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FULL PAPER

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Aquatic fungi from peat swamp palms: *Unisetosphaeria penguinoides* gen. et sp. nov., and three new *Dactylaria* species

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Abstract *Unisetosphaeria penguinoides* gen. et sp. nov. and three new species of *Dactylaria* are described from dead petioles and rhachides of the palms *Eleiodoxa conferta* and *Nenga pumila* (Arecaceae) collected in Sirindhorn Peat Swamp Forest, southern Thailand. *Unisetosphaeria* (Ascomycota) is compared with similar genera, and its placement at the family level is considered. The three new *Dactylaria* species (anamorphic fungi) are compared with similar species in the genus.

Key words Hyphomycetes · Palm fungi · Peat swamp forest · Tropical fungi

Introduction

During our study of the fungal diversity of palms in a peat swamp forest, several new taxa have been encountered and described (Hyde et al. 2002; McKenzie et al. 2002; Pinruan et al. 2002). In this article, we describe *Unisetosphaeria* (Ascomycota) and three new species of *Dactylaria* Sacc.

Materials and methods

The fungi examined in this study were from decaying tissues of *Eleiodoxa conferta* Giff. or *Nenga pumila* H. Wendl. collected in Sirindhorn Peat Swamp Forest, Narathiwat, in southern Thailand. Specimens consisting of dead palm fronds were returned to the laboratory and incubated under damp conditions in plastic boxes. The palm tissue was periodically examined for 3 weeks, and fungi appearing were isolated for identification. All measurements were made from materials mounted in water. Type material is deposited in the BIOTEC Bangkok Herbarium (BBH), Thailand. Single spore isolates were made on cornmeal agar (CMA) plates, with added antibiotics (penicillin G, 0.5 g/l and streptomycin 0.5 g/l) to suppress bacterial growth, and deposited in the BIOTEC Culture Collection (BCC).

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Species descriptions

Unisetosphaeria Pinnoi, E.B.G. Jones, McKenzie & K.D. Hyde, gen. nov.

Ascomata immersa, semi-immersa vel superficialia, pyriformia, hyalina vel pallide brunnea, ad apicem atrobrunnea, coriacea, ostiolata, papillata, sparsa. Papilla periphysata, pilis atris brevibus circumcincta, ad apicem seta singulari alta ex cellulis, multi-serialibus brunneis composita unilaterale enascenti. Peridium angulatibus, brunneis compositum. Paraphyses sparsae, indistinctae, ex cellulis ovoideis vel oblongis seriem brevem formantibus compositae. Asci 8-spori, clavati, unitunicati, breviter pedicellati, apice truncati, annulo apicali jodo non cyanescenti praediti. Ascosporae 2-seriales, hyalinae, septatae.

Type species: *Unisetosphaeria penguinoides* Pinnoi, E.B.G. Jones, McKenzie & K.D. Hyde.

