THE MYXOMYCETICOLOUS SPECIES OF NECTRIA [1]

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SUMMARY

A key to the five species of *Nectria* that develop on sporangia or aethalia of Myxomycetes and a description of each species and its imperfect state (when known) are given. Two new species, *Nectria hirsuta* and *Nectria sporangiicola,* are described. *Nectria myxomyceticola* nom. nov. (*Hypomyces exiguus* Pat.), *Nectria candicans* (Plowr.) comb. nov. (*Hypomyces candicans* Plowr.), *Acremonium fungicola* (Sacc.) stat. nov. (*Diplosporium album* var. *fungicolum* Sacc.), and *Stilbella tomentosa* var. *ovalispora* (A. L. Smith) Rogerson comb. nov. (*Stilbum tomentosum* var. *ovalispora* A. L. Smith) are proposed. Four species have been grown in culture from solitary ascospores and their characteristics in culture are described. A discussion of the genera *Nectriopsis* Maire and *Hyphonectria* (Sacc.) Petch is included. The haploid chromosome number of 4 is reported for *Nectria violacea* and *N. candicans.*

Five species of *Nectria* develop on sporangia or aethalia of Myxomycetes. Species of *Fuligo* and *Stemonitis* are most frequently parasitized; occurrences on light-spored Myxomycetes are uncommon. *Nectria violacea* (Fr.) Fr. and *N. candicans* (Plowr.) Samuels are widely distributed in North America and Europe and are especially common on *Fuligo septica* (L.) Weber in bogs where this species grows over the tips of gametophytes of *Sphagnum. Nectria myxomyceticola* Samuels is found at temperate and tropical latitudes. *Nectria hirsuta* Samuels and *N. sporangiicola* Samuels are known only from their type collections, in New Hampshire and New Jersey, respectively.

Nectria violacea, N. candicans and *N. myxomyceticola* are closely related, having cylindrical or oblong ascospores which are less than 10 μ long, cylindrical asci averaging less than 60 μ long, thin perithecial walls with modified hyphae or hairs, and imperfect states which are intermediate between *Verticillium* and *Acremonium. Nectria sporangiicola* also has small asci and ascospores, but its imperfect state is a *Gliocladium,*

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and the perithecial wall, although thin, is smooth. *Nectria hirsuta* is not closely related to the four above species because of its larger perithecia, asci and ascospores and thicker perithecial wall.

Byssostilbe stilbiger (Berk. & Br.) Petch, a member of the Clavicipitales, is found on sporangia of Myxomycetes in the tropics and subtropics. It is associated with synnemata of *Stilbella tomentosa* (Schrad. ex Fr.) Bres. var. *tomentosa,* and is easily distinguished from *Nectria* by its filiform ascospores.

MATERIALS AND METHODS

Eight solitary ascospores were isolated from asci of several collections of *Nectria violacea, N. candicans* and *N. myxomyceticola* with a micromanipulator. My colleague, Dr. Susan Carey, isolated ascospores from the type collection of *N. sporangiicola.* The ascospores germinated overnight on cornmeal dextrose agar (Difco) supplemented to a final percentage of 5% w/v of agar (Difco).

The media used for cultures were cornmeal dextrose agar (CMD), oatmeal agar (OA, Difco), V-8 Juice agar (V-8) (Toussoun and Nelson, **1968**: V-8 Juice, Campbell Soup Company, 200 ml; $CaCo_3$, 3 g; Difco agar, 20 g; distilled water, 800 ml) and potato sucrose agar (PSA) (Booth, **1971**; potato extract, 500 ml; surcose, 20 g; Difco agar, 20 g; distilled water, 500 ml; the potato extract prepared as follows: 1,800 g potatoes peeled, sliced, wrapped in cheese cloth, suspended in 4,500 ml boiling water for 10 min, the potatoes discarded, and the liquid autoclaved for 20 min at 15 lb/in^2). Cultures cited are maintained in the culture collection of C. T. Rogerson at The New York Botanical Garden.

THE GENERA NECTRIOPSIS AND HYPHONECTRIA

Nectria violacea and *N. candicans* were included in *Nectriopsis* Maire (**1911**), a genus described for species of *Hypomyces* Tulasne having uniseptate, rounded to subacute ascospores, and perithecia formed in a subiculum. In this sense *Nectriopsis* is intermediate between *Nectria* Fries, which lacks a subiculum but has rounded to subacute ascospores, and *Hypomyces,* which has a subiculum and fusiform, apiculate ascospores. *Nectriopsis violacea* (Schm. ex Fr.) Maire was designated the lectotype of the genus by Weese (**1913**).

Nectria subg. *Hyphonectria* Saccardo (**1883**) was raised to generic rank by Petch (**1937**), who asserted that the genus *Hyphonectria* (Sacc.) Petch had priority over *Nectriopsis. Nectriopsis* is, however,

the older generic name, and accordingly is the correct name for *Hyphonectria* in the sense of Petch. *Hyphonectria* (Sacc.) Petch is not superfluous since it must be typified by one of the eight species originally comprising the subg. *Hyphonectria* Sacc. (*International Code of Botanical Nemenclature,* 1966, Article 7 Note 4), none of which was ever included in the genera *Nectriopsis* or *Hyphonectria.* I intend to deal with the species of the subg. *Hyphonectria* in a forthcoming paper.

