

## Neotropical Ascomycetes 10. New and interesting *Cercophora* species

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*Cercophora atropurpurea* sp. nov. and *C. rugulosa* sp. nov. are described and illustrated based on material from Ecuador and Puerto Rico. *Cercophora striata*, previously known only from type material, is redescribed and fully illustrated from additional material collected in Costa Rica and Panama. Colony characteristics are reported for all three species and anamorphs illustrated when available. *Cercophora atropurpurea* differs from other members of the genus in having ovoid to vertically elongate, dark purple, warty ascomata and *C. rugulosa* differs in having globose to subglobose, rugulose ascomata.

Keywords: *Lasiosphaeria*, Lasiosphaeriaceae, Neotropics, Sordariales, systematics.

The genus *Cercophora* Fuckel was established in 1870 but was soon synonymized under *Sordaria* Ces. & De Not. (Fuckel, 1873) and seldom used until it was reintroduced by Lundqvist in 1972. The genus is recognized by membranous to coriaceous, dark colored, large ascomata and hyaline, cylindrical ascospores which develop a swollen, pigmented head. *Cercophora* currently contains over 50 species of lignicolous and coprophilous taxa which occur throughout temperate and tropical regions. *Cercophora* is closely related to *Lasiosphaeria* Ces. & De Not., which is distinguished mainly by ascospores that do not form a swollen, pigmented head, but molecular data do not support simply synonymizing these genera (A.N. Miller & Huhndorf, unpublished; A.N. Miller & al., 1999; 2000). Consequently, *Cercophora* is at present maintained as distinct following the conventional taxonomy of Lundqvist (1972).

Two new species of *Cercophora* were repeatedly collected during fieldwork in Ecuador and Puerto Rico. One rarely collected species, *Cercophora striata* (Ellis & Everh.) N. Lundq., was encountered

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during fieldwork in Costa Rica and Panama. All three are described and illustrated along with culture and anamorph data when available.

## Materials and methods

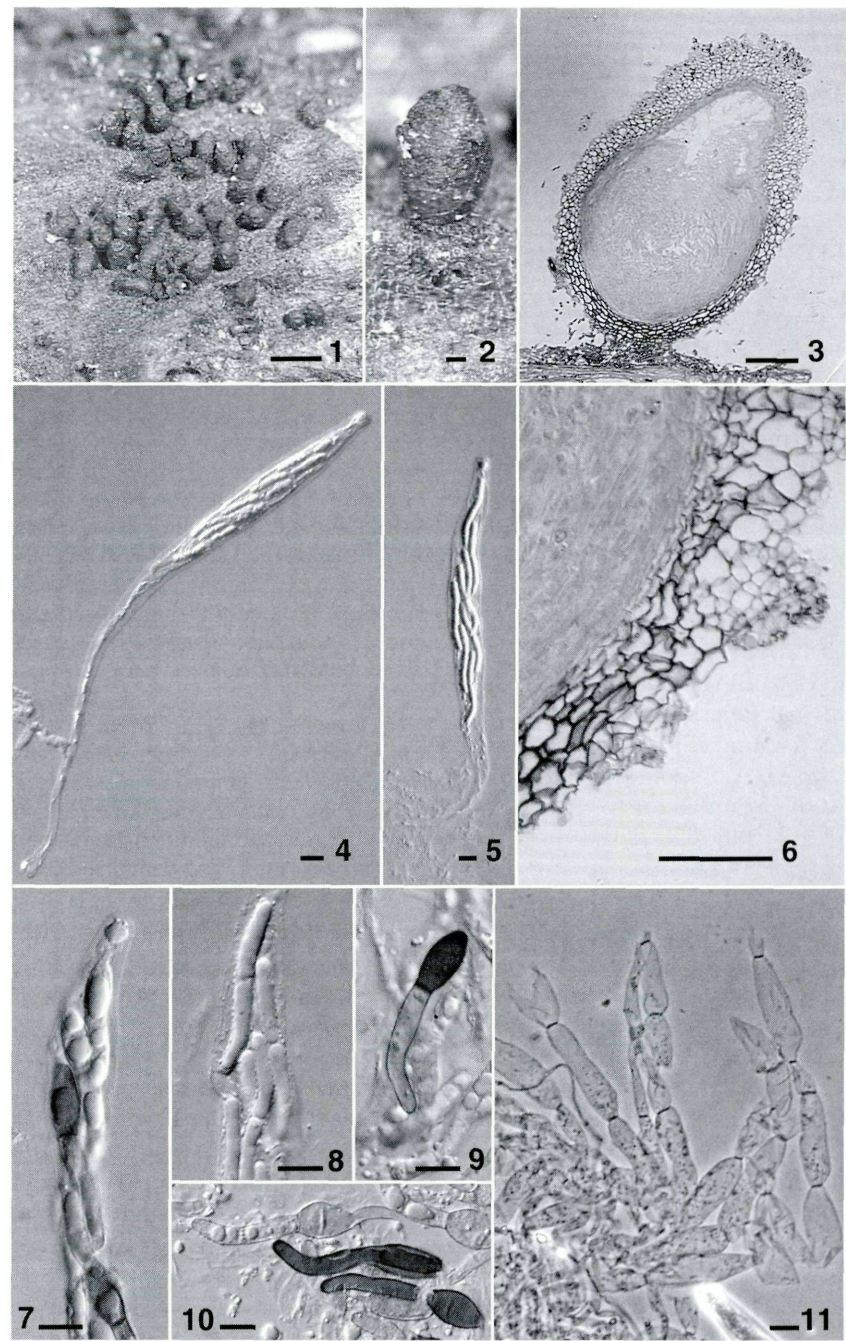
Several collections of each species were made by the junior author (S.M.H.) and Fernando A. Fernández (F.F.) in 1995 and 1997 and by F.F., Rosario Briones (R.B.) and the senior author (A.N.M.) in 2001. Single spore (SS) and multispore (MS) isolates were obtained following the procedures of Fernández & al. (1999). Squash mounts of ascomata were initially made in water, which was then replaced with lactophenol containing azure A. Measurements of microscopic structures were made in water. A minimum of 30 paraphyses, ascospores, phialides and conidia were measured for each species and mean and standard deviation (shown in brackets) were calculated. Ascomata were sectioned at 5 µm according to Huhndorf (1991). Images were captured in water using bright field (BF), differential interference (DIC) and phase contrast (PH) microscopy and processed using Adobe Photoshop 3.0 or 5.0 (Adobe Systems Incorporated, Mountain View, California) following the methods of Huhndorf & Fernández (1998).