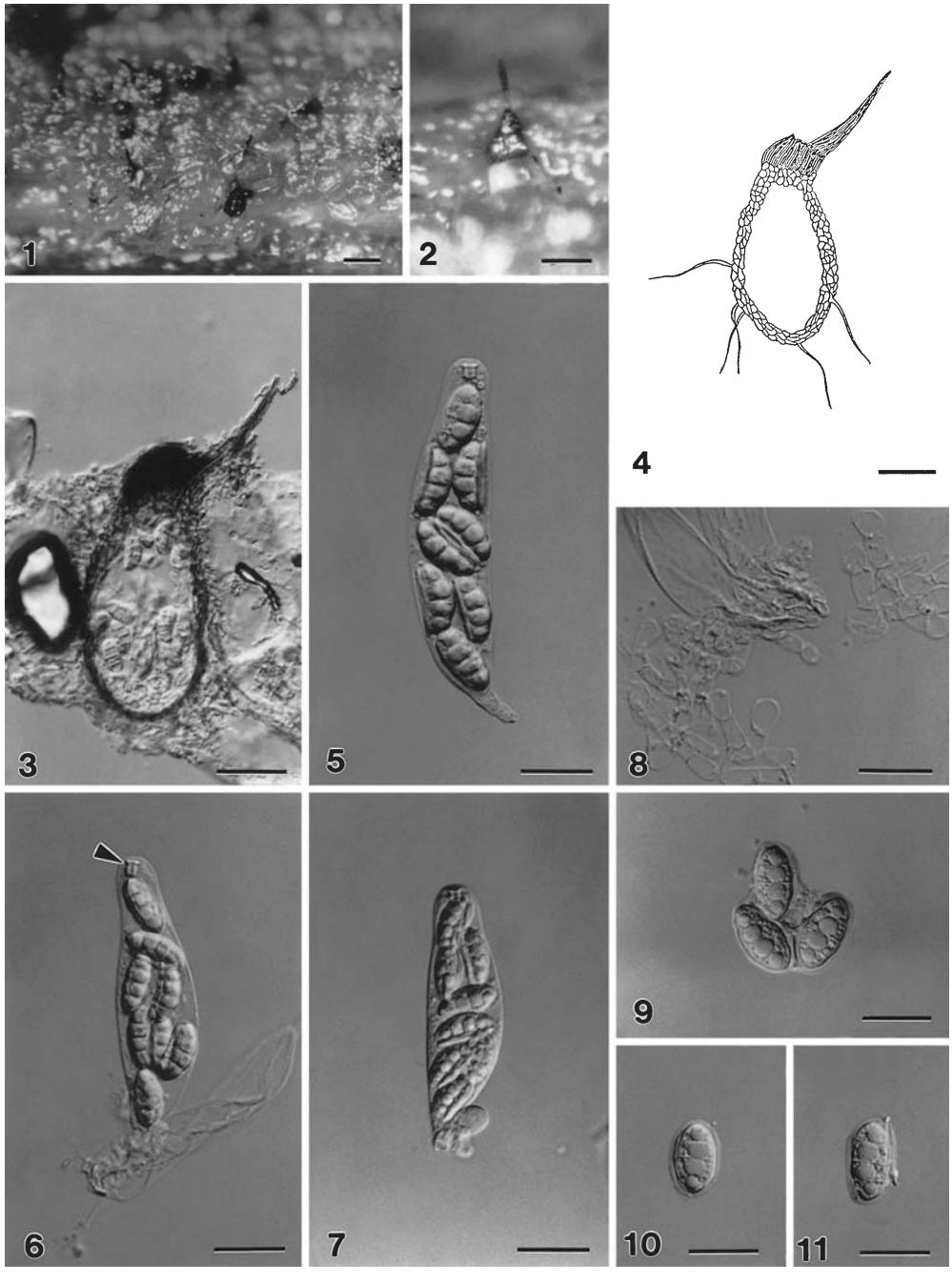
Ascomata immersed, semiimmersed to superficial, pyriform, hyaline to light brown, dark brown near the apex, coriaceous, ostiolate, papillate, scattered. Papilla periphysate, surrounded by short dark hairs. A single long seta, made up several rows of brown cells, arises from the ostiolar region. Peridium composed of angular brown-walled cells. Paraphyses sparse, obscure, comprising short rows of ovoid to oblong cells. Asci 8-spored, clavate, unitunicate, short pedicellate, apically truncate, with a

refractive, J-apical ring. Ascospores 2-seriate, hyaline, septate.

Etymology: from *uni* meaning one and *seta* meaning bristle, in reference to the single seta on the neck of the ascomata. It is also similar to the genus *Chaetosphaeria* Tul. & C. Tul.

Unisetosphaeria penguinoides Pinnoi, E.B.G. Jones, McKenzie & K.D. Hyde, sp. nov. Figs. 1–11

Ascomata 75–100 μm diam., 125–200 μm alta, immersa, semi-immersa vel superficialia, pyriformia, hyalina vel pallide brunnea, ad apicem atro-brunnea, coriacea, ostiolata, papillata, sparsa. Papilla periphysata, pilis brevibus atris circumcincta, ad apicem seta singulalia alta (100–150 μm alta, 10–12.5 μm diam.) ex cellulis multi-serialibus brunneis composita unilaterale enascenti. Peridium usque ad 10 μm crassum, ex cellulis 2–4 stratosis angulatis brunneis compositum. Paraphyses sparsae, indistinctae, ex cellulis ovoideis vel oblongis ~12 × 7 μm seriuem breviem formantibus compositae. Asci 75–102 × 20–25 μm, 8-spori, clavati, unitunicati, breviter pedicellati, apice truncati, annulo apicali jodo non cyanescenti 4.5–5 μm alto, 4–5 μm diam. praediti. Ascosporae 18.5–22.5 × 10–14 μm, 2-seriales, ovoideae vel fusoideae, rectae vel curvatae, hyalinae, 3-septatae, pariete laevi, tunica gelatinosa cicumdantes.