The features of perithecial ontogeny and morphology, asci and ascospores of *Nectria violacea* and *N. candicans* are not enough to distinguish these two species from other species of *Nectria* in a genus of their own. The so-called subiculum of *N. violacea* and *N. candicans* is vegetative mycelium and is not comparable to the sexually stimulated subiculum of *Hypomyces.*

KEY TO MYXOMYCETICOLOUS SPECIES OF NECTRIA

1. [Ascospores filiform; multicellular, breaking apart in the ascus; associated with *Stilbella tomentosa* var. *tomentosa*.....*Byssostilbe stilbiger*]
1. Ascospores oblong, cylindrical, or elliptical; equally 2-celled, not breaking apart in the ascus; associated with *Acremonium* spp., *Verticillium rexianum* or *Stilbella tomentosa* var. *ovalispora*.....2
2. Perithecia violet to purple.....1. *Nectria violacea*
2. Perithecia hyaline, white, yellow or brownish yellow.....3
3. Ascospores averaging more than 9 μ long.....2. *Nectria hirsuta*
3. Ascospores averaging less than 9 μ long.....4
4. Ascospores (4–)4.7–5.5(–7) μ long; cells of upper perithecial wall producing aculeolate, spinulose hairs.....3. *Nectria myxomyceticola*
4. Ascospores averaging more than 6 μ but less than 9 μ long; cells of upper perithecial wall producing nonaculeolate, branched, septate, spinulose hyphae or perithecial wall smooth.....5
5. Ascospores (5–)6–7.5(–8.7) × 2–3 μ; cells of upper perithecial wall producing nonaculeolate, branched, septate, spinulose hyphae.....4. *Nectria candicans*
5. Ascospores (7)8–9(–9.5) × 3 μ; perithecial wall smooth.....5. *Nectria sporangiicola*

1. NECTRIA VIOLACEA (Fr.) Fr., Summa Veg. Scand. Sect. 2: 388. 1849. FIGS. 1, 2, 7–11

≡ *Sphaeria violacea* Fr., Syst. Mycol. 2(2): 441. 1823.
≡ *Hypomyces violaceus* (Fr.) L.-R. Tul., Ann. Sci. Nat. Bot. Sér. 4, **13**: 14. 1860.
≡ *Peckiella violacea* (Fr.) Sacc., Syll. Fung. **9**: 945. 15 Sept., 1899.
≡ *Hypolyssus violacea* (Fr.) O. Kuntze, Rev. Gen. Plant. **3**(2): 488. 28, Sept., 1898.

≡ *Byssonectria violacea* (Fr.) Seaver, Mycologia **2**: 65. 8 Mar., 1910.

≡ *Nectriopsis violacea* (Fr.) Maire, Ann. Mycol. **9**: 323. 10 Aug., 1911.

≡ *Hyphonectria violacea* (Fr.) Petch, J. Bot. **75**: 220. Aug., 1937.

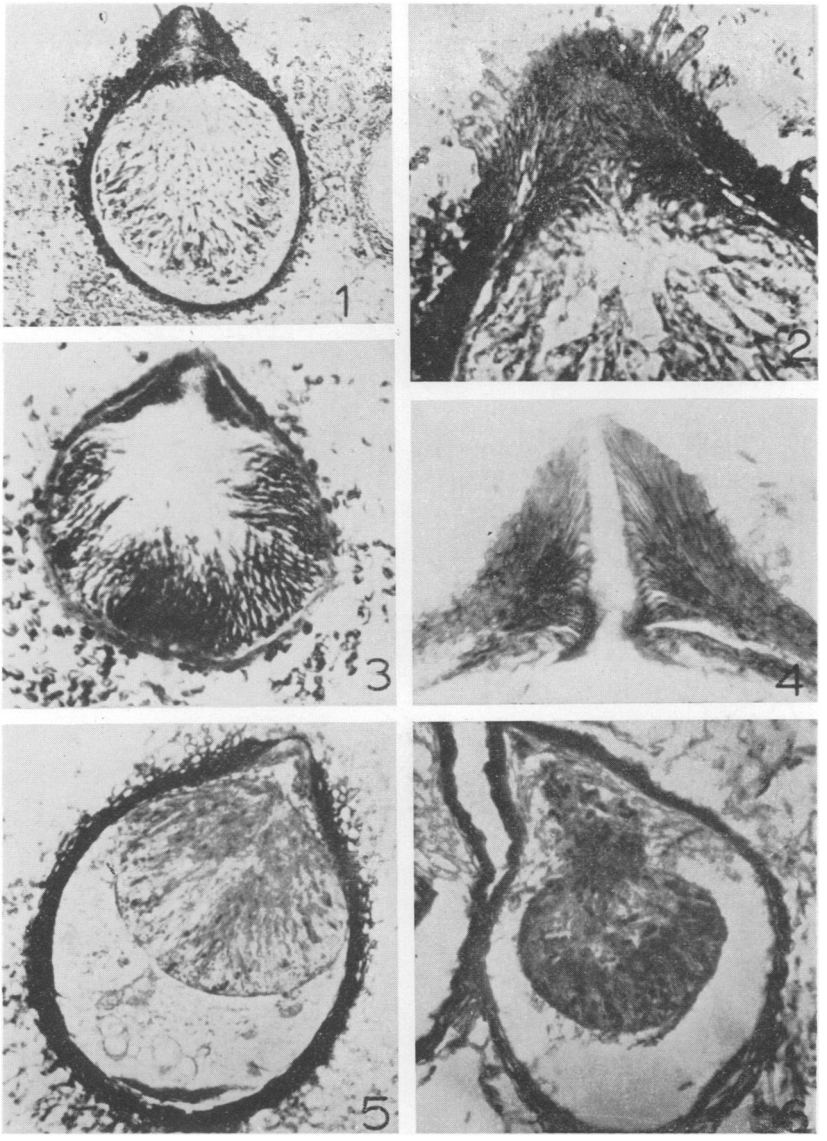
Conidial state.

