Two new species of *Nectria* with *Stilbella* and *Mariannaea* anamorphs

G. J. Samuels[1] & K. A. Seifert[2]

[1] Systematic Botany and Mycology Laboratory, United States Department of Agriculture, Rm. 304, B-011A, Beltsville, MD 20705, USA.
[2] Biosystematics Research Centre, Agriculture Canada, Ottawa, Ontario K1A 0C6, Canada.

Samuels, G. J. & K. A. Seifert (1991). Two new species of *Nectria* with *Stilbella* and *Mariannaea* anamorphs. – Sydowia 43: 249–263.

Nectria stilbellae sp. nov. and its anamorph *Stilbella aciculosa,* and *N. mariannaeae* sp. nov. and its anamorph *Mariannaea* cf. elegans are described from collections made in tropical America. The relationships of *Stilbella* to *Volutella,* and *Mariannaea* to *Clonostachys* are discussed. A key to species of the Hypocreales with synnematous anamorphs is included.

Keywords: taxonomy, Nectriaceae, Hyphomycetes, anamorph-teleomorph connection.

Samuels & Seifert (1987) defined the typical hypocrealean anamorph having the following salient features: phialides, light coloured colonies, conidiophores, and conidia, and conidia held in light coloured or colourless drops of liquid or slime. These features include most of the Moniliaceae, leading to the possibility that most phialidic genera of the family are hypocrealean anamorphs. In the present work, we document two additional connections of moniliaceous anamorphs, in the genera *Stilbella* Lindau and *Mariannaea* Samson, to species of the hypocrealean genus *Nectria* Fr.

Materials and methods

Ascospores were isolated with the aid of a micromanipulator. They were germinated on cornmeal-dextrose agar (CMD, Difco) at approximately 20 C. Cultures were subsequently studied on CMD, oatmeal agar (Centraalbureau Voor Schimmelcultures, 1990) and potato-dextrose agar (PDA, Difco). Herbarium specimens were rehydrated with 3% (aq.) KOH. Measurements were taken from specimens mounted in 100% lactic acid or water. Unless otherwise noted, microscopic structures are hyaline with smooth, thin walls. Terminology in the descriptions of the anamorphs follows Seifert (1985). Isolates have been deposited in the American Type Culture Collection and the Centraalbureau voor Schimmelcultures.

Descriptions of the species

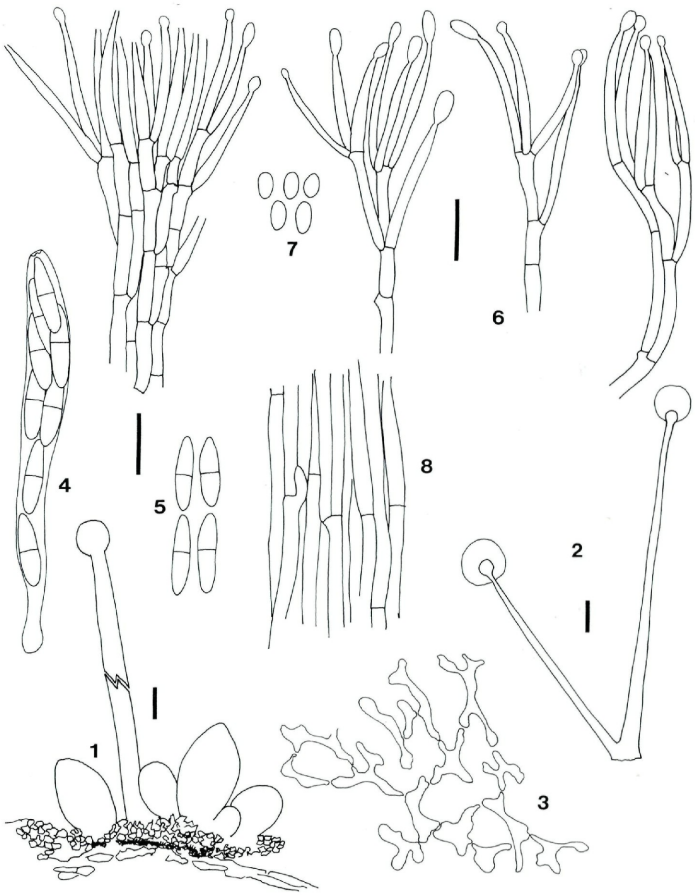
1. *Nectria stilbellae* Samuels & Seifert, sp. nov. – Figs. 1–8.

Nectriae consorti (Ellis) Seaver similis sed ascosporis (9-)9.8–11.7(-12.6) x 2.7–3(-3.5) µm abstans. Status anamorphicus synnematosus; synnemata alba, glabra; conidia ellipsoidea, 5–7 x 2.5–2.8 µm. Status anamorphicus: *Stilbella aciculosa* (Ellis & Everhart) Seifert. Holotypus: French Guiana (Samuels 3079, NY).