Figs. 1–11. Light micrographs and diagram of *Unisetosphaeria penguinoides* (from holotype). **1**, **2** Ascomata on substratum. **3** Section of ascoma. Note the blackened neck and single long brown seta. **4** Diagrammatic representation of ascoma section. **5–7** Asci. Note the relatively large subapical ring (*arrowhead* in **6**). **8** Paraphyses comprising short rows of ovoid to oblong cells. **9–11** Ascospores with thin mucilaginous sheath. *Bars* **1**, **2** 150 μm; **3**, **4** 50 μm; **5–11** 20 μm

Holotypus: In petiolidibus submersis emortuisque *Eleiodoxae confertae* 22:6:2001 A. Pinnoi (Aom103 in BBH).

Ascomata 75–100 μm diameter, 125–200 μm high, immersed, semiimmersed or superficial, pyriform, hyaline to light brown, dark brown near the apex, coriaceous, ostiolate, papillate, scattered (Figs. 1, 2). Papilla periphysate surrounded by short dark hairs (Figs. 3, 4). A single seta, 100–150 μm long, 10–12.5 μm diameter, made up of several rows of brown cells arises from the ostiolar region (Figs. 3, 4). Peridium up to 10 μm wide, composed of 2–4 layers of angular, brown-walled cells (Fig. 4). Paraphyses sparse, obscure, comprising short rows of ovoid to oblong cells, ~12 × 7 μm (Fig. 8). Asci 75–102 × 20–25 μm ($\bar{x}$ = 87 × 21.8 μm), 8-spored, clavate, unitunicate, short pedicellate, apically truncate, with a refractive, J-apical ring, 4.5–5 μm long, 4–5 μm diameter (Figs. 5–7). Ascospores 18.5–22.5 × 10–14 μm ($\bar{x}$ = 21.5 × 11.8 μm, n = 25), 2-seriate, ovoid to fusoid, straight or curved, hyaline, 3-septate, smooth-walled, with a large guttule in each cell, surrounded by a thin layer of mucilage (Figs. 9–11).

Holotype: Thailand, Narathiwat, Sirindhorn Peat Swamp Forest, on submerged petiole of *Eleiodoxa conferta*, June 22, 2001, A. Pinnoi (Aom103 in BBH).

Isotype: (PDD 76344).

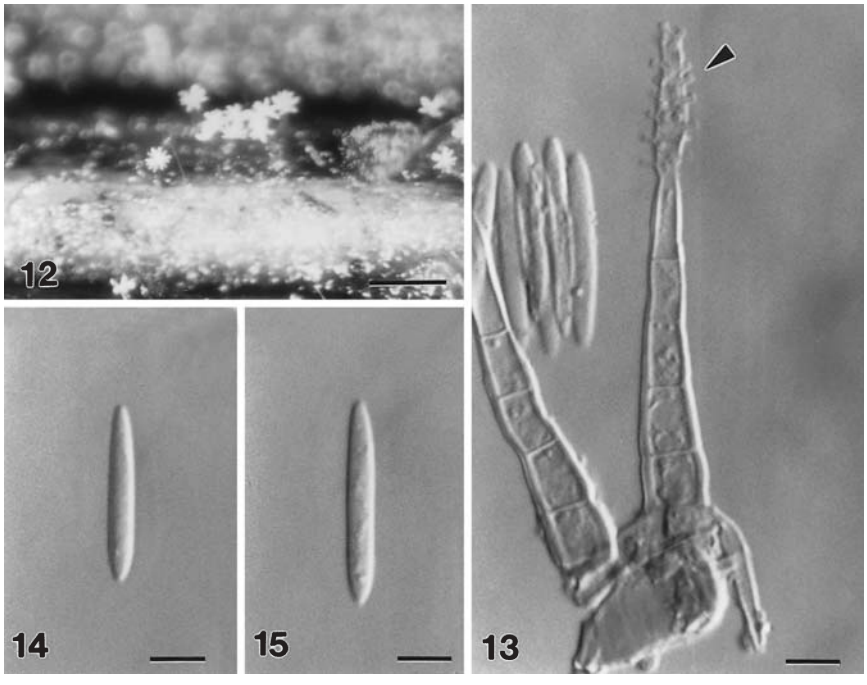
Etymology: from *penguin* and *–oides*, in reference to the similarity of the ascomata in section to a penguin outline.

