetae of *M. tenuisetosa*. The protologue of *M. trichocephala* does not mention a granulose pileus surface, and no disarticulated acanthocysts are reported in the micromorphological analysis (Singer, 1973). Hence, it can be assumed that a universal veil is not produced by *M. trichocephala*, a feature that supports exclusion of the species from sect. Sacchariferae in which all known members form a universal veil. Because of the close micromorphological similarity of *M. trichocephala* to *M. tenuisetosa*, we accept the former as a member of sect. Longisetae. One anomalous feature of *M. trichocephala*, however, is the development of spinulose caulocystidia. These acanthophysoid caulocystidia are the norm in sect. Sacchariferae stirps Amparoina and stirps Alphitophora (Desjardin, 1995), but they are currently unknown in sect. Longisetae where all other species form smooth caulocystidia. The suite of micromorphological features exhibited by *M. trichocephala*, seemingly intermediate between sections Sacchariferae and Longisetae, suggest the close affinity of these two lineages.

Stirps Longiseta A.H. Smith, N. Amer. Spec. *Mycena*: 39. 1947 (nomen nudum)

Pileipellis on primordia and mature basidiomes a cutis of repent, densely spinulose hyphae with repent acanthocyst terminal cells, through which arise numerous pileosetae.

5. *Mycena clavulifera* (Berk. & Broome) Sacc., Syll. Fung. 5: 301. 1887.

(Figs. 1-6)

≡ *Agaricus clavuliferus* Berk. and Broome, J. Linn. Soc. Bot. 11: 525. 1871.

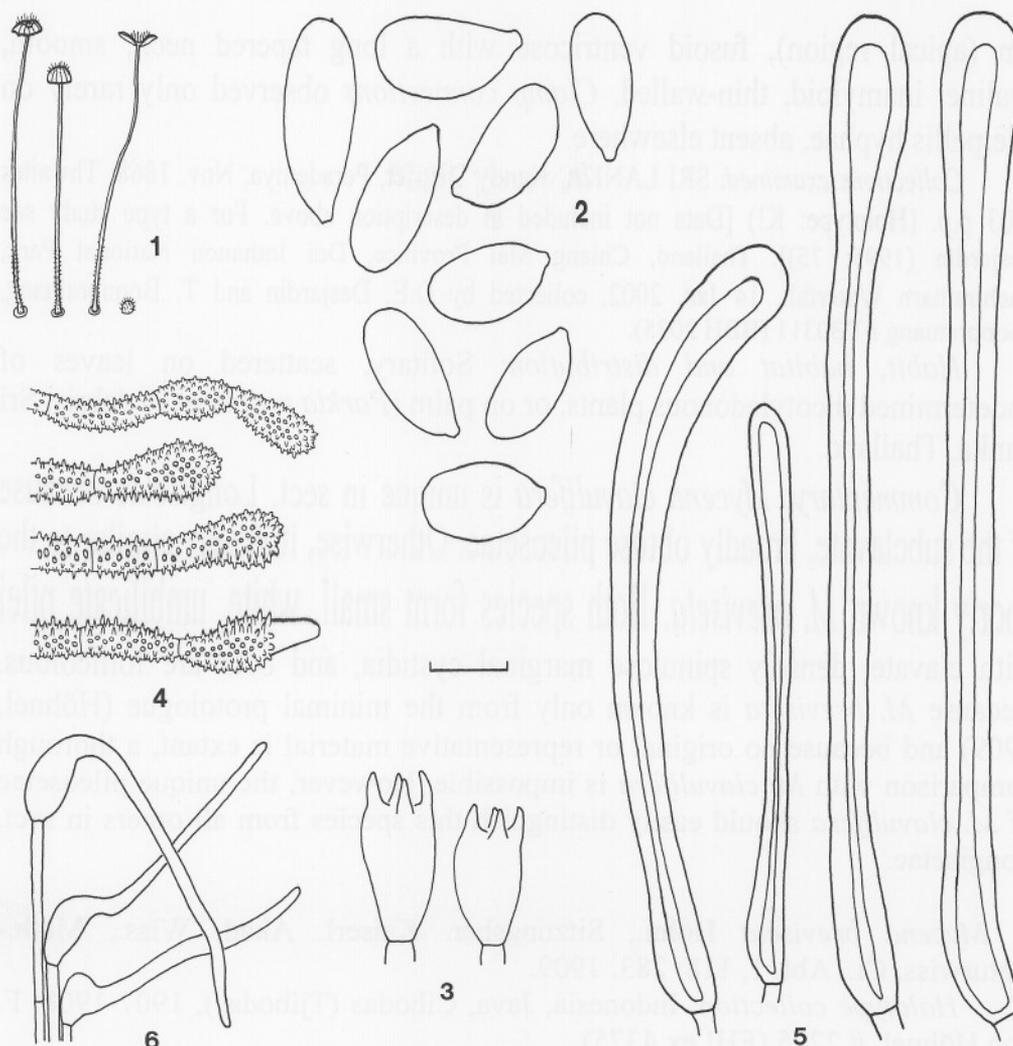
Holotype collection: Sri Lanka, Kandy District, Peradeniya, Nov. 1868, Thwaites #803 p.p. (K!).