Anamorph: *Stilbella aciculosa* (Ellis & Everhart) Seifert. – Stud. Mycol. 27: 44. 1985.
= *Stilbum aciculosum* Ell. & Ev. – J. Mycol. 1: 153. 1885.
See Seifert (1985) for additional synonyms.

Etymology of the specific epithet. – Refers to the *Stilbella* anamorph.

Synnemata in nature to 2 mm tall, cylindrical-capitate or subulate-capitate; the stipe 50–200 µm wide at base, tapering to 20–50 µm below the conidial mass, colourless to white, waxy, produced abundantly, sometimes in concentric rings, scattered, solitary or fasciculate. – Hyphae of stipe 2–3.5 µm wide, parallel, with smooth walls, inconspicuously roughened below the capitulum. – Conidiophore branching monoverticillate or 2-level verticillate, irregularly biverticillate or twice monochasial; metulae, when present, (7.5-)10–17 x 1.5–3.5 µm. – Conidiogenous cells phialides, 13.5–25 x 1.5–2 µm, subulate, in pairs or whorls of 3–5, conidiogenous aperture 1–2 µm wide, periclinal thickening usually visible, collarettes not seen. – Conidial mass 100–750 µm diam, at first clear, becoming yellow, drying white to yellow. – Conidia 5–7(-9) x 2.5–3 µm, ellipsoidal to ellipsoidal-fusiform. – Perithecia broadly pyriform to subglobose, 165–200(-265) µm high, 150–180(-200) µm diam, with an acute apex, yellow to red-orange, sometimes darker at apex, usually not collapsed when dry, sometimes becoming deeply cupulate, not changing colour in 3% KOH, yellow in lactic acid, smooth to roughened, solitary to gregarious or caespitose in groups of a few, often forming at the base of synnemata, superficial or with base slightly immersed in bark, not obviously stromatic but seated on a small, subcortical stroma of intertwined hyphae and difficult to remove from the substrate. – Cells at surface of perithecial wall forming a *textura epidermoidea*, walls unevenly thickened, lumina of adjacent cells joined by fine pores. – Perithecial wall narrow, ca. 20 µm wide, comprising a single region of intertwined hyphae in section having meandering lumina and unevenly thickened walls to 3 µm wide. – Perithecial apex formed of hyphal elements with rounded tips and arranged in a palisade; these elements continuous with the cells of the perithecial wall below, gradually becoming thinner toward the ostiolar canal and merging with the periphyses. – Asci narrowly



Figs. 1–8. — *Nectria stilbellae*. – 1. Habit sketch of perithecia and one synnema. – 2. Sketch of two synnemata. – 3. Cells at surface of perithecial wall showing fine pores between adjacent lumina. – 4. Ascus with ascospores. – 5. Discharged ascospores. – 6. Four aggregates of phialides. – 7. Conidia. – 8. Hyphae of interior of stipe of synnema. – Fig. 4, 5 drawn from SAMUELS 2909, all others from SAMUELS 3079. Scale bars Fig. 1, 2 = 100 µm; all others = 10 µm.

clavate, (51-)55–80(-90) x (5-)5.5–7.7(-8.5) µm, 8-spored, 15–30 µm of the ascal base devoid of ascospores, apex with an obscure refractive ring. – Ascospores ellipsoidal, (9-)9.8–11.7(-12.6) x 2.7–3(-3.5) µm, equally 2-celled, multiseriate, not constricted at the septum, smooth, colourless.

Characteristics in culture. – Colonies on oatmeal agar at 27 C 24–30 mm diam in 7 days, planar but appearing glandular because of synnemata, with white, cottony to funiculose aerial mycelium, surface white or with violet colouration with age, margin entire, reverse inconspicuous, soluble pigments absent. – Synnemata and conidia produced in two weeks similar to those found in nature. – Mononematous conidiophores produced near the colony margin, *Acremonium*-like, with once monochasial branched, subulate phialides 16–27 x 1–2 µm wide, periclinal thickening obvious. – Conidia 6–12 x 2–2.5 µm, fusoid, oblong-ellipsoidal to cylindrical, sometimes slightly curved.

Habitat. – *Nectria stilbellae* has been found on bark of recently dead trees where it possibly grows on mycelium and fructifications of immersed ascomycetes. *Stilbella aciculosa* has been isolated from terrestrial, estuarine or marine soils, roots and fruits, dung, and occasionally wood and bark (Seifert, 1985).

Distribution. – *Nectria stilbellae* is known only from French Guiana and Venezuela. *Stilbella aciculosa* is widely distributed in North America and Europe and is also found in Japan, Indonesia, Nepal, Costa Rica, and Panama (Seifert, 1985).

Holotype. – FRENCH GUIANA: Saül, ca. 15 km SW of Saül (02°60'N, 53°20'W) toward Mt. Galbao (03°50'N,53°20'W), elev. 600–650 m, on twigs of recently dead tree, Jan 1986, Samuels 3079 & Boise (NY, Isotype CAY).