This taxon is somewhat characteristic of the Chaetosphaeriaceae (*sensu* Réblová et al. 1999) in having superficial ascomata with setae, asci with a refractive apical ring, and transversely 3-septate, hyaline ascospores. In the Chaetosphaeriaceae, the taxon keys out to *Chaetosphaeria*. It differs in having ascomata with a papilla surrounded by short dark hairs and a single long seta made up of several rows of brown cells, sparse paraphyses comprising short rows of ovoid to oblong cells, and clavate asci with a large refractive, J-apical ring. Another family to consider is the Trichosphaeriaceae (*sensu* Barr 1990). In the key provided by Réblová (1999b) this taxon is similar to *Miyoshiella* Kawam. or *Rhamphoria* Niessl. *Unisetosphaeria* differs from *Miyoshiella* and *Rhamphoria* in having a single long seta, near the ostiole of the ascoma, made up of several rows of brown cells and sparse paraphyses comprising short rows of ovoid to oblong cells. *Miyoshiella* has a *Sporidesmium* anamorph (Réblová 1999a), whereas *Rhamphoria* species have ascospores with longitudinal septa (Sivanesan 1976). There appears to be no existing genus that can accommodate *Unisetosphaeria* and, therefore, the introduction of a new genus is warranted.

The placement of *Unisetosphaeria* at the family level requires discussion. The Chaetosphaeriaceae may be appropriate but *Unisetosphaeria* has several incompatible characters; these include the ascomata with blackened necks with short dark hairs and a single long seta made up of several rows of brown cells, the sparse paraphyses comprising short rows of ovoid to oblong cells, and clavate asci with a large refractive, J-apical ring. The Trichosphaeriaceae (*sensu* Barr 1990) appears more congruent. The type species, *Trichosphaeria pilosa* (Pers.) Fuckel, has been recently discussed and illustrated by Réblová et al. (1999). In this species the ascomata are small, black, and covered in dark, short setae. Paraphyses are conspicuous, asci are cylindrical with a distinct apical ring, and ascospores 1-celled. It is, therefore, suggested that *Unisetosphaeria* is included in the Trichosphaeriaceae.

Dactylaria uliginicola Pinnoi, E.B.G. Jones, McKenzie, & K.D. Hyde, sp. nov. Figs. 12–15

Coloniae in substrato naturo effusae, luteae. Mycelia superficialia, ex hyphis hyalinis laevibus septatis ramosis



Figs. 12–15. Light micrographs of *Dactylaria uliginicola* (from holotype). **12** Colonies on substratum. **13** Conidiophores, conidiogenous cells (*arrowhead*), and conidia. **14**, **15** Conidia. *Bars* **12** 100 μm; **13–15** 5 μm

composita. Setae et hyphopodia absentes. Stromata non evolventia. Conidiophora erecta, solitaria, cylindrica, 60–90 × 6.25–10 μm, versus apicem attenuata (~4 μm ad apicem), recta vel leviter flexuosa, laevia, 3–6-septata, hyalina. Cellulae conidiogenae integratae, 15–37.5 μm altae, hyalinae, multidenticulatae; denticulae cylindricae. Conidia 21–28 × 3–4.5 μm, ad basim angustata, apice rotundata et centro aculeata, hyalina, laevia, fusiformia, basi leviter truncata, 0–1-septata; disjunctio conidiorum schizolytica.