Descriptions and illustrations: Petch (1927: 162); Pegler (1986: 194-195, Fig. 40 E-J); Desjardin (1995: 75-76, Figs. 116-120).

Mycena clavulifera was described originally from material collected on decayed vegetable matter from Sri Lanka (Berkeley and Broome, 1871). Petch (1927: 162) redescribed the species based on a collection from dead twigs and decaying inflorescences of the palm *Parkia roxburghii* G. Don. Pegler (1986) collated the macromorphological descriptions published by Berkeley and Broome (1871) and Petch (1927), and provided a comprehensive micromorphological description and illustrations (based on Petch #4448). Apparently, until recently, the species was known from only three collections from Sri Lanka, viz., the two reported in the protologue, and one reported by Petch (1927). Desjardin (1995) published a type study with data that differed slightly from those reported by Pegler (1986). In addition, Pegler (1986), noted the unusual combination of features displayed by *M. clavulifera* and he suggested that it might belong in sect. *Sacchariferae*, whereas Desjardin (1995) indicated that the species was more closely allied with sect. *Longisetae*, albeit distinct from *M. longiseta*. Recently, a collection of this poorly known species was made in Thailand, extending the known range of the species considerably eastward. A description of the Thai collection is provided below.

Primordia (Fig. 1) 1 mm diam., hemispherical, covered with relatively long, hyaline to pale golden setae. *Pileus* (Fig. 1) 1-3 mm diam., convex to plano-convex, becoming umbilicate at maturity, drying deeply umbilicate; margin striate, decurved; disc covered with hyaline to golden setae up to 0.4 mm long; surface dull, dry, white with a pale yellowish brown disc and striae. *Context* very thin, white. *Lamellae* ascending to horizontal, narrowly adnate, distant (8-10) with one series of lamellulae, convex, broad, white. *Stipe* 10-20 × 0.2-0.5 mm, central, filiform, ±equal, arising from a basal disc; surface dull, dry, glabrous at the apex, hispidulous at the base, white overall; *basal disc* 1 mm diam., circular, flattened, greyish white.

Basidiospores (Fig. 2) 7.0-8.5(-9.5) × 3.5-4.5 μm (\bar{x} = 7.8 ± 0.7 × 3.9 ± 0.4 μm, Q = 1.8-2.2, \bar{Q} = 2.0 ± 0.1, n = 15), narrowly ellipsoid, smooth, hyaline, amyloid, thin-walled. *Basidia* (Fig. 3) 12.5-16 × 7-8 μm, broadly clavate, 4-spored. *Basidioles* broadly clavate. *Pleurocystidia* absent. *Cheilocystidia* absent. *Pileipellis* (Fig. 4) a cutis of repent, densely spinulose hyphae through which arise numerous pileosetae; *hyphae* 4.5-10 μm diam.,



Figs. 1-6. *Mycena clavulifera* (TB 0311). 1. Basidiomes (x2). 2. Basidiospores. 3. Basidia. 4. Pileipellis hyphae with terminal marginal cystidia. 5. Pileosetae. 6. Caulocystidia. Bars: 1 = 5 mm; 2 = 5 μ m; 3 = 10 μ m; 4-6 = 20 μ m.