Culture studies were conducted with SS and MS isolates on three types of media: water agar (WA, Difco Bacto), cornmeal agar (CMA, Difco), and oatmeal agar (OA, Difco). To standardize growth rates, isolates were initially transferred to CMA in 60 mm diam plastic Petri plates. After 3–6 wk, 5 mm diam plugs were removed from the margin of each isolate and placed inverted in the center of 60 mm diam plastic Petri plates containing WA, CMA or OA. Plates were incubated at room temperature (21–25 °C) under ambient light in Rubbermaid® plastic storage containers. Growth rates and colony characters were recorded at 7 d intervals for 42 d. Anamorphs, if produced, and other microscopic features were observed in water mounts at 42 d. Color terms are taken from Kornerup & Wanscher (1978).

## Results

***Cercophora atropurpurea*** A. N. Miller & Huhndorf, **sp. nov.** – Figs. 1–21.

Ascomata ovoidea vel axielongata, papillata, 350–465 µm diam, 620–790 (–975) µm alta, numerosa, dispersa vel gregaria, superficialia; superficie glabrata, atropurpurea vel nigra; collo conico, verrucoso; subiculum extensum, pilis brunneis exhibens. Paries ascomatis in sectione longitudinali 41–67 µm crassus, bistratosus. Papilla conica, periphysibus induta. Paraphyses filiformes-ventricosae,



Figs. 1–11. *Cercophora atropurpurea*. – 1, 2. Ascomata on substrate. – 3. Longitudinal section through ascoma. – 4, 5. Asci. – 6. Longitudinal section through warty ascomal wall. – 7. Ascus apex. – 8–10. Ascospores. – 11. Paraphyses. – Figs. 1–2 = macroscopic view; 3–10 = DIC; 11 = PH. – Scale bars: 1 = 1 mm; 2, 3 = 100 µm; 4, 5, 7–11 = 10 µm; 6 = 50 µm. – Figs. 1, 2, 7, 9–11 from SMH 2961; 3, 4, 6 from SMH 3118; 5, 8 from SMH 3170.



septatae. Asci elongati-clavati,  $198\text{--}297 \times 12\text{--}20\ \mu\text{m}$ , longe-stipitati, stipes  $77\text{--}188 \times 2.5\text{--}6.5\ \mu\text{m}$ , unitunicati, annulo apicali et globulo sub-apicali praediti, octospori, biseriati vel triseriati. Ascosporae juveniles cylindricae,  $33\text{--}51 \times 3\text{--}5.5\ \mu\text{m}$ , hyalina, aseptatae, utrinque caudatae gelatinosae,  $15\text{--}29.5\text{--}(57)\ \mu\text{m}$ , deinde bicellulares; cellula superior inflata, anguste fusiformis vel ellipsoidea,  $11\text{--}19 \times 6\text{--}10.5\ \mu\text{m}$ , sursum conica, basi truncata, hyalina vel brunnea; cellula pedicelli  $22.5\text{--}36 \times 3\text{--}5.5\ \mu\text{m}$ , hyalina vel brunnea; demum ascosporae uniseptatae usque ad quinseptatae.

Holotype. – U.S.A. Puerto Rico, Luquillo Mts., El Verde Research Area, 16-ha Grid, adj. to 11.17.44, 378 m, 15 Jan. 1997, on 7 cm diam branch, leg. S.M.H. and F.F. (SMH 2961, F). Paratypes. – U.S.A. Puerto Rico, Luquillo Mts., El Verde Research Area, 16-ha Grid, next to 09.15.32, 372 m, 25 Jan. 1997, on twigs, leg. S.M.H. and F.F. (SMH 3113, F); 09.15.32, 372 m, 30 Jan. 1997, on twigs, leg. S.M.H. and F.F. (SMH 3181, F).

Ascomata ovoid to vertically elongate, papillate, occasionally collapsing laterally when dried,  $350\text{--}465\ \mu\text{m}$  diam,  $620\text{--}790\text{--}(975)\ \mu\text{m}$  high, numerous, scattered to gregarious, superficial; surface warty towards the apex, glabrous below, dark ruby (12F5) to black; neck conical, warty; subiculum present, extending over large areas, hairs brown,  $2.5\text{--}4\ \mu\text{m}$  wide, thin-walled, multiseptate. – Ascomatal wall of *textura angularis* in surface view; in longitudinal section 2-layered, composed of pseudoparenchymatous cells, thicker towards the apex, inner layer  $8\text{--}15\ \mu\text{m}$  thick, composed of 3–6 layers of elongate to flattened, hyaline cells, outer layer  $33\text{--}52\ \mu\text{m}$  thick, composed of 6–8 layers of polygonal to irregularly shaped, brown cells; warts  $53\text{--}74\ \mu\text{m}$  wide  $\times$   $47\text{--}63\ \mu\text{m}$  tall, composed of  $10\text{--}17 \times 12\text{--}16$  layers of smaller, polygonal, hyaline to brownish cells. – Ascomatal apex with periphyses. – Paraphyses filiform-ventricose,  $4.5\text{--}13\ \mu\text{m}$  [ $8.5 \pm 2.0$ ] wide, infrequent, septate, unbranched, deliquescing early. – Asci elongate clavate,  $198\text{--}297 \times 12\text{--}20\ \mu\text{m}$ , long-stipitate, stipe  $77\text{--}188 \times 2.5\text{--}6.5\ \mu\text{m}$ , numerous, unitunicate, thin-walled, apex blunt; ring narrow, shallow, refractive; subapical globule large,  $4\text{--}6\ \mu\text{m}$  diameter, smooth; with 8, biseriate to triseriate ascospores. – Ascospores cylindrical, ends rounded,  $33\text{--}51 \times 3\text{--}5.5\ \mu\text{m}$  [ $41.5 \pm 4.5 \times 4.0 \pm 0.5$ ], slightly sigmoid or geniculate, lower 1/3 to 1/4 bent  $45^\circ$  or less, hyaline, aseptate; bipolar appendages present,  $15\text{--}29.5\text{--}(57)\ \mu\text{m}$ , gelatinous, lash-like; becoming differentiated into a swollen head and pedicel while inside the ascus, transversely uniseptate; head narrowly fusiform to ellipsoid,  $11\text{--}19 \times 6\text{--}10.5\ \mu\text{m}$ , conical at the apex, truncate at the base, hyaline to brown, occasionally 1-septate; pedicel  $22.5\text{--}36 \times 3\text{--}5.5\ \mu\text{m}$ , hyaline to pale brown, sometimes brown, up to 3-septate; head dark brown and ascospores 1- to 5-septate after liberation from the ascus.