Holotypus: In rachidibus submersis emortuisque *Eleiodoxae confertae* 22:6:2001 A. Pinnoi (Aom113 in BBH).

Ex holotypo: Living culture BCC 9883.

Colonies on natural substrata effuse, yellow (Fig. 12). Mycelium superficial, comprising hyaline, smooth, septate, branched hyphae. Setae and hyphopodia absent. Stromata not developed. Conidiophores erect, solitary, arising from hyphae, cylindrical, 60–90 × 6.3–10 μm, tapering apically (to ~4 μm near the apex), straight or slightly flexuous, unbranched, smooth, 3–6-septate, septa more or less equidistantly spaced, hyaline (Fig. 13). Conidiogenous cells integrated, 15–37.5 μm long, hyaline, polydenticulate; denticles cylindrical. Conidia 21–28 × 3–4.5 μm, slightly narrow at the base, hyaline, smooth, fusiform, apex acutely rounded, base similar but slightly truncate, 0–1-septate (Figs. 14, 15*)*. Conidial secession schizolytic.

Holotype: Thailand, Narathiwat, Sirindhorn Peat Swamp Forest, on submerged rachis of *Eleiodoxa conferta*, June 22, 2001, A. Pinnoi (Aom113 in BBH).

Isotype: (PDD 76345).

Ex-holotype: Living culture BCC 9883.

Etymology: From the Latin *uliginicola*, living in swamps.

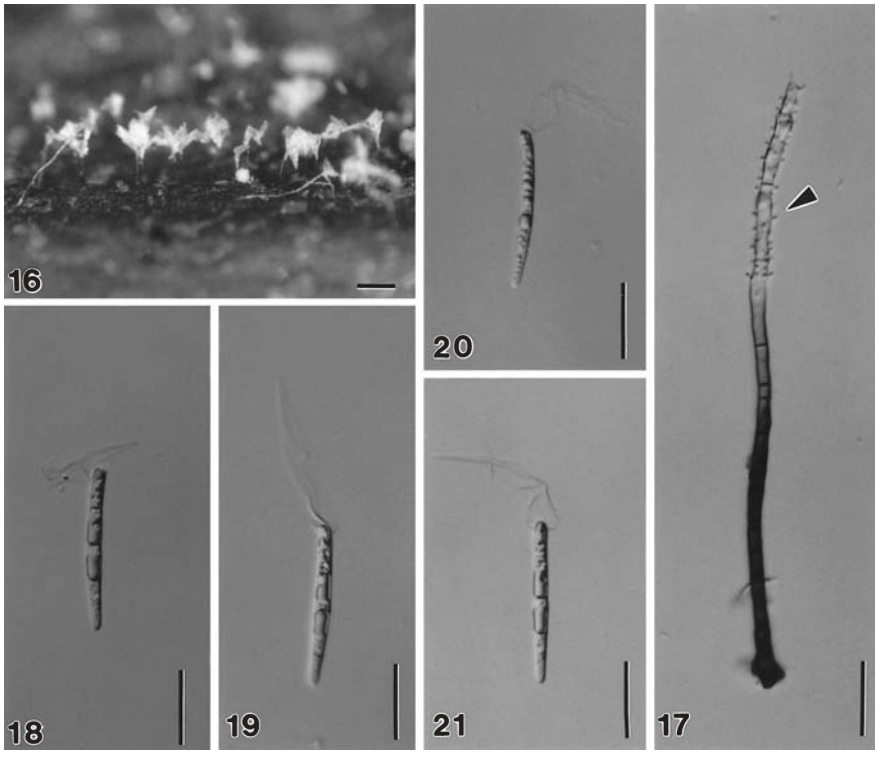
Colonies on potato dextrose agar (PDA), reaching 2 cm diameter in 25 days, woolly with central tuftlike growth, outwardly immersed, central area brown with paler to whitish tufts, outer immersed area pale grey, grey-brown from below, not staining agar, not sporulating within 1 month.