cylindrical to inflated, hyaline, inamyloid, subgelatinous to non-gelatinous, thin-walled; *spinulae* 0.5-1.5 \times 0.5 μ m, cylindrical; *marginal cystidia* (terminal cells at pileus margin) clavate to ventricose, densely spinulose overall or seldom with a smooth apical region; *pileosetae* (Fig. 5) 150-260(-400) \times 12-20 μ m (at base) \times 10-15 μ m (at middle) \times (8-)13-30 μ m (at apex), cylindrical to subclavate, broadly obtuse, smooth, inamyloid, with hyaline to yellow or tawny walls 2-6 μ m thick. *Hypodermium* slightly differentiated from pileus tramal hyphae; hyphae inflated up to 24 μ m diam., weakly dextrinoid. *Pileus trama* of interwoven hyphae 8-16 μ m diam., weakly dextrinoid. *Lamellar trama* weakly dextrinoid. *Stipe tissue* monomitic; *cortical hyphae* 4-8 μ m diam., parallel, cylindrical, smooth, hyaline, dextrinoid, thin-walled; *medullary hyphae* 8-12 μ m diam., dextrinoid. *Caulocystidia* (Fig. 6) absent from upper 2/3 of stipe, scattered and scarce on lower 1/3 of stipe, 80-100 \times 9-10 μ m (base) \times 3.5-4.5

µm (apical region), fusoid ventricose with a long tapered neck, smooth, hyaline, inamyloid, thin-walled. *Clamp connections* observed only rarely on pileipellis hyphae, absent elsewhere.

Collections examined: SRI LANKA, Kandy District, Peradeniya, Nov. 1868, Thwaites #803 p.p. (Holotype: K!) [Data not included in description above. For a type study see Desjardin (1995: 75)]. Thailand, Chiang Mai Province, Doi Inthanon National Park, Vachiratharn Waterfall, 14 Jan. 2002, collected by D.E. Desjardin and T. Boonpratuang, Boonpratuang #TB0311 (BBH 2025).

Habit, habitat and distribution: Solitary, scattered on leaves of undetermined dicotyledonous plants, or on palm (*Parkia roxburghii*) debris. Sri Lanka, Thailand.

Commentary: *Mycena clavulifera* is unique in sect. Longisetae because of the subclavate, broadly obtuse pileosetae. Otherwise, it is very similar to the poorly known *M. breviseta*. Both species form small, white, umbilicate pilei with clavate, densely spinulose marginal cystidia, and both are foliicolous. Because *M. breviseta* is known only from the minimal protologue (Höhnelt, 1909) and because no original or representative material is extant, a thorough comparison with *M. clavulifera* is impossible. However, the unique pileosetae of *M. clavulifera* should easily distinguish this species from all others in sect. Longisetae.

6. *Mycena breviseta* Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 118: 283. 1909.

Holotype collection: Indonesia, Java, Cibodas (Tjibodas), 1907-1908, F. von Höhnelt, # 2225 (FH! ex 4375).

Descriptions: Höhnelt (1909: 283-284); Desjardin and Horak (2002: in press).

Mycena breviseta was described from a single collection on dry leaves from a forest at Cibodas (Tjibodas), Java. The holotype collection contains no intact basidiomes and no pilei. Desjardin and Horak (2002) provided a translation of the protologue and a brief commentary on allied species. Until further material is collected, this taxon will remain insufficiently known.

7. *Mycena longiseta* Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 118: 282. 1909.

Holotype collection: Indonesia, Java, Cibodas (Tjibodas), 1907-1908, F. von Höhnelt, 2225 (FH! ex 4386). Note that von Höhnelt used the number 2225 for the holotype collections of both *M. longiseta* and *M. breviseta*, although data annotated by von Höhnelt on the collection labels differ and the herbarium accession numbers differ.

Descriptions and illustrations: Höhnelt (1909: 282-283); Desjardin and Horak (2002: in press).

Mycena longiseta is a species restricted to southeast Asia. Although the epithet has been used since 1938 (Kühner, 1938: 172) for a widely distributed temperate Northern Hemisphere taxon, the latter species is more appropriately identified as *M. aciculata* (see below). A comprehensive redescription and illustrations of this important species, the type of sect. Longisetae, was published recently by Desjardin and Horak (2002). See there for details. Diagnostic features include the very long (up to 1000 µm), hyaline pileosetae on a grey, convex pileus, amyloid basidiospores, distinctive pileus marginal cystidia, and thin-walled, smooth caulocystidia.

8. *Mycena aciculata* (A.H. Smith) Desjardin & E. Horak, Sydowia (in press).