Colonies on WA, CMA and OA moderately slow-growing, (21–) 30–38 (–60) mm diam in 21 d, silky, mostly submerged, aerial hyphae cottony on OA, sparse, hyaline to brownish-orange (5C4) on WA,



brownish-orange (5C4) to yellowish-brown (5E8) on CMA, olive (3F6) to olive-brown (4F6) on OA, occasional minute reddish-brown to black spots forming in 35 d on OA, phialides copiously produced over the entire mat in all media; margin fimbriate to plumose on WA, even on CMA, wavy on OA, appressed and submerged, hyaline on WA and CMA, olive (3F6) to olive-brown (4F6) on OA, not distinct; reverse same as the mat in all media.

Hyphae largely undifferentiated, 1.5–5.5  $\mu\text{m}$  wide, thin-walled, hyaline to pale brown, pale brown hyphae occasionally encrusted with circular crystals. – Conidiogenous cells phialides, commonly produced from pale brown hyphae as single terminal or several lateral phialides, delimited by a basal septum, monophialidic or polyphialidic, cylindrical, (7–) 13–32  $\times$  2–4  $\mu\text{m}$  at widest part, mostly pale brown, rarely hyaline, constricted below the collarette, 1–2  $\mu\text{m}$  just below the collarette; collarette cup-shaped, not flaring, 2–4.5  $\mu\text{m}$  long  $\times$  2–3  $\mu\text{m}$  wide, same color as phialide. – Conidia pyriform, truncate at base, 3–4 (–4.5)  $\times$  2–3  $\mu\text{m}$  [ $3.5 \pm 0.3 \times 2.5 \pm 0.2$ ], hyaline, aggregated in slimy heads. – Blastoconidia produced laterally from hyphae, pyriform to obovoid, larger than the phialoconidia, 4–7 (–8)  $\times$  2.5–3.5  $\mu\text{m}$  [ $5.5 \pm 1.1 \times 3.0 \pm 0.2$ ], hyaline.

Habitat. – Found on tropical, partially or completely decorated, hardwood twigs and branches of 2–7 cm diam on the ground.

Etymology. – Refers to the dark purplish pigments exuded from the outer ascomatal wall cells and occasionally from the subiculum.

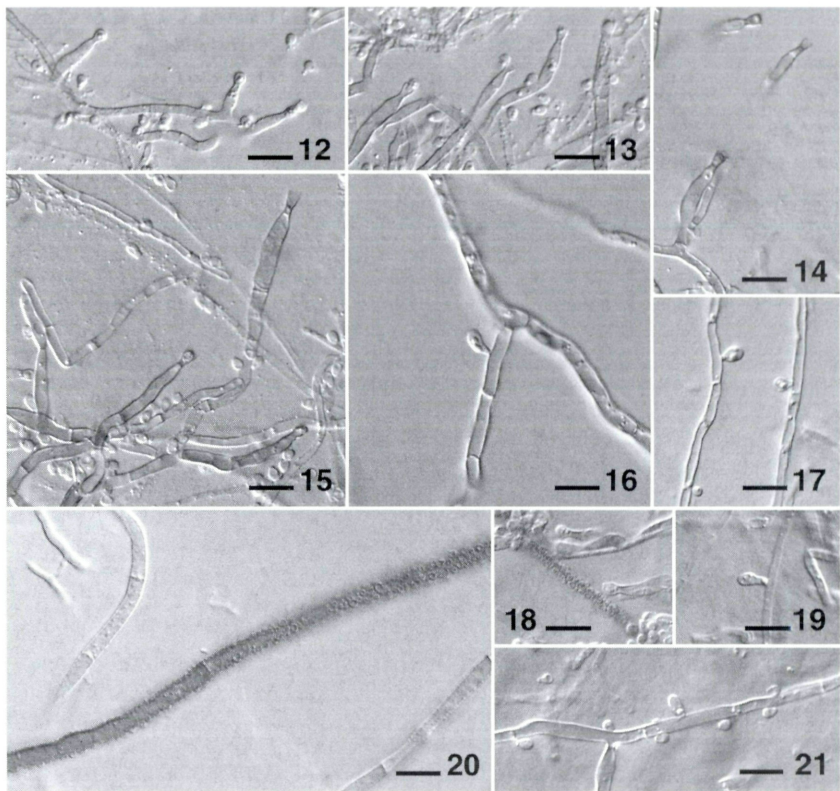
Known distribution. – Puerto Rico.

Specimens used in culture studies. – 2961–1, 2, 3, 4, 5 (all SS), 3073–1, 3 (SS), 4 (MS).

Other material examined. – U.S.A., Puerto Rico, Luquillo Mts., El Verde Research Area, 16-ha Grid, SE of 03.03.43, 370 m, 18 Jan. 1997, on 2 cm diam branch, leg. S.M.H. and F.F. (SMH 3022, F); S of 04.03.23, 373 m, 20 Jan. 1997, on 5 cm diam branch, leg. S.M.H. and F.F. (SMH 3073, F); S of 09.15.32, 372 m, 25 Jan. 1997, on 15 cm diam branch, leg. S.M.H. and F.F. (SMH 3118, F); 09.15.32, 372 m, 29 Jan. 1997, on wood fragment and branch, leg. S.M.H. and F.F. (SMH 3170, F).