The conidia of *Dactylaria uliginicola* are similar to those of *D. chrysosperma* (Sacc.) G.C. Bhatt & W.B. Kendr., *D. fusifera* (Berk. & M.A. Curt.) de Hoog, and *D. candidula* (Höhn.) G.C. Bhatt & W.B. Kendr. The tapering hyaline conidiophores of *D. uliginicola* distinguish it from *D. chrysosperma*. The conidiophores of *D. uliginicola* are longer and broader than those of *D. fusifera* (60–90 × 6.25–10 μm vs. 25–30 × 4–6 μm), whereas the conidia are shorter (21–28 × 3–4.5 μm vs. 30–40 × 3.8–4.6 μm) (Hoog 1985). The conidiophores of *D. candidula* are shorter (60–90 μm vs. 20–35(–50) μm), the conidia are smaller (21–28 × 3–4.5 μm vs. 15–23 × 2.5–3.4(–4.2) μm) and constricted at the median septum.

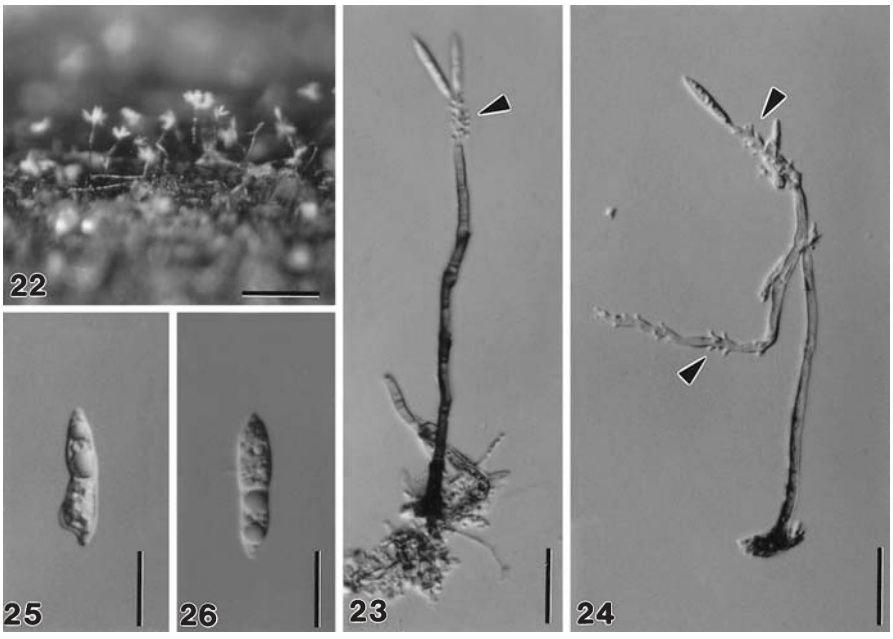
Dactylaria flammulicornuta Pinnoi, E.B.G. Jones, McKenzie & K.D. Hyde, sp. nov. Figs. 16–21

Coloniae in substrato naturo effusae, albinae. Mycelia superficialia, ex hyphis brunneis laevibus septatis ramosis composita. Setae et hyphopodia absentes. Stromata non evolventia. Conidiophora erecta, solitaria, cylindrica, 160–250 × 4.5–6.25 μm, recta vel flexuosa, laevia, 8–12-septata, brunnea, ad apicem pallide brunnea. Cellulae conidiogenae integratae, 27.5–90 × 5–6.5 μm, hyalinae, multidenticulatae; denticulae cylindricae. Conidia 42.5–62.5 × 4.5–5 μm, cylindrica, hyalina, 0–1-septata; disjunctio conidiorum schizolytica.

Holotypus: In petiolibus emortuis ad terram *Nengae pumilae* 12:2:2002 A. Pinnoi (Nen29 in BBH).