≡ *Mycena codoniceps* var. *aciculata* A.H. Smith, Mycologia 29: 344. 1937.

Holotype collection: United States, California, Humboldt Co., Orick, 2 Dec. 1935, A.H. Smith #3704 (MICH!).

Descriptions and illustrations: As *Mycena codoniceps*: Kühner (1926: 86-91, Fig. 21). As *Mycena codoniceps* var. *aciculata*: Smith (1937: 344, Fig. 1, e-f). As *Mycena longiseta*: Kühner (1938: 172-176, Fig. 50), Smith (1947:57-59, Fig. 2 nos. 1, 2, 9), and Maas Geesteranus (1983: 419-421, Figs. 46-52; 1992: 25-27, Figs. 46-52).

Mycena aciculata represents the common, widely distributed, temperate Northern Hemisphere species misidentified in the literature as *M. longiseta*. A commentary on *M. aciculata* and the confusion surrounding the species concept of *M. longiseta* was published recently by Desjardin and Horak (2002). See there for details. *Mycena aciculata* differs from *M. longiseta* primarily in the former species having inamyloid basidiospores, distinctive cheilocystidia, more strongly gelatinized pileipellis tissue, shorter pileosetae, thick-walled caulocystidia and basal disc cystidia (i.e. setae), and in lacking pileus marginal cystidia.

9. *Mycena palmicola* Desjardin, Boonpratuang & Hywel-Jones, **sp. nov.**

(Figs. 7-13)

Pileus 0.5-1 mm, convexus, sulcatus, albidus, hispidulus, pilis 0.1 mm longis hyalinis sparsis ornatus. *Lamellae* adnexae, remotae, primariae 1-3, albae. *Stipes* 0.5-1 × 0.2 mm, albus, filiformis, basim versus pruinosis, basi discoideo pruinosis instructus. *Sporae* 7.5-9(-9.5) × 4.8-5.6 µm, ellipsoideae, leves, hyalinae, amyloideae. *Basidia* 4-spora. *Basidiola* clavata. *Pleurocystidia* et *cheilocystidia* nulla. *Hyphae pileipellis* 3.5-6.5 µm latae, cylindraceae, haud gelatinosae, echinulatae, spinulis minutis, cylindraceis 0.5-1.5 × 0.5 µm dense instructae; *pileosetae* 75-150 × 5-8 µm (ad basim) × 2.5-3.5 µm (ad apicem), hyalinae, crassitunicatae. *Trama pilei* et *lamellarum* ex *hyphis* dextrinoideis compositum. *Hyphae corticales stipitis*

dextrinoideae, leves. *Caulocystidia* 28-68 × 8-10 µm, ad basim inflata, hyalina, tenuitunicata. Ad folia dejecta Licuali. Thailandia. Holotypus: BBH 1966.