Acremonium fungicola (Sacc.) Samuels, stat. nov.

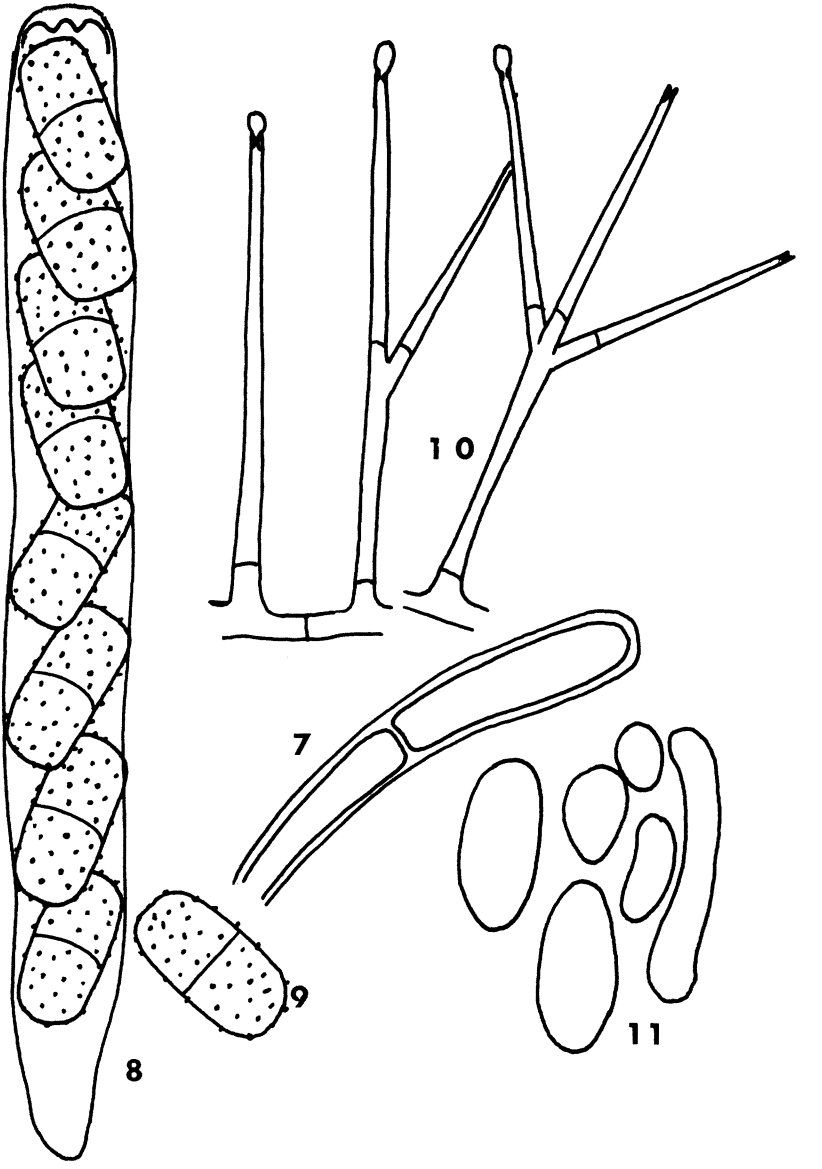
≡ *Diplosporium album* Bon. var. *fungicolum* Sacc., Syll. Fung. **4**: 178. 10 Apr., 1886.

Mycelium white, violet immediately surrounding each perithecium, dense, covering the surface of the aethalia of the host. Conidiophores white, produced throughout the colony; conidia in solitary, hyaline slime heads at the tips of the phialides. Perithecia (FIG. 1) immersed in the mycelium, becoming collabent on drying, broadly pyriform, (116–)240–275(–390) × (150–)240–260(–310) μ, or globose, (170–)240–260(–340) μ, violet to purple; walls 15–20 μ thick, cells of the surface thin-walled, angular, 7–10 μ across in greatest dimension. Papillae (FIG. 2) free, acute, formed of thick-walled, septate, unbranched, hyphae; hyphae extending outwardly as hairs, 10–50 μ long, 5 μ in diam at the rounded tips (FIGS. 1, 2, 7), forming a fringe around the papillae; periphyses ca. 15 μ long, bases 2 μ in diam, tips rounded, 1 μ in diam. Asci (FIG. 8) cylindrical, (40–)50–60(–75) × 3–5 μ, 8-spored, sessile, apices with a nonchitinoid ring, bases rounded. Ascospores (FIG. 9) obliquely uniseriate with overlapping ends, equally 2-celled, cylindrical, spinulose, (5–)7–8 × 2.5–3 μ, not constricted, hyaline.