Figs. 16–21. Light micrographs of *Dactylaria flammulicornuta* (from holotype). **16** Colonies on substratum. **17** Conidiophores and conidiogenous cells (*arrowhead*). **18–21** Conidia with long flamelike appendage. *Bars* **16** 200 μm; **17–21** 25 μm



Figs. 22–26. Light micrographs of *Dactylaria palmae* (from holotype). **22** Colonies on substratum. **23**, **24** Conidiophores and conidiogenous cells (*arrowheads*). **25**, **26** Conidia. *Bars* **22** 125 μm; **23**, **24** 25 μm; **25**, **26** 12 μm

Colonies on natural substratum effuse, white (Fig. 16). Mycelium superficial, comprising brown, smooth, septate, branched hyphae. Setae and hyphopodia absent. Stromata not developed. Conidiophores erect, solitary, arising from hyphae, cylindrical, 160–250 × 4.5–6.3 μm, straight or slightly flexuous, occasionally branched, smooth, 8–12-septate, brown, pale brown at apex (Fig. 17). Conidiogenous cells integrated, 27.5–90 × 5–6.5 μm, hyaline, polydenticulate; denticles cylindrical (Fig. 17). Conidia 42.5–62.5 × 4.5–5 μm ($\bar{x}$ = 56 × 4.6 μm, n = 25), cylindrical, hyaline, 0–1-septate, with an apical appendage with a flamelike appearance (Figs. 18–21). Conidial secession schizolytic.

Holotype: Thailand, Narathiwat, Sirindhorn Peat Swamp Forest, on terrestrial petiole of *Nenga pumila*, February 12, 2002, A. Pinnoi (Nen29 in BBH).

Etymology: from the Latin *flamma* and *cornula* = horned, in reference to flamelike appearance of the appendage.

The conidia of *Dactylaria flammulicornuta* are unique within the genus *Dactylaria*. No other species is known to have an apical appendage, although *Dactylaria tunicata* Goh & K.D. Hyde has been described with a fragile, hyaline, gelatinous sheath (Goh and Hyde 1997).

Dactylaria palmae Pinnoi, E.B.G. Jones, McKenzie & K.D. Hyde, sp. nov. Figs. 22–26

Coloniae in substrato naturo effusae, luteae. Mycelia superficialia, ex hyphis brunneis laevibus septatis ramosis composita. Setae et hyphopodia absentes. Stromata non evolventia. Conidiophora erecta, solitaria, cylindrica, 100–150 × 3–4.5 μm, recta vel flexuosa, laevia, brunnea. Cellulae conidiogenae integratae, 25–60 × 3–3.8 μm, hyalinae, multidenticulatae; denticulae cylindricae. Conidia 23.8–25 × 3.8–5 μm, fusiformia, hyalina, 1-septata; disjunctio conidiorum schizolytica.

Holotypus: In vaginis folii emortuis ad terram *Nengae pumilae* 12:2:2002 A. Pinnoi (Nen35 in BBH).

Colonies on natural substratum effuse, yellow (Fig. 22). Mycelium superficial, comprising brown, smooth, septate, branched hyphae. Setae and hyphopodia absent. Stromata not developed. Conidiophores erect, solitary, arising from hyphae, cylindrical, 100–150 × 3–4.5 μm, straight or slightly flexuous, sometimes branched, brown, pale brown toward the apex (Figs. 23, 24). Conidiogenous cells integrated, 25–60 × 3–3.8 μm, hyaline, polydenticulate; denticles cylindrical (Figs. 23, 24). *Conidia* 23.8–25 × 3.8–5 μm, fusiform, hyaline, 1-septate, sometimes constricted at septum (Figs. 25, 26). Conidial seccession schizolytic.

Holotype: Thailand, Narathiwat, Sirindhorn Peat Swamp Forest, on terrestrial sheath of *Nenga pumila*, February 12, 2002, A. Pinnoi (Nen35 in BBH).

Etymology: In reference to its association with palms.

Dactylaria palmae is similar to *D. tunicata* Goh & K.D. Hyde, *D. candidula* (Höhn) G.C. Bhatt & W.B. Kendr., *D. cymbiformis* Matsush., and *D. mucronulata* Ellis. & Langl. However, the conidiophores of *D. palmae* are branched and the conidia lack a sheath. The other three species have smaller conidia than those of *D. palmae* [*D. candidula*, 15–23 × 2.5–3.4(–4.2) μm; *D. cymbiformis*, 15–26.5 × 4–6(–8) μm; *D. mucronulata*, 8.5–11 × 2.5–3.6 μm] (Matsushima 1980).

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