Additional specimens examined. – Data as holotype, Samuels 2909 & Boise (NY). VENEZUELA: Amazonas: Cerro de la Neblina, 5.1 km NE Pico Phelps, 00°50'N,65°10'W, elev. 1730–1850 m, on bark of dead branch, 3 Feb 1985, Rossman 2472 (BPI, VEN).

Nectria stilbellae is found on branches and terminal branchlets of recently dead trees. Waxy, white synnemata are associated with the perithecia on the host, and these were proven to be the anamorph of the *Nectria* when identical synnemata formed in cultures derived from its ascospores.

Nectria stilbellae is classified in *Nectria* subg. *Dialonectria* Sacc. (Samuels & al., 1991). Species in this group are characterized by having superficial, usually smooth, red perithecia the wall of which is less than 25 µm wide. *Nectria stilbellae* is distinguished primarily by its anamorph and is most closely related to *N. consors* (Samuels, 1977), *N. camelliae* (Shipton) Boesewinkel (Shipton, 1979; Boesewinkel, 1982), and the *Nectria* species that have *Chaetopsina* Rambelli

anamorphs (SAMUELS, 1985; SAMUELS & al., 1990; SAMUELS & al., 1991). The anamorphs in this complex are characterized by having thick-walled, setose conidiophores (*Chaetopsina* spp.) or thick-walled setae incorporated in their conidiomata (*Volutella* FR.) or conidiophores (*Cylindrocladiella* BOESEWINKEL).

The *Stilbella* anamorph of *Nectria stilbellae* has most of the diagnostic characters of *S. aciculosa* that were listed by SEIFERT (1985): slender, unpigmented synemmata with a terminal white or yellow conidial mass; somewhat penicillately branched conidiophores; fusiform conidia; purple colouration on OA; *Acremonium*-like mononematous conidiophores with longer conidia than are found in the synnemata. The marginal hyphae near the capitulum are usually conspicuously verrucose, a feature not seen clearly in synnemata of *N. stilbellae* that formed in nature and in culture. This character is variable in *S. aciculosa*; some collections have marginal hyphae with warts to 2 μm wide, in other collections, the roughening is inconspicuous.

The similarity of *Nectria stilbellae* to *Nectria consors* (ELLIS) SEAVER (SAMUELS, 1977), which has a *Volutella* anamorph, raises the question of the distinction between *Stilbella* and *Volutella*, which was not considered by SEIFERT (1985). Our studies of type specimens of species described in *Volutella*, and of unnamed species from New Zealand, indicate that a continuum exists between the typical sessile, setose sporodochia of *V. ciliata* ALB. & SCHW.: FR. and slender, stipitate, setose synnemata. *Stilbella aciculosa* lacks setae, but has fusoidal conidia that are somewhat similar to those of *V. ciliata* and *V. buxi* (CORDA) BERK. The conidiophore branching and shape of the phialides are also similar. Although it is presently acceptable to restrict *Volutella* to species with setose conidiomata, it may be necessary in the future to utilize other characters to distinguish this genus from *Stilbella*.

SEIFERT (1985) revised *Stilbella*, removing most of the species that had previously been linked to hypocreaceous teleomorphs to *Tubercularia* TODE:FR. and *Rhizostilbella* VAN DER WOLK. These genera are characterized in part by red-brown synnemata that turn red in KOH. Three of the remaining species were linked, respectively, to *Nectria gracilipes* (TUL.) WOLLENWEBER, *N. macrostoma* BERK. & CURT., and *Emericellopsis synnematicola* MATHUR & THIRUMALACHAR (Eurotiales). *Nectria gracilipes* and *N. macrostoma* are closely related to each other, but none of these fungi is closely related to *N. stilbellae*.

Many species of the Hypocreales have synnematous anamorphs, which are now included in the anamorph genera *Actinostilbe* PETCH, *Calostilbella* HOEHNEL, *Didymostilbe* HENN., *Fusarium* LINK: FR., *Gliocladium* CORDA, *Rhizostilbella* VAN DER WOLK, *Stilbella* LINDAU, *Tubercularia* TODE: FR. and *Virgatospora* FINLEY. Synnematous

anamorphs have served to delimit several genera in the Hypocreales, including *Calostilbe* Hoehnel, *Corallomyces* Berk. & Curt., *Peethambara* Subram. & D.J. Bhat, *Megalonectria* Speg., *Sphaerostilbe* Tulasne, *Sphaerostilbella* Henn., *Stilbocrea* Pat., and *Stilbonectria* Karsten; of these, only *Peethambara* (anamorph = *Didymostilbe)* and *Sphaerostilbella* (anamorph = *Gliocladium)* are considered to be distinct from *Nectria* (see Seifert, 1985). Species having synnematous anamorphs are widely distributed in *Nectria*; the formation of a synnema is not, *per se,* an indicator of relationships, although the anatomy of these structures may be taxonomically useful (Seifert & Okada, 1990). A key to species of the Hypocreales having synnematous anamorphs follows.