Characteristics in culture.—Colonies derived from solitary ascospores on CMD, 2–3 cm in diam, margin undulate in 1 week; mycelium white mostly submerged with little aerial hyphae; conidiophores arising from the surface of the agar; colonies derived from solitary ascospores on OA, 3–5 cm in diam, margin entire in 1 week; mycelium white, tomentose, with floccose concentric rings; conidiophores arising from the surface of the agar and from the aerial hyphae; colonies derived from solitary ascospores on V-8, 4–5 cm in diam, margin entire in 1 week; mycelium pink in the center, fading to white at the margin, tomentose; conidiophores arising from the surface of the agar and from the aerial hyphae. Conidiophores (FIG. 10), on CMD, OA and V-8, white, unbranched phialides, or 2–3 philadies arising from the tip of one axis; phialides aseptate or uniseptate, smooth, 30–50 μ long, bases 2 μ in diam, tips 1 μ in diam. Conidia (FIG. 11), on CMD, OA and V-8, unicellular,



FIGS. 1–2. *Nectria violacea.* 1. Perithecium, × 185. 2. Papilla with hairs, × 470. FIGS. 3–4. *Nectria candicans.* 3. Perithecium, × 250. 4. Papilla, × 1,010. FIG. 5. *Nectria myxomyceticola,* perithecium, × 200. FIG 6. *Nectria sporangiicola,* perithecium, × 380. (1–2. Rogerson culture 67–192. 3–4. Rogerson culture 68–150. 5. Rogerson culture 69–180. 6. Holotype.)



FIGS. 7–11. *Nectria violacea,* representative sketches. 7. Perithecial hair, × 1,600. 8. Ascus, × 3,000. 9. Ascospore, × 3,000. 10. Conidiophores, three with developing conidia, × 1,350. 11. Conidia, × 3,100.

smooth-walled, hyaline, elliptical, 6–9.5 × 2–3 μ, many elongating, 17 μ; in solitary slime heads at the tips of the phialides; slime heads on OA pale tan, adjacent slime heads coalescing, forming extensive areas of pale tan slime in the center of the colony. Perithecia not forming on OA in cultures derived from solitary ascospores, forming within 1 month on OA in culures derived from combinations of compatible, solitary ascospores; compatibility factors segregating in a 4 + 4 fashion in the ascus; haploid chromosome number = 4.

Holotype.—GERMANY: Bernstadt, on *Fuligine violacea,* Schmidt, 1817 (UPS; herb. E. Fries, as *Sphaeria violacea!*)

Habitat.—Found only on *Fuligo septica* (syn: *Fuligo violacea*), July to October in New York, not common.

Distribution.—U.S.A.: Idaho (1),[3] Maine (5), New York (5), South Carolina (1), Tennessee (1), Washington (3). CANADA: Quebec (1) EUROPE: Austria (1), Czechoslovakia (6), England (1), Finland (11), France (1), Germany (5), Scotland (3), Sweden (4), Switzerland (1).

Representative specimens examined.—U.S.A. Maine: Waldo County, Northport, near Belfast, on *Fuligo septica,* R. L. Homola, 1 Oct., 1967 (NY, Rogerson culture 67–192); Lincoln County, Boothbay Harbor, on *Fuligo septica,* S. Stein, 10 Aug., 1971 (NY, Rogerson culture 71–367). EUROPE. Czechoslovakia: Mähr, Weisskirchen, Swrcow, on *Fuligo septica,* H. Petrak, III. 1936. (NY, F. Petrak. Fl. Bohemiae et Moraviae exs. II. ser.—I Abt. Pilze. no. 2383). Finland: Mustiala on *Aethalium violaceum* P., Nov (K; Karsten. Fungi Fenniae exs. no. 270). France: Meurthe-et-Moselle, Pierre-Percée, Forêt des Elieux, on *Fuligo septica,* R. Maire, 3/8 1908 (MPU; as *Hypomyces violaceus*). Scotland: Cawdor Woods, C. B. Plowright, 19 Sept., 1879 (K; as *Hypomyces violaceus*).

Illustrations.—Müller and von Arx (**1962**), fig. 250; Munk (**1957**), fig. 8; Plowright (**1882**), Pl. 157, fig. 2, a–e.

Notes.—Saccardo's description of *Diplosporium album* var. *fungicolum* was based on Plowright's (**1882**, p. 157, fig. 2d) illustration, which incorrectly shows the conidia to be 2-celled and the conidiophores to be highly branched. The conidia of *Acremonium fungicola* are unicellular and the conidiophores are infrequently branched.