***Cercophora rugulosa*** A. N. Miller & Huhndorf, **sp. nov.** – Figs. 22–40.

Ascomata globosa vel subglobosa, 390–610  $\mu\text{m}$  diam, 400–615  $\mu\text{m}$  alta, numerosa, dispersa vel gregaria, superficialia; superficie prisca glabrata, rugulosa in statu sicco, nigra; collo indistincto. Paries ascomatis in sectione longitudinali 49–95  $\mu\text{m}$  crassus, tristratosus. Paraphyses filiformes-ventricosae, septatae, subinde contentu atrolazulin repletatae. Asci anguste clavati, 133–198  $\times$  11–16.5 (–18)  $\mu\text{m}$ , stipitati, stipes 30–59 (–91)  $\times$  3–8  $\mu\text{m}$ , unitunicati, annulo apicali et globulo subapicali praediti, octospori, biseriati vel triseriati. Ascospores juveniles cylindricae, (26–) 29.5–37.5 (–39)  $\times$  3–4.5  $\mu\text{m}$ , hyalina, aseptatae, non caudatae, deinde bicellu-



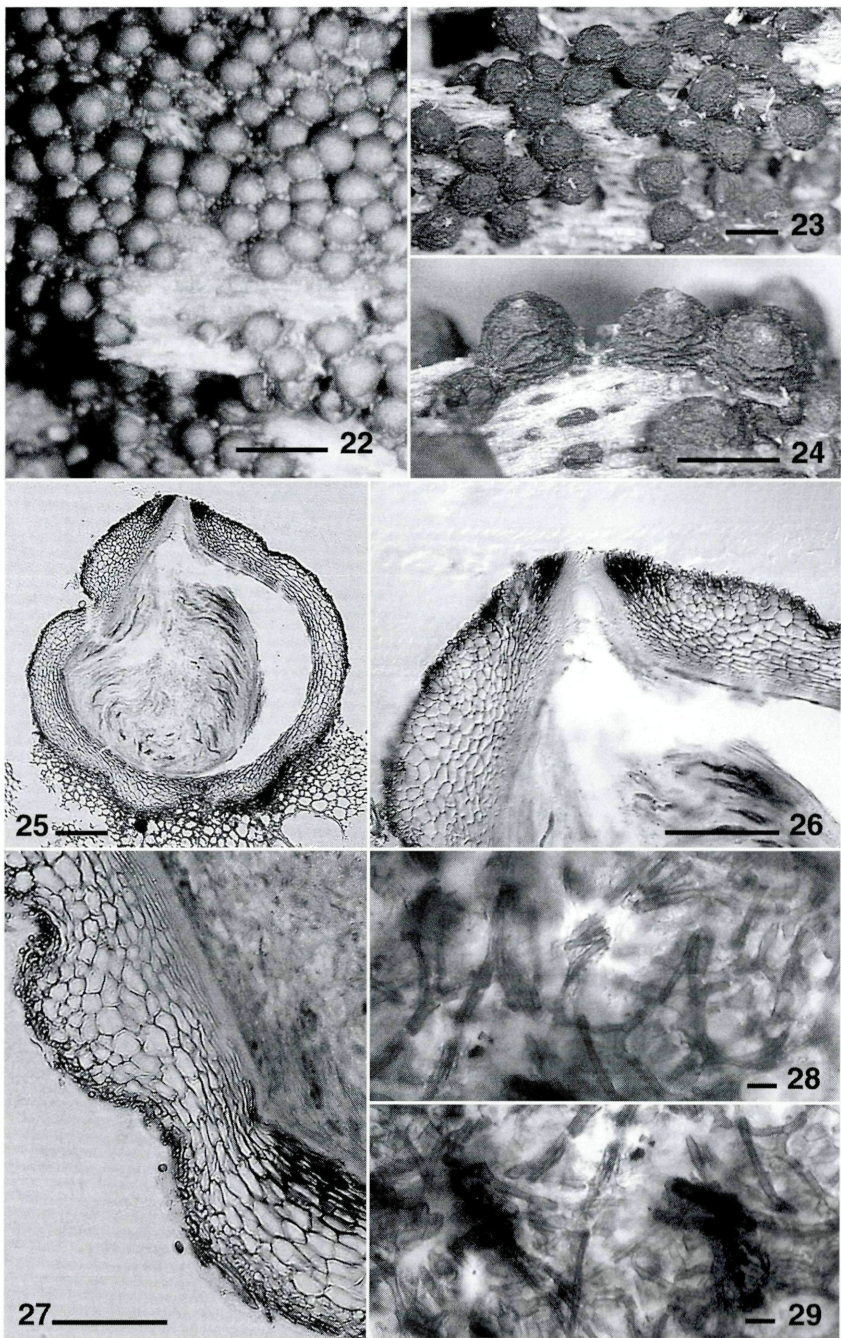
Figs. 12–21. *Cercophora atropurpurea*. – 12–15. Phialides and conidia. – 16, 17, 19, 21. Conidia produced directly from hyphae. – 18, 20. Crystallized hyphae. – Figs. 12–21 = DIC. – Scale bars: 12–21 = 10  $\mu\text{m}$ . – Figs. 12, 13, 20 from SMH 2961-1; 16, 17 from SMH 3073-1; 14, 15, 18, 19, 21 from SMH 3073-4.

lares; cellula superior inflata, ellipsoidea vel ovoidea,  $11.5\text{--}15.5 \times 5\text{--}7$  (–8)  $\mu\text{m}$ , sursum acutiuscula, basi truncata, hyalina vel brunnea; cellula pedicelli  $16.5\text{--}20.5 \times 3.5\text{--}4.5$   $\mu\text{m}$ , hyalina vel pallide brunnea; demum ascosporae uniseptatae usque ad biseptatae.

Holotype. – U.S.A. Puerto Rico, Luquillo Mts., El Verde Research Area, 16-ha Grid, 11.21.24, base quad, near 11.22.11, 375 m, 16 Jun. 1995, on 20 cm diam branch, *Casearia arborea*, leg. S.M.H. and F.F. (SMH 1518, F).