Key to species of Hypocreales with synnematous anamorphs

1. Ascospores dictyosporous or phragmosporous. 2
1*. Ascospores didymosporous 5

2. Ascospores dictyosporous, 15–40 x 7–15 µm; anamorph *Tuberculariа* . . . . . *Nectria pseudotrichia* (Schw.) Berk. (Seeler, 1940; Seifert, 1985)
2*. Ascospores phragmosporous, 14–55 x 5–7 µm; anamorph *Tuberculariа* or *Virgatospora*. 3

3. Perithecia remaining orange or pallid in KOH, ascospores 38–55 x 10–13 µm, 3–5-septate; anamorph *Virgatospora* . . . . . *Nectria spirostriata* Rossman (Rossman, 1983)
3*. Perithecia turning red in KOH, ascospores 14–26 x 4–7.5µm, 3-septate; anamorph *Tuberculariа* 4

4. Ascospores 16–26 x 5.5–7.5 µm, smooth, budding ascoconidia in asci. . . . . *Nectria canadensis* Ellis & Ev. (Rossman, 1983; Seifert, 1985)
4*. Ascospores 14–20 x 4–6 µm, striate, without ascoconidia . . . . . *Nectria lateritia* (Karst.) Rossman (Rossman, 1983)

5. Ascospores averaging > 20 µm long 6
5*. Ascospores averaging ≤ 20 µm long 10

6. Perithecia remaining yellow or pallid in KOH; ascospores 31–42 x 14.5–21 µm, smooth; anamorph *Didymostilbe* . . . . . *Peethambara sundara* Subram. & D. J. Bhatt (Seifert, 1985)
6*. Perithecia turning red in KOH; ascospores 18–50 x 5–13 µm, smooth or striate; anamorph *Actinostilbe* or *Fusarium* 7

7. Perithecia with a furfuraceous coating of narrow yellow hyphae; ascospores 29–50 x 9–13 µm, yellow-brown; anamorph *Fusarium* or *Calostilbella* 8

7*. Perithecia glabrous or with scattered, golden, spinulose hairs arising from the surface and base; ascospores 18–33 x 5–9 µm; anamorph *Fusarium* or *Actinostilbe* 9

8. Ascospores 29–35 x 9–11 µm, smooth ..... *Nectria jatrophae* (Möller) Wollenw. (Wollenweber, 1930: 684; Samuels, 1973)

8*. Ascospores (27-)35–45(-50) x (9-)11–13 µm, coarsely striate ..... *Nectria striispora* Ellis & EV. (Samuels, 1973)

9. Perithecia with scattered, golden, spinulose hairs; ascospores (20-)23.3–29.6(-33) x (5-)6.3–8(-9) µm, striate; anamorph *Actinostilbe* ..... *Nectria mammiformis* (Chardón) Samuels (Samuels & Dumont, 1982)

9*. Perithecia glabrous; ascospores 18–30 x 6.5–9 µm, slightly striate; anamorph *Tubercularia* ..... *Nectria aurantiaca* (Tul.) Jaczewski (Seifert, 1985)

10. Perithecia yellow, orange, or pallid in KOH 11

10*. Perithecia red in KOH 13

11. Perithecia superficial, non stromatic, not immersed in hyphae and perithecial wall surface not distinctly hyphal; occurring on Aphyllophorales; anamorph *Gliocladium,* synnemata yellow ..... *Sphaerostilbella lutea* (Henn.) Sacc. (Seifert, 1985)

11*. Perithecia completely immersed in a white or off-white hyphal stroma, or superficial on an erumpent stroma and then surface of perithecial wall distinctly hyphal; corticolous or on corticolous pyrenomycetes; anamorph *Stilbella,* synnemata often black 12

12. Perithecia completely immersed in an effused, white to roseous hyphal stroma; ascospores (8.5-)10–14 x 4–6 µm; synnemata white, orange to pink and arising from stromata, and gray, black or gray-brown and arising from stromata and from substrate ..... *Nectria macrostoma* Berk. & Broome (Seifert, 1985)

12*. Perithecia superficial in discrete, tuberculate, erumpent aggregates, tan; surface of perithecial wall hyphal, ascospores 9.5–15(-17) x 3.5–6 µm; synnemata white black, gray, or gray-brown, scattered or arising from perithecial aggregates ... *Nectria gracilipes* (Tul.) Wollenw. (Seifert, 1985)

13. Ascospores averaging ≤10 µm wide 14
13*. Ascospores averaging >10 µm wide 15

14. On scale insects, not conspicuously stromatic; ascospores 16–20(-25) x 9–12.5 µm; anamorph *Fusarium* ..... *Nectria flammea* (Tul.) Dingley (Booth, 1971)

14*. Corticolous, often on a coralloid stroma; ascospores 14–21 x 5–9 µm; anamorph *Rhizostilbella* ..... *Nectria mauritiicola* (Henn.) Seifert & Samuels (Seifert, 1985)