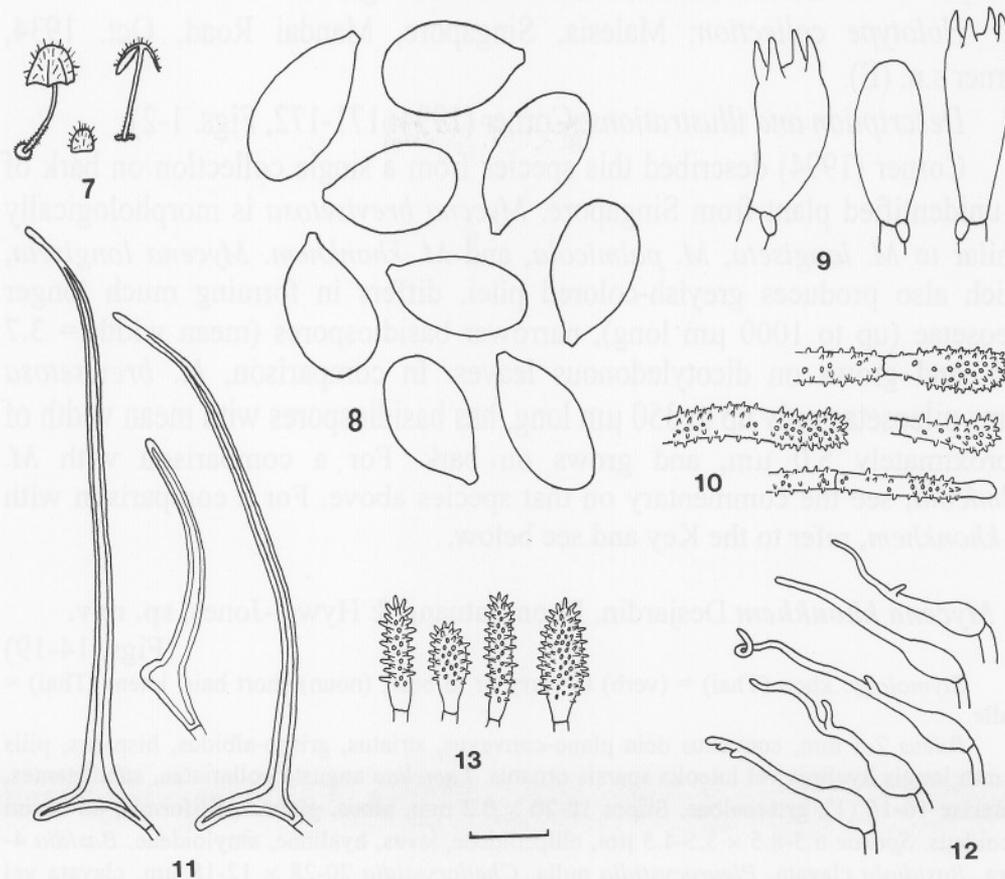
Primordia 0.5 mm diam., hemispherical, minutely hispidulous from short, erect setae, white. *Pileus* (Fig. 7) 0.5-1 mm diam., convex, sulcate, minutely hispidulous from short, erect, hyaline setae, dull, dry, white. *Lamellae* horizontal, adnexed, remote (1-3) with no lamellulae, white. *Stipe* 0.5-1 × 0.2 mm, central, cylindrical, dull, dry, glabrous above, base pruinose, white overall, arising from a small, circular, concave, pruinose, white basal disc.

Basidiospores (Fig. 8) 7.5-9(-9.5) × 4.8-5.6 µm ($\bar{x} = 8.4 \pm 0.6 \times 5.2 \pm 0.3$ µm, $Q = 1.4-1.9$, $\bar{Q} = 1.62 \pm 0.1$, $n = 15$), ellipsoid, smooth, hyaline, weakly amyloid, thin-walled. *Basidia* (Fig. 9) 16-20 × 8-9.5 µm, broadly clavate, 4-spored. *Basidioles* (Fig. 9) clavate. *Pleurocystidia* absent. *Cheilocystidia* absent. *Pileipellis* a cutis of repent, sparsely to densely spinulose hyphae through which arise numerous pileosetae; *hyphae* (Fig. 10) 3.5-6.5 µm diam., cylindrical, non-gelatinous, hyaline, inamyloid; terminal cells at pileus margin forming *marginal cystidia* (Fig. 10) 24-32 × 5.5-9 µm, clavate, apically spinulose, basally smooth, hyaline, thin-walled; *spinulae* 0.5-1.5 × 0.5 µm, cylindrical, unevenly distributed; *pileosetae* (Fig. 11) 75-150 × 5-8 µm (base) × 2.5-3.5 µm (apex), filiform to acicular, apex sharply acute, base geniculate, with hyaline, inamyloid walls 0.5-2.5 µm thick. *Pileus tramal hyphae* 5-10.5 µm diam., cylindrical to inflated, non-gelatinous, hyaline, dextrinoid. *Lamellar tramal hyphae* similar to those in pileus trama, dextrinoid. *Stipe tissue* monomitic; *cortical and medullary hyphae* 4-8 µm diam., cylindrical, parallel, smooth, hyaline, dextrinoid, thin-walled. *Caulocystidia* (Fig. 12) absent at stipe apex, common at stipe base, 28-68 × 8-10 µm (base) × 1.2-3 µm (apical neck), with a swollen ventricose base and along, simple or sparsely branched neck, hyaline, inamyloid, thin-walled. *Basal disc cystidia* (Fig. 13) numerous, 24-32 × 6.5-11 µm, cylindrical to clavate, covered with dense spinulae (similar to the pileus marginal cystidia), hyaline, inamyloid, thin-walled; *spinulae* 1-2.5 × 0.5 µm, cylindrical. *Clamp connections* present at the base of basidia, not observed elsewhere.