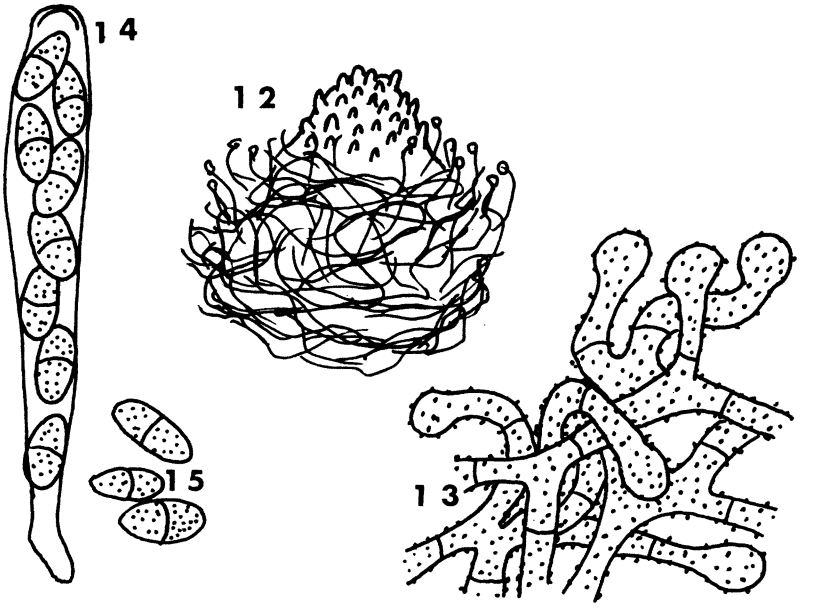
[3] The numbers in parentheses are the numbers of specimens examined from the areas.

Tulasne (**1860**) described dark, broadly ovate chlamydospores for *N. violacea;* I have not seen chlamydospores for this species in specimens or in culture. Tulasne may have mistaken the dark, globose spores of the host, *Fuligo septica,* for chlamydospores of the parasite.

2. **Nectria hirsuta** Samuels, sp. nov. FIGS. 12–15

Perithecia pyriformia, 370–400 μ alta, 350–450 μ lata, luteola; asci 65–95 μ longi, 6–10 μ lati, cylindrici deinde clavati, apice simplici; ascosporae aeque bicellulares, ellipsoideae, 9–13 μ longae, 4–5 μ latae, spinulosae.

Mycelium white, floccose, covering the surface of the sporangia of the host. Perithecia (FIG. 12) immersed in the mycelium, solitary or gregarious, broadly pyriform, 370–400 × 340–450 μ, yellow; wall 35–40 μ thick, cells of the surface obscured by hyphae. Papillae free, rounded, ca. 93 μ in diam at the ostiolar opening, ca. 60 μ high; composed of diagonally diverging hyphae, extending outwardly as hairs, 5–10 μ long (FIG. 12); periphyses cylindrical, ca. 15 × 1.5 μ, tips rounded. Hyphae covering the upper half of the wall standing erect as thin-walled, septate, branched, spinulose hairs (FIG. 13) with slightly swollen tips 4–5 μ in diam. Asci (FIG. 14) cylindrical becoming clavate,



FIGS. 12–15. *Nectria hirsuta,* holotype, representative sketches. 12. Perithecium, × 100. 13. Spinulose hairs that arise from perithecial wall, × 1,400. 14. Ascus, × 940. 15. Ascospores, × 940.

67–95 × 6–10 μ, 8-spored, sessile or with a short stalk, apices simple, bases pedicellate. Ascospores (FIG. 15) uniseriate, becoming biseriate above or clustered in the tops of the asci, equally 2-celled, ellipsoidal, spinulose, 9–13 × 4–5 μ, not constricted, hyaline.

Holotype.—U.S.A.: New Hampshire, Intervale, on the sporangium of an unidentifiable myxomycete, R. Thaxter (1061), Aug., 1907 (FH; as *Ophionectria* n.s.!; slide in NY).

Distribution.—Known only from the type collection.

Notes.—Synnemata of *Stilbella tomentosa* (Schrader ex Fries) Bresadola var. **ovalispora** (A. L. Smith) Rogerson, comb. nov. (*Stilbum tomentosum* Schrad. ex Fr. var. *ovalispora* A. L. Smith, Trans. Brit. Mycol. Soc. **2**: 26. 1902 [2 Mar., 1903]) are associated with perithecia of *N. hirsuta* on the sporangia in the type collection. I found no other asexual state. Since *N. hirsuta* has never been cultured, the connection between it and *Stilbella tomentosa* var. *ovalispora* is not proven.

Stilbella tomentosa var. *tomentosa* has been found associated with perithecia of *Byssostilbe stilbiger*.

3. **Nectria myxomyceticola** Samuels, nom. nov. FIGS. 5, 16–20

≡ *Hypomyces exiguus* Pat., Bull. Soc. Mycol. France **18**: 180. 15 May, 1902, non *Nectria exigua* Hino & Katumoto, Bull. Fac. Agric. Yamaguti Univ. **9**: 889. 1958.