15. Ascospores striate 16
15*. Ascospores smooth, spinulose, verruculose to verrucose ... 17

16. Perithecia glabrous, becoming cupulate; ascospores 8.5–13.5 x 4–5 µm; anamorph *Tubercularia* ..... *Nectria pseudocinnabarina* Rossman (Rossman, 1989)

16*. Perithecia with hooked, spinulose, golden hairs, not collapsing; ascospores 13.5–18.3(-21) x 4–6.2 µm; anamorph *Actinostilbe* ..... *Nectria flavolanata* Berk. & Broome (Samuels & al., 1990a; Seifert, 1990)

17. Perithecia, non stromatic, not collapsed, pyriform with an acute apex; ascospores (9-)9.8–11.7(-12.6) x 2.7–3(-3.5) µm, colourless, smooth, anamorph *Stilbella* ..... *Nectria stilbellae* Samuels & Seifert

17*. Perithecia conspicuously stromatic or not, collapsing by lateral pinching or becoming cupulate, globose and non papillate or with a short blunt papilla; ascospores 12–18.6 x 5–8 µm, colourless or yellow-brown, spinulose, verrucose, to verruculose; anamorph *Fusarium* 18

18. On *Valsa*; ascospores (13-)13.7–16.5(-18.6) x (5.6-)6–7(-7.4) µm, spinulose; anamorph *Fusarium* ..... *Nectria stilbosporae* Tul. (Wollenweber, 1924: 675)

18*. Corticolous, fungicolous or not; ascospores 12–17 x 5–8 µm, spinulose, verrucose to verruculose; anamorph *Fusarium* or *Tubercularia* 19

19. Corticolous, non fungicolous; perithecia globose, non papillate, becoming cupulate; ascospores 13–15 x 5–6.5 µm, colourless, spinulose; anamorph *Tubercularia* ..... *Nectria australiensis* Seifert (Seifert, 1985)

19*. Corticolous or fungicolous (but not on *Valsa)*; perithecia pyriform with a short blunt papilla; ascospores (12-)13–16.3(-17) x (5.5-)5.8–7.4(-8) µm; yellow-brown, verrucose to ver-

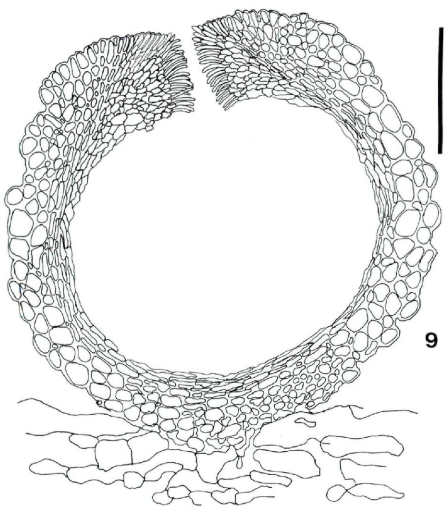
ruculose; anamorph *Fusarium* .....
..... *Nectria flavoviridis* (TUL.) WOLLENW.
(WOLLENWEBER, 1930: 674; BOOTH, 1959)

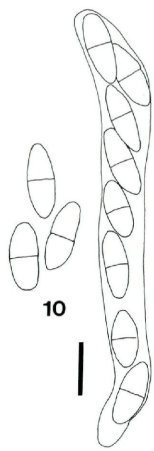
2. *Nectria mariannaeae* SAMUELS & SEIFERT, sp. nov. – Figs. 9–14.

Perithecia superficialia vel basi immersa, globosa vel tympaniformia, 250–350 µm alta, 310–340 µm lata, apice plana, pallide lutea, serius aurantiaca vel brunnea, colore in KOH immutato. Perithecii paries 35–45 µm latus e cellulis 15–30 µm diam compositus. Asci cylindracei vel anguste cylindracei, (43-)56–72(-80) x (4-)5–7(-8) µm, apice annulo refractili minute praedito. Ascosporae ellipsoideae vel anguste fusiformes, (7-)8.8–10.5(-11) x 3.5–4.5(-5) µm, laeves vel spinulosae, hyalinae, bicellulares, septo mediano.

Anamorph: *Mariannaea* cf. *elegans* (CORDA) SAMSON. – Stud. Mycol. 6 75. 1974.

Etymology of the specific epithet. – 'marianneae' refers to the *Mariannea* anamorph.