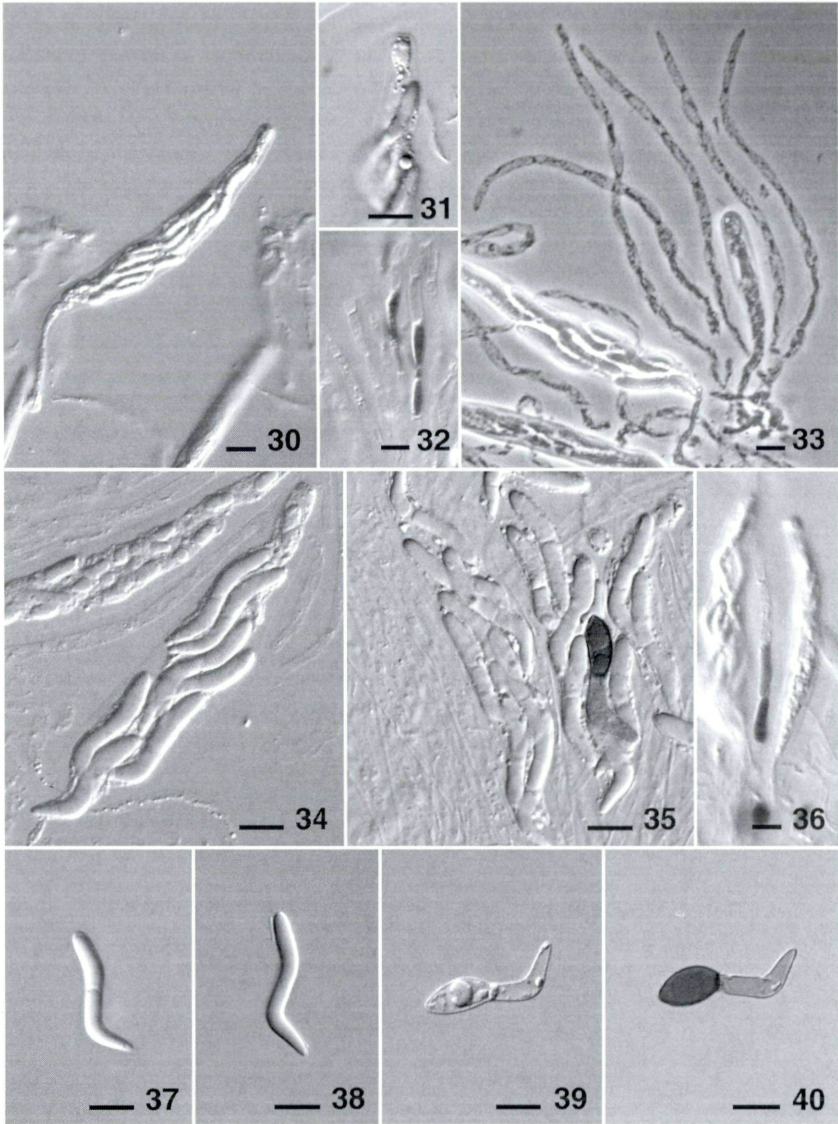
Ascomata globose to subglobose, 390–610  $\mu\text{m}$  diam, 400–615  $\mu\text{m}$  high, numerous, scattered to gregarious, occasionally fused, superficial; surface smooth when fresh, rugulose when dry; neck indistinct, black; subiculum absent. – Ascomatal wall of *textura intricata* and *textura angularis* in surface view; in longitudinal section 3-layered, inner layer 7–13  $\mu\text{m}$  thick, composed of 3–6 layers of elongate to flattened, hyaline to pale brown, pseudoparenchymatous





Figs. 22–29. *Cercophora rugulosa*. – 22–24. Ascomata on substrate. – 25. Longitudinal section through ascoma. – 26. Longitudinal section through neck wall. – 27. Longitudinal section through ascomal wall. – 28, 29. Interwoven brown hyphae on outside of ascomata. – Figs. 22–24 = macroscopic view; 25, 27 = BF; 26, 28, 29 = DIC. – Scale bars: 22 = 1 mm; 23, 24 = 500 µm; 25 = 100 µm; 26, 27 = 50 µm; 28, 29 = 10 µm. – Figs. 22–29 from SMH 1518.





Figs. 30–40. *Cercophora rugulosa*. – 30. Ascus. – 31. Ascus apex. – 32, 36. Paraphyses with blue contents. – 33. Paraphyses. – 34, 35, 37–40. Ascospores. – Figs. 30–32, 34–40 = DIC; 33 = PH. – Scale bars: 30–40 = 10 µm. – Figs. 31, 35, 36, 38–40 from SMH 1518; 30, 33, 34 from SMH 1757; 32, 37 from SMH 3179.

cells, middle layer (37–) 45–59 (–74) µm thick, composed of 8–12 layers of elongate to polygonal, pale brown, pseudoparenchymatous cells, outer layer 5–5.5 (–8) µm thick, composed of 1–2 layers of loosely interwoven prosenchymatous hyphae, hyphae 1.5–4.5 µm

wide, brown, thin-walled. – Ascomatal apex with periphyses. – Perithecial contents initially bright sulfur yellow, pigment quickly diffusing in water. – Paraphyses filiform-ventricose, 2–6.5 (–9.5)  $\mu\text{m}$  [ $4.5 \pm 1.5$ ] wide, numerous, septate, unbranched, persistent, contents occasionally containing blue pigments in water. – Asci narrowly clavate,  $133\text{--}198 \times 11\text{--}16.5$  (–18)  $\mu\text{m}$ , stipitate, stipe 30–59 (–91)  $\times$  3–8  $\mu\text{m}$ , numerous, unitunicate, thin-walled, apex blunt; ring narrow, shallow; subapical globule large, 4–5  $\mu\text{m}$  diam, smooth; with 8, biseriate to triseriate ascospores. – Ascospores cylindrical, apical end rounded, basal end subacute, (26–) 29.5–37.5 (–39)  $\times$  3–4.5  $\mu\text{m}$  [ $33.5 \pm 2.0 \times 3.5 \pm 0.5$ ], slightly sigmoid or geniculate, lower 1/3 bent  $45^\circ\text{--}90^\circ$ , hyaline, aseptate; appendages absent; becoming differentiated into a swollen head and pedicel while inside the ascus, transversely uniseptate; head ellipsoid to ovoid,  $11.5\text{--}15.5 \times 5\text{--}7$  (–8)  $\mu\text{m}$ , subacute at the apex, truncate at the base, hyaline to rarely brown; pedicel  $16.5\text{--}20.5 \times 3.5\text{--}4.5$   $\mu\text{m}$ , hyaline to rarely pale brown, rarely 1-septate; head brown and ascospores 1- to 2-septate after liberation from the ascus.

Colonies on WA moderately slow-growing, 21–39 mm diam in 21 d, moderately fast-growing on CMA and OA, covering the plate in 21 d, silky on WA, silky to slightly subfelty on CMA and OA, appressed, hyaline on WA, hyaline to light yellow (2A5) on CMA, hyaline to grayish-yellow (4D8) on OA; margin even or plumose in all media, appressed, hyaline, not distinct; reverse same as the mat in all media.