Collection examined: THAILAND, Nakorn Nayok Province, Khao Yai National Park, Phakrajai, elev. ca. 650 m, 26 Jun. 2001, collected by D.E. Desjardin, N.L. Hywel-Jones and T. Boonpratuang, Boonpratuang #TB0254 (Holotype: BBH 1966).

Habit, habitat and distribution: Scattered to gregarious on senescent leaves of fan palm (*Licuala* sp.) in primary forest. Thailand.

Commentary: *Mycena palmicola* is the smallest member of sect. Longisetae known to date. The species is characterized by the following features: white, sulcate pilei less than 1 mm diam. covered with short, hyaline setae; 1-3 white lamellae; a tiny, white stipe less than 1 mm long; growth on senescent fan palm leaves; a cutis-type, non-gelatinized pileipellis composed of



Figs. 7-13. *Mycena palmicola* (Holotype: TB 0254). 7. Basidiomes (x10). 8. Basidiospores. 9. Basidia and basidiole. 10. Pileipellis hyphae with terminal marginal cystidia. 11. Pileosetae. 12. Caulocystidia. 13. Basal disc cystidia. Bars: 7 = 1 mm; 8 = 5 μ m; 9 = 10 μ m; 10-13 = 20 μ m.

spinulose hyphae with clavate, spinulose marginal cystidia; relatively short (75-150 μ m) and narrow (2.5-8 μ m), hyaline pileosetae; smooth caulocystidia with swollen base and a long and narrow neck that is sometimes branched; acanthophysoid basal disc cystidia; and an absence of cheilocystidia. In combination, these features suggest a close affinity to *M. brevisetosa*. *Mycena brevisetosa* differs, however, by forming slightly larger (0.5-2.5 mm diam.), pale grey to fuscous pilei, many more lamellae (7-11), a longer stipe (1.5-7 mm), forms occasional cheilocystidia, and grows on the bark of dicotyledonous trees (*vide* Corner, 1994). *Mycena palmicola* is the only known member of sect. Longisetae that forms acanthophysoid basal disc cystidia (instead of non-spinulose cystidia), reminiscent of the basal disc cystidia common in sect. Sacchariferae stirps Amparoina. The latter feature suggests another morphological link between sections Longisetae and Sacchariferae.

10. *Mycena brevisetosa* Corner, Beih. Nova Hedwigia 109: 171. 1994.

Holotype collection: Malesia, Singapore, Mandai Road, Oct. 1934, Corner s.n. (E).

Description and illustrations: Corner (1994: 171-172, Figs. 1-2).

Corner (1994) described this species from a single collection on bark of an unidentified plant from Singapore. *Mycena brevisetosa* is morphologically similar to *M. longiseta*, *M. palmicola*, and *M. khonkhem*. *Mycena longiseta*, which also produces greyish-colored pilei, differs in forming much longer pileosetae (up to 1000 μm long), narrower basidiospores (mean width = 3.7 μm), and grows on dicotyledonous leaves. In comparison, *M. brevisetosa* forms pileosetae only up to 350 μm long, has basidiospores with mean width of approximately 5.0 μm , and grows on bark. For a comparison with *M. palmicola*, see the commentary on that species above. For a comparison with *M. khonkhem*, refer to the Key and see below.