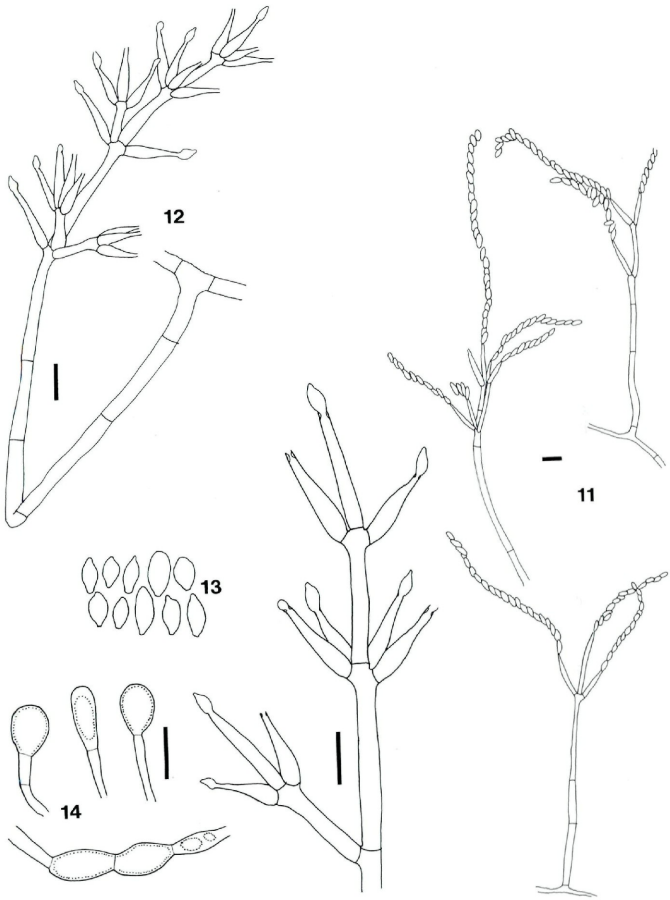




Figs. 9, 10. — *Nectria mariannaeae*. – 9. Median longitudinal section through a mature perithecium. – 10. Ascus and ascospores. – Drawn from DUMONT VE 2908. Scale bars: Fig. 9 = 100 µm, Fig. 10 = 10 µm.

Perithecia globose to tympaniform, 250–350 µm high, 310–340 µm wide, with a flat apex, at first pale yellow, becoming orange to brown and then with a yellow ostiolar area, not changing colour in KOH or lactic acid, usually not collapsed when dry, sometimes collapsing by lateral pinching, smooth to slightly roughened, solitary, superficial or with base slightly immersed in bark and difficult to remove from the substrate. – Cells at surface of perithecial wall circular in outline, 15–30 µm diam, walls ca. 2 µm thick; cells around the ostiolar area much smaller, with elliptic lumina ca. 15 µm long toward the perithecial periphery and ca. 5 µm long near the ostiolar opening, walls ca. 1.5 µm thick. – Perithecial wall 35–45 µm wide; outer region 30–35 µm wide of 3–4 layers of cells with circular to angular lumina and walls 2–3 µm thick; inner region 10–15 µm wide, of flattened and compressed cells. – Perithecial apex formed of a compact palisade of hyphal elements continuous with the inner wall region and protruding through circular cells of the outer wall region and becoming progressively narrower toward the ostiolar canal; the tip cell of the outer hyphal elements clavate, ca. 25 µm long, 5–7 µm wide. Each perithecium seated on a small basal stroma of pseudoparenchymatous cells. – Asci cylindrical to narrowly clavate, (43-)56–72(-80) x (4-)5–7(-8) µm, 8-spored, apex with a minute ring and often appearing simple. – Ascospores ellipsoidal to narrowly fusiform, (7-)8.8–10.5(-11) x 3.5–4.5(-5) µm, equally 2-celled, slightly or not constricted at the septum, smooth or finely spinulose, hyaline.

Characteristics in culture. – Colonies on PDA at 27 C 10–20 mm diam in 7 days, planar to convex, with white, funiculose aerial mycelium, sometimes appearing more or less arachnoid at the center, margin entire, reverse light or dark brown, soluble pigments absent. – Conidiophores 80–400 µm tall, stipes 3–7 µm wide with slightly thickened walls at the base, 2.5–4 µm wide just below the conidiogenous cells, arising from the agar surface or from fascicles or aerial hyphae. – Conidiophore branching usually 1–3 level verticillate, the nodes 15–37 µm long; metulae rarely present, 12–20 x 3–3.5 µm. – Conidiogenous cells phialidic, 10–25(-35) x 2–4 µm, subulate to acerose, in terminal or intercalary whorls of 3–9, sometimes in pairs, or single, conidiogenous aperture 1–1.5 µm wide, periclinal thickening usually obvious, cylindrical to slightly flared collarette sometimes visible. – Conidia 5–9(-17) x (2-)2.5–4.5 µm, often asymmetrical, fusoid, often apiculate, the base sometimes obtusely flattened, in long, white, imbricate chains that collapse into white, slimy masses with age. – Chlamydospores terminal or intercalary, slightly thick-walled, 10–14 x 5–8 µm, when terminal ellipsoidal to clavate, when intercalary globose to ellipsoidal, with up to 9 cells in a chain.