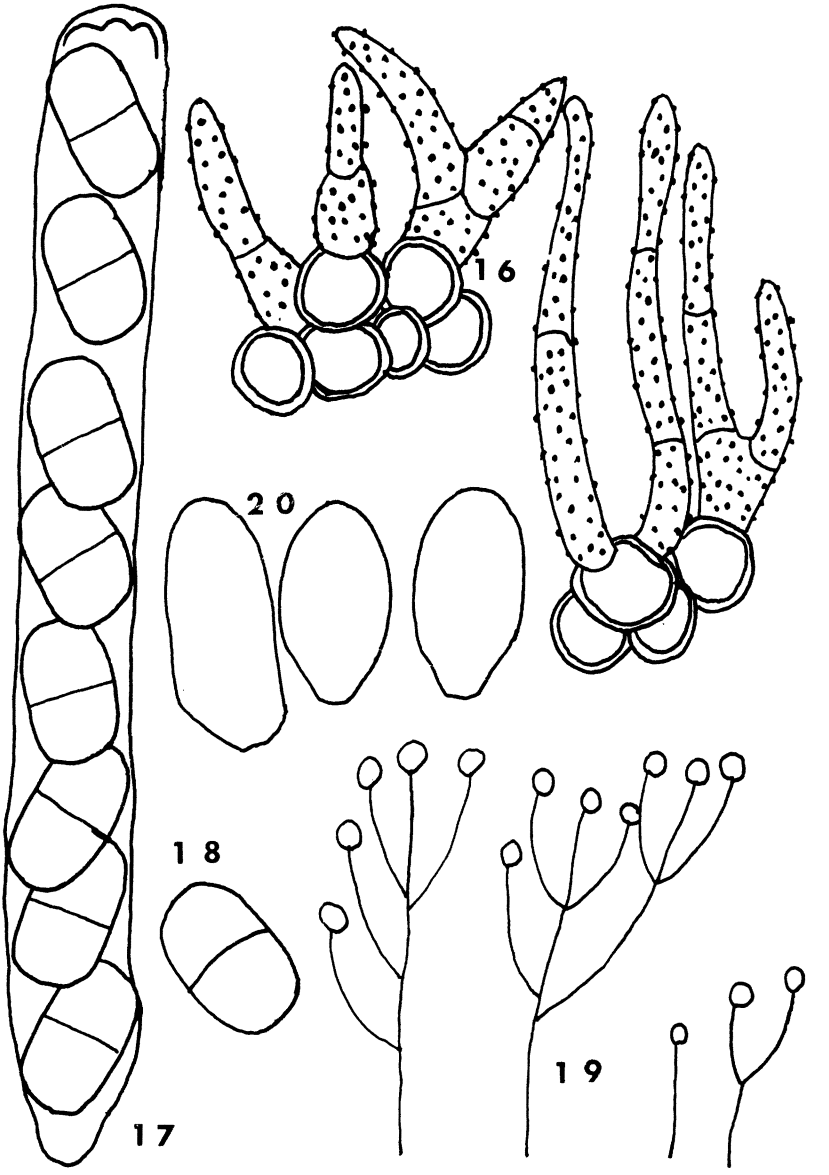
Conidial state.

Verticillium rexianum (Sacc.) Sacc., Syll. Fung. **4**: 153. 10 Apr., 1886.

≡ *Verticillium nanum* Berk. **V. rexianum* Sacc., Michelia **2**: 577. 1 Dec., 1882.

= ?*Verticillium niveo-stratosum* Lindau, Verh. Bot. Vereins Prov. Brandenburg **45**: 158. 3 June, 1903.

Mycelium white, floccose, covering the surface of sporangia or aethalia of the host. Conidiophores white, produced throughout the colony; conidia in solitary hyaline slime heads at the tips of the phialides. Perithecia (FIG. 5) free or immersed in the mycelium, solitary or gregarious, subglobose, 140–216 × 125–200 μ, or globose, 200–370 μ in diam, white to pale yellow; wall 10–15 μ thick, cells of the surface angular, 7–10 μ across in greatest dimension, with slightly thickened walls. Papillae free, acute, surrounded by a 25 μ-thick region of spherical cells 7–10 μ in diam, 1–3 hairs (FIG. 16) arising from each of the



FIGS. 16–20. *Nectria myxomyceticola,* representative sketches. 16. Perithecial hairs, × 1,000. 17. Ascus, × 3,000. 18. Ascospore, × 3,000. 19. Conidiophores with hyaline slime heads at the tips of phialides, × 330. 20. Conidia, × 4,000.

spherical cells, aculeolate, white, erect, spinulose, 20–100 μ long, 3–5 μ in diam at the bases, infrequently septate, infrequently branched, sometimes merging with the mycelium. Asci (FIG. 17) cylindrical sometimes becoming clavate, (30–)40–50(–60) × (2.5–)3.4(–6) μ, 8-spored, sessile, apices with a nonchitinoid ring, bases rounded or pedicellate. Ascospores (FIG. 18) obliquely uniseriate with overlapping ends, oblong, smooth (4–)4.7–5.5(–7) × 2–3 μ, not constricted, hyaline.