Hyphae largely undifferentiated, 1–4  $\mu\text{m}$  wide, commonly forming hyphal coils, thin-walled, hyaline to light yellowish, cubodial crystals produced on WA, anamorph not produced on WA, CMA or OA.

Habitat. – Found on tropical, decorticated, hardwood logs and branches of 15–50 cm diam on the ground.

Etymology. – Refers to the wrinkled appearance of the ascomata after drying.

Known distribution. – Puerto Rico, Ecuador.

Specimens used in culture studies. – 1518–1, 2, 3 (all SS).

Other material examined. – ECUADOR. Orellana Providence, Yasuní National Park, Tinamou Trail,  $00^\circ 40' 16''$  S,  $77^\circ 24' 01''$  W, 200–300 m, 5 Mar. 2001, on 12 cm diam log, leg. F.F., A.N.M. and R.B. (SMH 4341, 4345, 4438, F); on wood piece, leg. F.F., A.N.M. and R.B. (SMH 4347, F); Laguna Trail, on 5 cm diam branch, leg. F.F., A.N.M. and R.B. (SMH 4371, F). U.S.A., Puerto Rico, Luquillo Mts., El Verde Research Area, 16-ha Grid, 02.18.11, 352 m, 5 Oct. 1995, on 15 cm diam log, upper branch of *Chionanthus domingensis*, leg. S.M.H. and F.F. (SMH 1757,

F); 09.15.22, 372 m, 30 Jan. 1997, on 50 cm diam log, leg. S.M.H. and F.F. (SMH 3179, F).

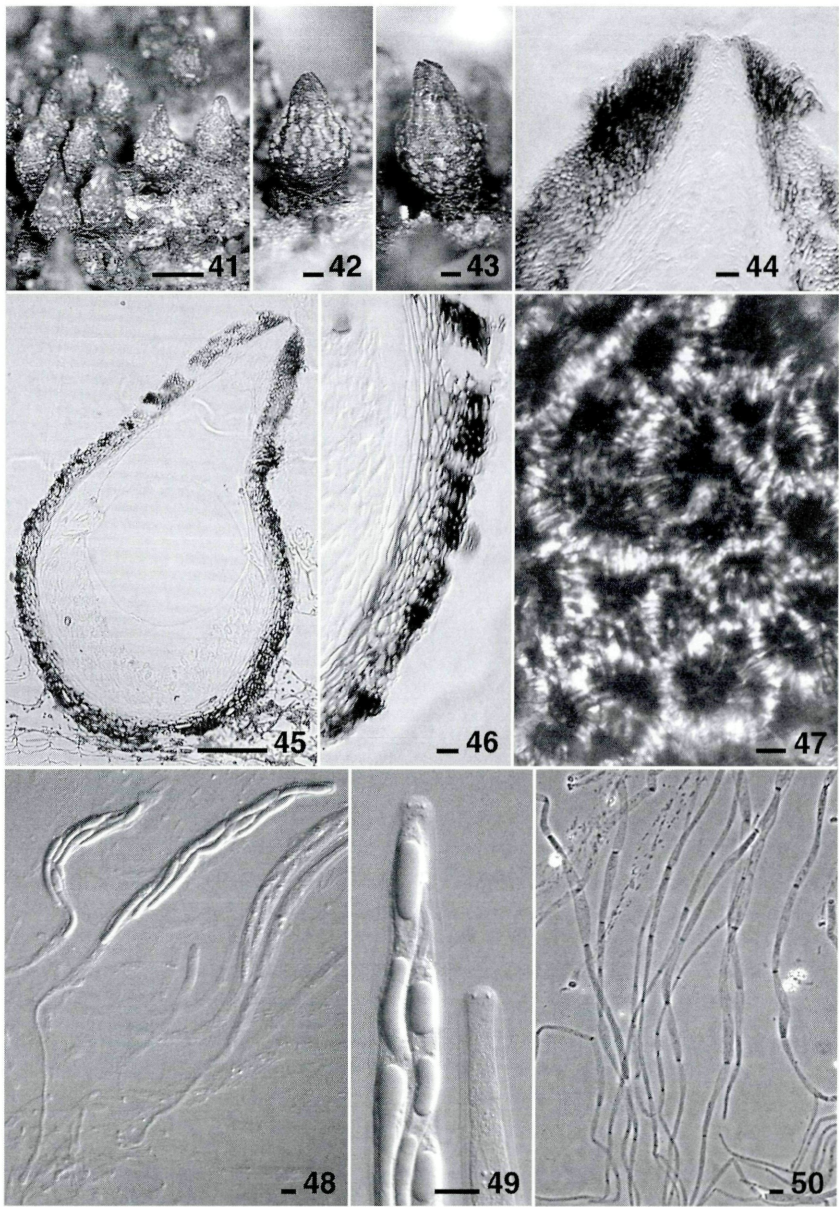
***Cercophora striata*** (Ellis & Everh.) N. Lundq. – Figs. 41–57.

- ≡ *Sordaria striata* Ellis & Everh., J. Mycol. 4: 79 ('67'). 1888.
- ≡ *Podospora striata* (Ellis & Everh.) Ellis & Everh., N. Am. Pyrenomycetes p. 131. 1892.
- ≡ *Pleurage striata* (Ellis & Everh.) Kuntze, Rev. Gen. Plant. 3(3): 504. 1898.