Figs. 11–13. — *Mariannaea* anamorph of *Nectria mariannaeae*. – 11. Three conidiophores showing conidia in imbricate chains. – 12. Two conidiophores showing details of phialides. – 13. Conidia. – 14. Chlamydospores. – All drawn from CMD. Fig. 11, 13 from DUMONT VE 2980. Fig. 12 from CUP-MJ 789. Fig. 14 from CUP-MJ 789. Scale bars = 10 µm.

Habitat. – *Nectria mariannaeae* has been found only on bark. *Mariannaea elegans* has been isolated from bark, decaying wood, and soil.

Distribution. – *Nectria mariannaeae* is known only from Jamaica and Venezuela. *Mariannaea elegans* is widely distributed in the Northern Hemisphere but has been found in South Africa (Samson, 1974).

Holotype. – VENEZUELA: Merida: Parq. Nac. Sierra Nevada, 7 km E of Tabay, above fish hatchery at La Mucuy, on pine, 25 Jul 1971, Dumont (VE 2980), Samuels & Borjas (VEN, NY, ROGERSON culture 71–199, CBS 745.88).

Paratype. – JAMAICA: St. Andrew Parish: vic. Dick's Pond, W of Hardwar Gap, near Holywell Recreation Area and Wag Water River, elev. 2800–3000 ft., on bark, 11 Jan 1971, Korf & al. (CUP-MJ 789) (NY, ROGERSON culture 71–13, CBS 746.88).

Nectria mariannaeae most closely resembles the *Nectria* teleomorphs of *Sesquicillium* W. Gams (Samuels, 1989a) in habitat, in having orange perithecia that do not become red in KOH, and in perithecial anatomy. These species fall within a larger group that includes *N. ochroleuca* (Schw.) Berk. and several other species (Samuels, 1976; 1988; 1989a). This group of species is characterized by orange, KOH-, corticolous perithecia that have relatively wide pseudoparenchymatous walls. In addition to perithecial characters, this group is characterized by slimy salmon-coloured conidia that are often held in imbricate chains, and that are often asymmetric, with the basal abscission scar laterally displaced.

The genus *Mariannaea* Samson was originally proposed by Arnaud (1952) without a Latin description. Samson (1974) redescribed the genus and provided the Latin description; thus the genus is attributed solely to him. He recognized *M. camptospora* Samson and two varieties of *M. elegans*. *Mariannaea elegans* var. *elegans* isolates originate in wood and bark and have agar colonies that are brown in reverse; isolates of *M. elegans* var. *punicea* Samson originate in soil and agar colonies are crimson in reverse. Additional species include *M. clavispora* Samson & Bigg (1988) and *M. superimposita* (Matsushima) Samuels (1989b). No teleomorph has previously been linked to the genus.

Because of its verticillately branched conidiophores, and catenate, light-coloured, unicellular conidia, *Mariannaea* was compared to, and synonymized with *Paecilomyces* Bainier. This synonymy was correctly rejected by Samson (1974) because conidial chains of *Paecilomyces sensu stricto* are dry and the conidia are also held end-to-end in chains. The known teleomorphs of *Paecilomyces* are in the eurotiaceous genera *Byssochlamys, Talaromyces,* and *Thermoascus*.

SAMSON (1974) aptly compared *Mariannaea* to *Clonostachys* CORDA and *Sesquicillium*. Conidia of species of these genera are also held in slimy, imbricate chains. The known teleomorphs of *Clonostachys* (*Gliocladium roseum* BAINIER and its relatives, see SAMUELS, 1976; 1988) and *Sesquicillium* (SAMUELS, 1989a) are species of *Nectria* that are related to *N. ochroleuca* BERK. & CURTIS.

The *Mariannaea* anamorph of *Nectria mariannaeae* has several qualitative differences from *M. elegans* (see SAMSON, 1974), but the size ranges of most structures overlap. In general, the phialides and conidia of the *Mariannaea* anamorph of *N. mariannaeae* are longer and more slender than those of *M. elegans*. In *M. elegans*, the conidiophores are much longer and usually have whorls of metulae, structures that are uncommon on conidiophores of the *Mariannaea* anamorph of *N. mariannaeae*. Colony characteristics of the two entities are roughly the same, although reddish or purple pigments are often produced by *M. elegans* on PDA.

These differences may be sufficient to consider these two anamorphs distinct species. However, micromorphology of cultures of *M. elegans* does change with continuous subculturing, and one of these changes is a reduction in the number of metulae on the conidiophores (K. SEIFERT, unpublished). Therefore, it is conceivable that the available cultures of the *Mariannaea* anamorph of *N. mariannaeae* have degenerated in the same way in the nearly 20 years since their original isolation. A shortening of conidiophores, and changes in the sizes of conidia and phialides would also be consistent with changes in micromorphology that occur with subculture. Therefore, until fresh cultures of *N. mariannaeae* are available, the identity of *M. elegans* as its anamorph remains speculative. For that reason, we have only tentatively assigned a specific epithet to the anamorph at this time.