Characteristics in culture.—Colonies derived from solitary ascospores on CMD, 4 cm in diam, margin entire in 1 week; mycelium white, mostly submerged with little aerial hyphae, conidiophores arising from the surface of the agar and from the aerial hyphae; colonies derived from solitary ascospores on OA and V-8, 4 cm in diam, margin entire in 1 week, mycelium white, tomentose, conidiophores arising from the surface of the agar and from the aerial hyphae; colonies derived from solitary ascospores on PSA, 7 cm in diam, margin entire in 3 weeks, mycelium pink in the center fading to white at the margin, tomentose, conidiophores arising from the surface of the agar and from the aerial hyphae. Conidiophores (FIG. 19), on CMD, OA, V-8 and PSA, white, verticillately branched, or simple phialides, phialides aseptate or uniseptate, smooth, 40–50 μ long, bases 2 μ in diam, tapering and gently curving upward to tip 1 μ in diam. Conidia (FIG. 20), on CMD, OA, V-8 and PSA, unicellular, smooth-walled, hyaline, elliptical, (5–)6–7(–13) × 2–3 μ, frequently with a prominent, basal hilum; in solitary hyaline slime heads at the tips of the phialides; slime heads on OA buff, adjacent slime heads coalescing, forming extensive buff-colored areas in the colony. Perithecia not forming on OA in cultures derived from solitary ascospores, forming within 1 month on OA in cultures derived from combinations of compatible, solitary ascospores; compatibility factors segregating in a 4 + 4 fashion in the ascus.

Holotype.—GUADELOUPE on *Stemonitis,* Juss (404) (FH; as *Hypomyces exiguus*!; slide in NY).

Habitat.—On sporangia of *Arcyria cinerea* (Bull.) Pers., *A. nutans* (Bull.) Grev., *Fuligo septica, Stemonitis fusca* Roth, *S. nigrescens* Rex, *Stemonitis* spp., August to October in eastern U. S. A., rare.

Specimens examined.—U.S.A.: Louisiana: East Baton Rouge Parish, south of Baton Rouge, Louisiana State University, Essen Lane Farm, on *Stemonitis fusca,* C. T. Rogerson, 25 Aug., 1960 (NY). New York: Albany County, Poplar Street Bog, on *Stemonitis,* Stanley J. Smith (47028) & J. Kenneth Dean, 21 Sept., 1971 (NY, NYS);

Essex County, Indian Pass Trail, ½ mi from Heart Lake, on *Stemonitis nigrescens,* C. T. Rogerson (culture 70-96) et al., 14 Oct., 1970 (NY); Westchester County, Ward Poundridge Reservation, on *Fuligo septica,* C. T. Rogerson (culture 69-180), 6 Oct., 1969 (NY). North Carolina: Macon County, along Scotsman Creek, branch of Chattooga River, Bull Pen Road, on *Fuligo septica,* R. H. Peterson & C. T. Rogerson, 3 Aug., 1961 (NY); Swain County, woods along Indian Creek, Great Smoky Mountains National Park, on *Stemonitis flavogenita* Jahn, C. T. Rogerson (culture 68-84), 14 Aug., 1968 (NY). Ohio: Hocking County, Crane Hollow, Hocking State Park, on *Arcyria cinerea,* C. T. Rogerson, 1 Sept., 1968 (NY); Ross County, Long Branch Hollow, Scioto Trail State Forest, on *Stemonitis fusca,* C. T. Rogerson, 31 Aug., 1968 (NY). VENEZUELA. Edo: Yaracuy, 2–4 km above Jobito, near San Felipe, Parque Nacional Yurubi, on *Arcyria nutans,* K. P. Dumont (VE 1846) et al., July, 1971 (NY).