11. *Mycena khonkhem* Desjardin, Boonpratuang & Hywel-Jones, **sp. nov.**

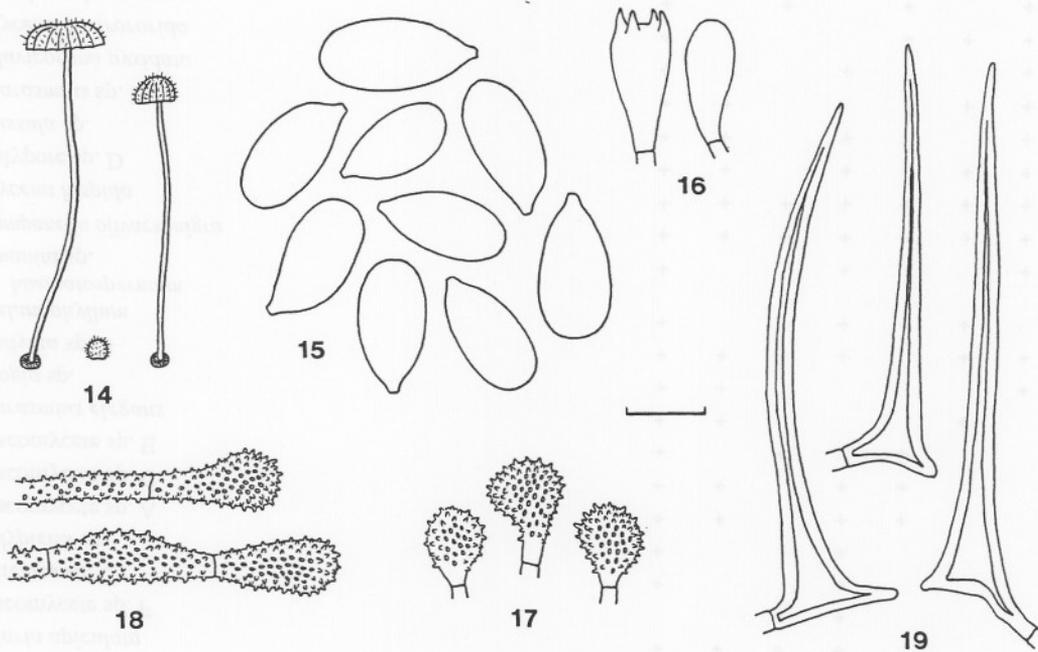
(Figs. 14-19)

Etymology: khon (Thai) = (verb) to carry or to bear; (noun) short hair; khem (Thai) = needle.

Pileus 2-5 mm, convexus dein plano-convexus, striatus, griseo-albidus, hispidus, pilis 0.1 mm longis hyalinis vel luteolis sparsis ornatus. *Lamellae* anguste collariatae, subdistantes, primariae 10-16 (1), griseoalbae. *Stipes* 10-20 \times 0.2 mm, albus, glabrus, filiformis, ad basim discoideus. *Sporae* 6.5-8.5 \times 3.5-4.5 μm , ellipsoideae, leves, hyalinae, amyloideae. *Basidia* 4-spora. *Basidiola* clavata. *Pleurocystidia* nulla. *Cheilocystidia* 20-28 \times 12-18 μm , clavata vel vesiculosa, echinulata, spinulis minutis, 0.5-1 \times 0.5 μm , cylindraceis dense praedita. *Hyphae pileipellidis* 3.5-8 μm latae, cylindraceae vel inflatae, subgelatinosae, echinulates, spinulis minutis, 0.5-1 \times 0.5 μm dense instructae; *pileosetae* 70-140 \times 16-25 μm (ad basim) \times 6-8 μm (ad medium), hyalinae vel luteolae, crassitunicatae. *Trama pilei et lamellarum exhyphis* dextrinoideis compositum. *Hyphae corticales stipitis* dextrinoideae, leves. *Caulocystidia* nulla. Ad folia dejecta. Thailandia. Holotypus: BBH2011.

Primordia 1 mm diam., hemispherical, dark grey with short, erect, hyaline setae. *Pileus* (Fig. 14) 2-5 mm diam., obtusely conical to convex when young, expanding to plano-convex, not umbilicate; margin decurved, striate; surface dull, dry, covered with short, erect, hyaline to pale yellow setae; disc and striae grey to dark grey, white elsewhere. *Lamellae* ascending, narrowly adnate, often with a pseudocollarium, subdistant (10-16) with one series of lamellulae, moderately broad, pale greyish white. *Stipe* 10-20 \times 0.2 mm, central, filiform, glabrous overall, dull, dry, white, arising from a small, circular, flattened basal disc that is white when fresh but dries grey.

Basidiospores (Fig. 15) 6.5-8.5 \times 3.5-4.5 μm (\bar{x} = 7.6 \pm 0.7 \times 3.9 \pm 0.3 μm , Q = 1.6-2.1, \bar{Q} = 1.93 \pm 0.1, n = 15), ellipsoid, smooth, hyaline, amyloid, thin-walled. *Basidia* (Fig. 16) 16-20 \times 7-8 μm , clavate, 4-spored. *Basidioles*



Figs. 14-19. *Mycena khonkhem* (Holotype: TB 0297). 14. Basidiomes (x2). 15. Basidiospores. 16. Basidium and basidiole. 17. Cheilocystidia. 18. Pileipellis hyphae with terminal marginal cystidia. 19. Pileosetae. Bars: 14 = 5 mm; 15 = 5 μ m; 16 = 10 μ m; 17-20 = 20 μ m.