The separation of *Mariannaea* from *Clonostachys* may ultimately prove to be untenable. Now that a teleomorph for a *Mariannaea* species is known, and the relationship of this teleomorph to the *N. ochroleuca*-group has been demonstrated, a stronger case must be made for maintaining two distinct genera. The present concept of *Clonostachys* allows for two synanamorphs, the first with verticillate conidiophores, and the second with compact penicillately branched conidiophores. The conidiophores of *Mariannaea* species are intermediate between the two synanamorphs of *Clonostachys* species. The branching is usually verticillate, but in some cases the metulae in the basal whorls may be quite long, and irregularly penicillate branching may also occur. Species of both *Clonostachys* and *Mariannaea* tend to have asymmetrical conidia in imbricate chains that slime down.

Acknowledgments

This research was supported in part by National Science Foundation Grant BSR 87–21877 to G.J. Samuels and C. T. Rogerson. The original collections of the *Nectria* species were made with National Science Foundation support to K. P. Dumont. Dr. A. Y. Rossman kindly let us study her specimen of *N. stilbellae*. Dr. Rupert C. Barneby (NY) corrected the Latin diagnoses. We appreciate the comments Drs. W. Gams and A. Leuchtmann provided in review of this article.

References

Arnaud, G. (1952). Mycologie concrète: Genera. – Bull. Soc. Mycol. France 68: 181–223.

Boesewinkel, H.J. (1982). *Cylindrocladiella*, a new genus to accommodate *Cylindrocladium parvum* and other small-spored species of *Cylindrocladium*. – Can. J. Bot. 60: 2288–2294.

Booth, C. (1959). Studies of pyrenomycetes: IV. *Nectria* (Part I). – Mycol. Pap. 73: 1–115.

— (1971). The Genus *Fusarium*. – Commonwealth Mycological Institute, Kew. 237 p.

Centraalbureau Voor Schimmelcultures (1990). List of Cultures, Fungi and Yeasts, 32nd edition. – Baarn.

Rossman, A. Y. (1983). The phragmosporous species of *Nectria* and related genera. – Mycol. Pap. 150: 1–164.

— (1989). A synopsis of the *Nectria cinnabarina*-group. – Mem. New York Bot. Gard. 49: 253–265.

Samson, R.A. (1974). *Paecilomyces* and some allied hyphomycetes. – Stud. Mycol. 6: 1–117.

— & W.L. Bigg (1988). A new species of *Mariannaea* from California. – Mycologia 80: 131 – 134.

Samuels, G. J. (1973). The genus *Macbridella* with notes on *Calostilbe, Herpotrichia, Phaeonectria,* and *Letendraea*. – Can. J. Bot. 51: 1275–1283.

— (1976). A revision of the fungi formerly classified as *Nectria* subgenus *Hyphonectria*. – Mem. New York Bot. Gard. 26(3): 1–126.

— (1977). *Nectria consors* and its *Volutella* conidial state. – Mycologia 69: 255–262.

— (1985). Four new species of *Nectria* and their *Chaetopsina* anamorphs. – Mycotaxon 22: 13–32.

— (1988). Species of *Nectria* (Ascomycetes, Hypocreales) having orange perithecia and colourless, striate ascospores. – Brittonia 40: 306–331.

— (1989a). *Nectria* and *Sesquicillium*. – Mem. New York Bot. Gard. 49: 266–285.

— (1989b). *Nectria* and *Penicillifer*. – Mycologia 81: 347–355.

— & K. P. Dumont (1982). The genus *Nectria* (Hypocreales) in Panama. – Caldesia 13: 379–423.

—, C. T. Rogerson & Y. Doi (1990). Hypocreales. – Mem. New York Bot. Gard. 59: 6–108.

—, A. Y. Rossman, R. Lowen & C. T. Rogerson (1991). *Nectria* subg. *Dialonectria*.- Mycol. Pap. (in press).

— & K. A. Seifert (1987). Taxonomic implications of variation among hypocrealean anamorphs. In: J. Sugiyama (ed.).Pleomorphic fungi: the diversity and its taxonomic implications. – Kodansha Ltd., Tokyo and Elsevier, Amsterdam: 29–56.

Seeler, E. V., Jr. (1940). A monographic study of the genus *Thyronectria*. – J. Arnold Arboretum 21: 429–460. Pls. I-V.

Seifert, K.A. (1985). A monograph of *Stilbella* and some allied hyphomycetes. – Stud. Mycol. 27: 1–235.

— (1990). Synnematous Hyphomycetes. – Mem. New York Bot. Gard. 59: 109–154.
— & G. Okada (1990). Taxonomic implications of conidiomatal anatomy in synnematous hyphomycetes. – Stud. Mycol. 32: 29–40.
Shipton, W.A. (1979). *Calonectria camelliae* sp. nov., the perfect state of *Cylindrocladium camelliae*. – Trans. Brit. Mycol. Soc. 72: 161–164.
Wollenweber, H. W. (1924). *Fusaria* autographice delineata, 510–659. – Berlin.
— (1930). *Fusaria* autographice delineata, 660–1100. – Berlin.