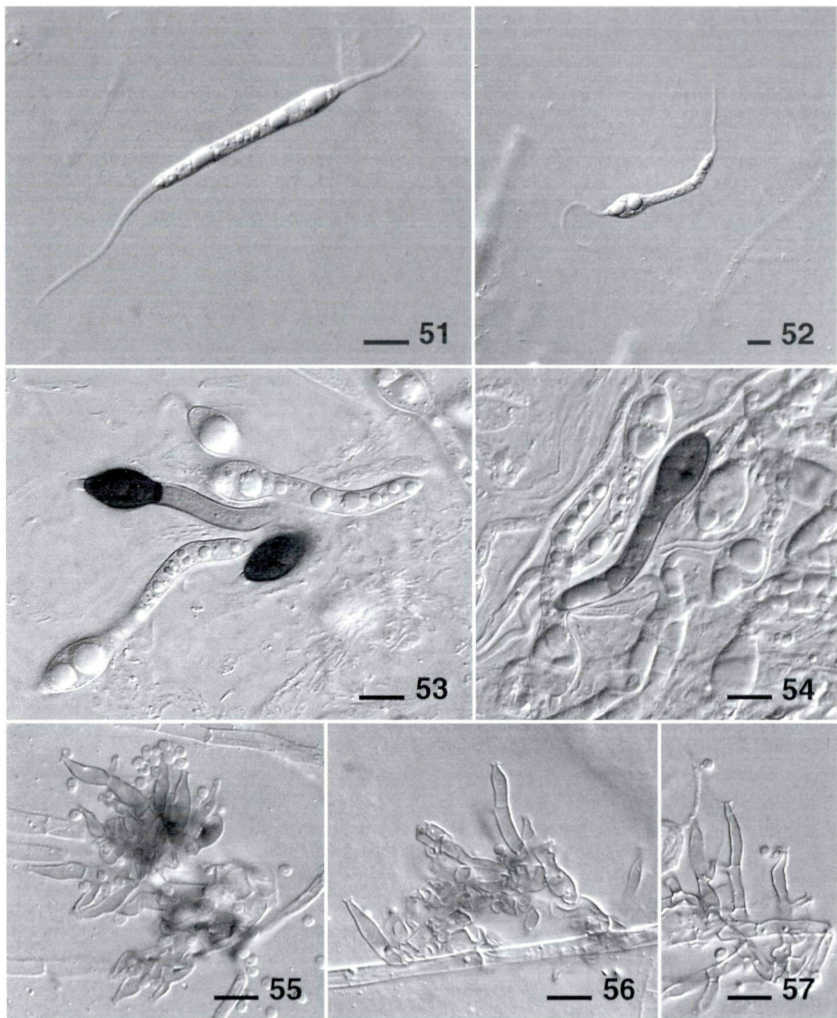
Ascomata ovoid to obpyriform, papillate, 315–515  $\mu\text{m}$  diam, 510–785  $\mu\text{m}$  high, numerous, clustered in large groups, superficial; surface upon drying covered with white to grayish granules or crystalline flakes below the neck, granules not apparent when fresh; neck conical, striate with 5–8 striations or glabrous, distinct; subiculum absent. – Ascomatal wall areolate in surface view, areoles of *textura angularis*, cells between areoles of *textura prismatica*; in longitudinal section 2-layered, composed of pseudoparenchymatous cells, inner layer 6.5–11.5  $\mu\text{m}$  thick, composed of 3–5 layers of elongate to flattened, hyaline cells, outer layer 19–30.5  $\mu\text{m}$  thick, composed of 5–9 layers of thick-walled cells, areoles composed of globose to polygonal, dark brown cells, cells between areoles composed of polygonal to elongate, hyaline to brown cells. – Ascomatal apex with periphyses. – Paraphyses filiform, 2.5–6.5  $\mu\text{m}$  [ $4.0 \pm 1.0$ ] wide, abundant, septate, unbranched, persistent. – Asci elongate clavate, (278–) 305–384 (–413)  $\mu\text{m}$ , long-stipitate, stipe 88–166 (–192)  $\times$  4–9.5  $\mu\text{m}$ , numerous, unitunicate, thin-walled, apex blunt; ring narrow, shallow; subapical globule absent; with 8, biseriate to triseriate ascospores. – Ascospores cylindrical, ends rounded, 47.5–61.5  $\times$  4–6  $\mu\text{m}$  [ $53.5 \pm 3.0 \times 5.0 \pm 0.5$ ], slightly sigmoid or geniculate, lower 1/3 to 1/4 bent 45° or less, hyaline, aseptate; bipolar appendages present, 19–71 (–115)  $\mu\text{m}$ , gelatinous, lash-like; becoming differentiated into a swollen head and pedicel while inside the ascus, transversely uniseptate; head ellipsoid, 17.5–21.5 (–23)  $\times$  8.5–13.5  $\mu\text{m}$ , conical at the apex, truncate at the base, hyaline to occasionally brown, rarely 1-septate; pedicel 29.5–41 (–45)  $\mu\text{m}$ , hyaline to occasionally pale brown, rarely 3-septate; head dark brown and ascospores 1- to 5-septate after liberation from the ascus.

Colonies on WA, CMA and OA fast-growing, on WA covering the plate in 7 d, on CMA and OA 40–60 mm diam in 7 d, isolate 2 (aberrant growth) on CMA covering the plate in 42 d, on OA covering the plate in 21 d, silky, mostly submerged, hyaline on WA, hyaline to yellowish brown (5F5) on CMA, brownish orange (5C3) to yellowish brown (5F8) on OA, numerous minute reddish-brown spots forming in 14 d on OA, phialides copiously produced over the entire





Figs. 41–50. *Cercophora striata*. – 41–43. Ascomata on substrate. – 44. Longitudinal section through neck wall. – 45. Longitudinal section through ascoma. – 46. Longitudinal section through ascomal wall. – 47. Horizontal view of ascomal wall showing areoles. – 48. Asci. – 49. Ascus apex. – 50. Paraphyses. – Figs. 41–43 = macroscopic view; 44, 46–49 = DIC; 45 = BF; 50 = PH. – Scale bars: 41 = 500 µm; 42, 43, 45 = 100 µm; 44, 46–50 = 10 µm. – Figs. 41–46 from SMH 3431; 47–50 from SMH 4036.



Figs. 51–57. *Cercophora striata*. – 51–54. Ascospores. – 55–57. Phialides and conidia. – Figs. 51–57 = DIC. – Scale bars: 51–57 = 10  $\mu$ m. – Fig. 51 from SMH 4036; 52–54 from SMH 3431; 55–57 from SMH 4036-3.

mat in all media; margin plumose on WA and CMA, even on OA, appressed and submerged, hyaline to yellowish brown (5F5), not distinct; reverse same as the mat except becoming black around the oatmeal flakes on OA; sclerotium-like structures produced in 7 wks, subglobose to ovoid, up to 3 mm diam, black, superficial and immersed.