(Fig. 16) clavate. *Pleurocystidia* absent. *Cheilocystidia* (Fig. 17) scattered, 20-28 \times 12-18 μ m, broadly clavate to vesiculose, densely spinulose overall, hyaline, inamyloid, thin-walled; spinulae 0.5-1 \times 0.5 μ m, cylindrical. *Pileipellis* a cutis of repent, densely spinulose hyphae, terminating at the margin in marginal cystidia, and through which pileosetae project; *hyphae* (Fig. 18) 3.5-8 μ m diam., cylindrical to inflated, imbedded in a thin gelatinous matrix, hyaline, inamyloid; *marginal cystidia* (Fig. 18) 20-40 \times 10-16 μ m, similar to the cheilocystidia, subcylindrical to broadly clavate, densely spinulose overall, hyaline, inamyloid, thin-walled; *spinulae* 0.5-1 \times 0.5 μ m, cylindrical; *pileosetae* (Fig. 19) scattered, 70-140 \times 16-25 μ m (base) \times 6-8 μ m (centrally), aculeate to acicular, apex sharply acute, base geniculate, with hyaline to pale yellow, inamyloid walls 2-4 μ m thick. *Pileus tramal hyphae* inflated up to 20 μ m diam., smooth, non-gelatinous, hyaline, dextrinoid. *Lamellar trama hyphae* similar to those in the pileus, dextrinoid. *Stipe tissue* monomitic; *cortical and medullary hyphae* 6-18 μ m diam., cylindrical, parallel, smooth, hyaline, strongly dextrinoid, thin-walled. *Caulocystidia* absent. *Clamp connections* absent.

Collection examined: THAILAND, Nakorn Nayok Province, Khao Yai National Park, Darn Chang trail, 1 Nov. 2001, T. Boonpratuang #TB0297 (Holotype: BBH 2011).

Habit, habitat and distribution: Solitary, scattered on dead, undetermined dicotyledonous leaves. Thailand.

Commentary: *Mycena khonkhem* is characterized by the following suite of characters: a convex, grey pileus 2-7 mm diam. with short, hyaline setae; subdistant lamellae with relatively narrow basidiospores (3.5-4.5 μm diam.); a white, glabrous stipe that arises from a small, grey basal disc; foliicolous substrate; acanthocyst-type cheilocystidia and pileus marginal cystidia; a gelatinized, cutis-type pileipellis of densely spinulose hyphae; relatively short (up to 140 μm), hyaline pileosetae; and absence of caulocystidia. This new species is morphologically similar to *M. longiseta* and *M. brevisetosa*. *Mycena longiseta* differs from *M. khonkhem* in forming much longer pileosetae (up to 1000 μm long), in having marginal cystidia with non-spinulose apices, in forming numerous caulocystidia, and in lacking cheilocystidia. *Mycena brevisetosa* differs in forming much smaller basidiomes with broader basidiospores (4.5-5.5 μm diam.), different-shaped cheilocystidia, numerous caulocystidia, and in growing on bark.

Insufficiently known taxa

Mycena codoniceps (Cooke) Sacc., Syllog. Fung. 9: 36. 1891.

= *Agaricus codoniceps* Cooke, Grevillea 80: 102. 1888.

No material is apparently extant for this taxon originally described from a collection on tree fern stems in a nursery in Britain (Cooke, 1888). The protologue described a species with minute, campanulate, sulcate, umber pileus with short erect hairs, adnate lamellae, and a short stem attenuated downwards with an umber base. There was no mention of a basal disc, and none was illustrated by Cooke (1886-1888: Illus. #1149, t. 952, fig. B). Moreover, whether *M. codoniceps* represented a native north temperate taxon or a tropical taxon introduced into the nursery remains uncertain. *Mycena codoniceps* was the name originally accepted by Kühner (1926) for the temperate Northern Hemisphere taxon herein called *M. aciculata*. For a further accounting of the status of *M. codoniceps* see Desjardin and Horak (2002). The protologue of *A. codoniceps* shows similarities with that of *M. brevisetosa* and the two taxa may be synonymous. Without British nursery material to analyze, however, this taxonomic dilemma is unresolvable.

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