Hyphae largely undifferentiated, 1.5–7.5  $\mu$ m wide, thin-walled, hyaline to pale brown. – Conidiogenous cells phialides, com-



monly produced in compact clusters as single terminal or several lateral phialides, delimited by a basal septum, monophialidic or polyphialidic, cylindrical to obpyriform,  $8.5\text{--}18.5 \times 2.5\text{--}4.5$  at the widest part, subhyaline to pale brown, constricted below the collarette,  $1\text{--}1.5\text{ }\mu\text{m}$  wide just below the collarette; collarette short, slightly flaring, inconspicuous, same color as the phialide. – Conidia subglobose to pyriform, truncate at the base,  $2.5\text{--}3.5 \times 2\text{--}3\text{ }\mu\text{m}$  [ $3.0 \pm 0.2 \times 2.5 \pm 0.2$ ], hyaline, aggregated in slimy heads. – Sclerotium-like structures composed of globose to subglobose, tightly compacted, hyaline to yellowish, thick-walled, pseudoparenchymatous cells surrounded by a black, carbonized wall 1–2 cell layers thick.

**Habitat.** – Found on hardwood branches and herbaceous stems.

**Known distribution.** – Costa Rica, Panama, U.S.A. (Louisiana).

Specimens used in culture studies. – 4036–1, 2, 3, 4 (all SS).

**Material examined.** – COSTA RICA. Provincia Limón, Estación R.B. Hitoy Cerire, Sendero La Catarata, 120 m, 20 Jan. 1999, on dead stem of some monocot, leg. S.M.H. and F.F. (SMH 4036, F). PANAMA. Barro Colorado Island National Monument, Donato trail,  $9^{\circ} 10' \text{ N}$ ,  $79^{\circ} 50' \text{ W}$ , 50–150 m, 16 Sep. 1997, on 10 cm branch, leg. S.M.H. and F.F. (SMH 3431, F). U.S.A. Louisiana, St. Martinsville, 7 Jun. 1888, on decaying stems of some large weed, AB Langlois 1408. HOLOTYPE (NY).

## Discussion

Lundqvist (1972) suggested *Cercophora* may not be monophyletic and molecular data from the nuclear large-subunit ribosomal DNA gene (28S) suggest that *Cercophora* is polyphyletic (A. N. Miller & Huhndorf, unpublished; A. N. Miller & al., 1999; 2000). These molecular data also do not support the monophyly of *Lasiosphaeria*. As such, the authors currently follow the conventional taxonomy of Lundqvist (1972) and maintain *Cercophora* as a distinct artificial genus based on the cylindrical ascospores which develop a swollen, pigmented head.

Species of *Cercophora* are distinguished mainly on ascomatal morphology and to a lesser extent on ascospore size and shape. *Cercophora atropurpurea* differs from other species in the genus in having ovoid to vertically elongate, dark purple ascomata seated on a subiculum (Figs. 1, 2). This species occurs on hardwood twigs and branches which occasionally become stained dark purple around the ascomata from the purplish pigment exuded from the subiculum. The ascomata usually appear warty towards the apex due to aggre-



gations of numerous, smaller, polygonal cells in the outer ascomatal wall (Figs. 3, 6). Perithecia with violet-colored pigments are rare in *Cercophora* (Lundqvist 1972) and only two other species, *C. caerulea* (Petch) N. Lundq. and *C. septentrionalis* N. Lundq., are known. The former occurs on elephant dung and the perithecia are immersed in a weft of dark violet to blackish blue hyphae, whereas the latter occurs on horse dung and the perithecia are covered by brown, flexuous hyphae. Lundqvist (1972) described the hyphae surrounding the perithecia in *C. caerulea* as roughened and examination of the type material indicates this is due to crystalline structures forming on the surface of the hyphae. While subiculum hyphae of *C. atropurpurea* were only slightly scabrous, cultures of this species produced roughened crystallized hyphae (Figs. 18, 20) similar to that found in *C. caerulea*.

*Cercophora rugulosa* is distinguished from all other species of *Cercophora* by the wrinkled appearance of the ascomata upon drying (Figs. 23, 24). Although not apparent in macroscopic view, perithecial squash mounts revealed a tightly compressed third wall layer composed of interwoven brown hyphae (Figs. 27–29). This species also possesses a yellow centrum, paraphyses with blue contents (Figs. 32, 36) and ascospores which lack gelatinous appendages (Figs. 34, 35, 37–40), characters which are uncommon in species of *Cercophora*. *Cercophora areolata* N. Lundq. and *C. sulphurella* (Sacc.) R. Hilber also have yellow centra but lack blue pigments in their paraphyses and possess ascospores with gelatinous appendages.

*Cercophora striata* is distinguished by its striate neck and the distinct white granules which form on the outside of the perithecia upon drying (Figs. 41–43). These granules appear as crystalline structures which quickly dissolve in water explaining why they are not apparent in fresh material. This species also possesses an areolate peridium (Fig. 47) which also occurs in *C. areolata*, *C. coprophila* (Fr.) N. Lundq., *C. septentrionalis* and *C. silvatica* N. Lundq. (Lundqvist, 1972). The tendency of the peridium to break up into distinct areoles is obvious in perithecial squash mounts of *C. striata* (Fig. 47) and *C. areolata* but is much less apparent in the latter three species.

*Cercophora atropurpurea* and *C. striata* produced phialidic-like anamorphs commonly associated with members of the Lasiosphaeriaceae (Lodha, 1987; Gams, 2000). The anamorph of *C. atropurpurea*, which consisted of scattered phialides with distinctive collarettes (Figs. 12–15), is referable to the genus *Phialophora* Medlar (Gams, 2000). *Phialophora*-type anamorphs have also been reported for *Lasiosphaeria ovina* (Fr.) Ces. & de Not. and *Lasiosphaeria hirsuta* (Fr.) Ces. & de Not. (Gams, 1973) as well as several

other taxa in the Lasiosphaeriaceae (Lodha, 1987). *Cercophora atropurpurea* also produced blastoconidia directly from the hyphae (Figs. 16, 17, 19, 21) which were significantly larger than the phialoconidia. The anamorph of *C. striata* is very similar to *Cladorrhinum phialophoroides* Mouchacca & W. Gams in that it produced clustered phialides with short, flaring collarettes (Figs. 55–57) and sclerotium-like structures (Mouchacca & Gams, 1993). *Cercophora samala* Udagawa & Muroi and several species of *Apiosordaria* Von Arx & Gams are also known to possess *Cladorrhinum*-type anamorphs (Mouchacca & Gams, 1993). No anamorph was found in cultures of *C. rugulosa*.

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