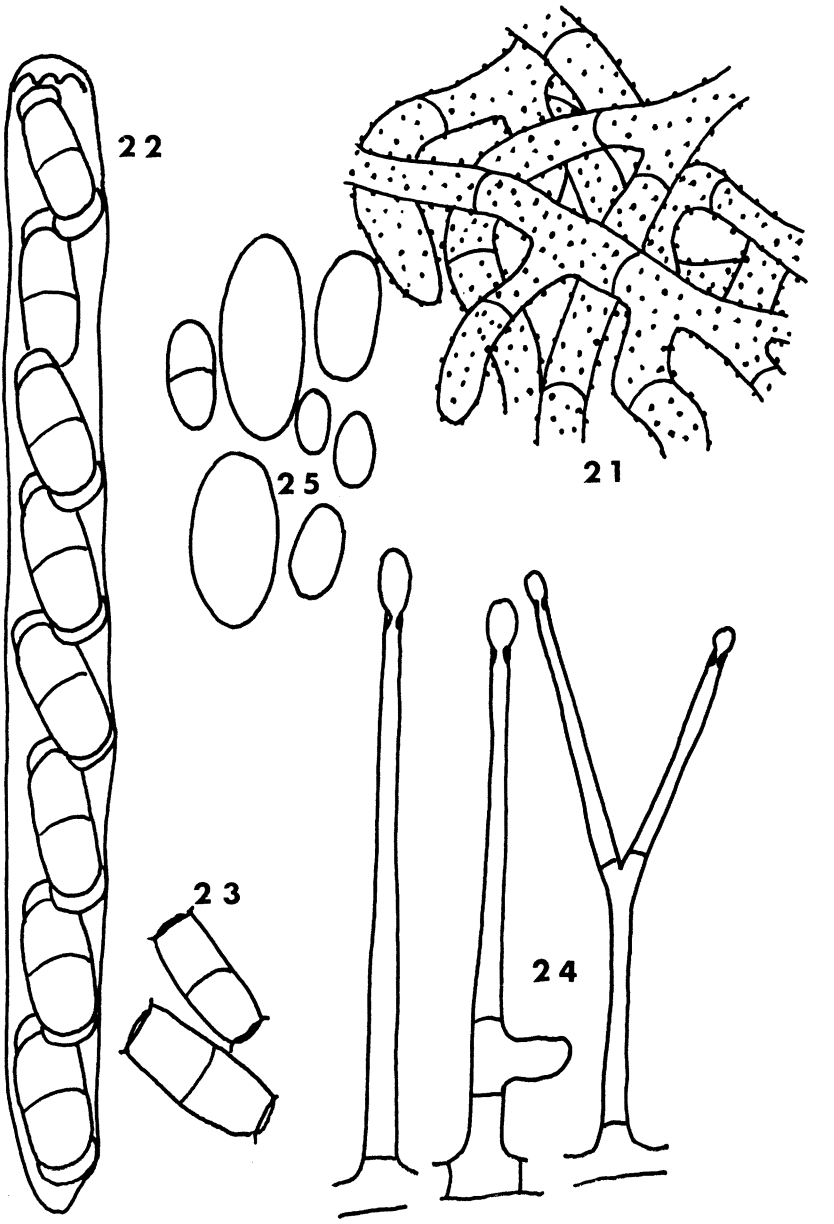
Verticillium nanum var. *rexianum,* on *Arcyria,* Morgan, 1882 (NY).

Notes.—Gams (**1971**) reported *Verticillium rexianum* from England and Germany on the following Myxomycetes: *Arcyria cinerea, Arcyria* sp., *Comatricha nigra* (Pers.) Schroet., *C. typhoides* (Bull.) Rost., *Cribaria argillacea* (Pers.) Pers., *C. aurantiaca* Schrad., *Dictydium cancellatum* (Batsch) Macbr., *Fuligo septica, Lycogala epidendrum* (L.) Fr., *Physarum nutans* Pers., *Stemonitis fusca, Trichia botrytis* (J. F. Gmelin) Pers., *T. floriformis* (Schw.) G. List. and *T. varia* (Pers.) Pers. He did not report the perfect state.

Arnold (**1969**) stated that *Verticillium niveo-stratosum* (= *V. rexianum,* fide Gams, **1971**) is the imperfect state of *N. candicans.* However, the verticillately branched conidiophores of *V. rexianum* are distinct from the unbranched conidiophores of *N. candicans. Nectria myxomyceticola* and *N. candicans* can be distinguished from each other only through microscopic examination.

4. **Nectria candicans** (Plowr.) Samuels, comb. nov. FIGS. 3–4, 21–25

≡ *Hypomyces candicans* Plowr., Grevillea **11**: 50. Dec., 1882.
≡ *Nectriopsis candicans* (Plowr.) Maire, Ann. Mycol. **9**: 324. 10 Aug., 1911.
≡ *Hypolyssus candicans* (Plowr.) O. Kuntze, Rev. Gen. Plant. **3**(2): 488. 28 Sept., 1898.
= *Nectria rexiana* Ellis, Amer. Naturalist **17**: 194. Feb., 1883.
≡ *Lasionectria rexiana* (Ellis) Cooke, Grevillea **12**: 112. June, 1884.



FIGS. 21–25. *Nectria candicans,* representative sketches. Spinulose hyphae that arise from perithecial wall, × 1,750. *22.* Ascus, × 3,300. *23.* Ascospores, × 3,300. Conidiophores with developing conidia, × 1,200. *25.* Conidia, × 3,000.

≡ *Cucurbitaria rexiana* (Ellis) O. Kuntze, Rev. Gen. Plant. **3**(2): 461. 28 Sept., 1898.
= *Hypocrea tenerrima* Ellis, Proc. Acad. Nat. Sci. Philadelphia **45**: 442. 1893. [27 Feb., 1894].

Conidial state.

Acremonium sp.

Mycelium white, floccose, scanty or abundant, covering the surface of the sporangia or aethalia of the host. Conidiophores white, produced throughout the colony; conidia in solitary, hyaline slime heads at the tips of the phialides. Perithecia (FIG. 3) gregarious, immersed in the mycelium, or solitary, then seated directly on the sporangia and clothed in white hyphae, broadly pyriform, (125–)170–190(–248) × (105–)140–165(–240) μ, or globose, (125–)180–210(–250) μ in diam; walls 5–10 μ thick, cells of the surface thin-walled, angular tending to be prosenchymatous, 7–10 μ across in greatest dimension. Papillae (FIG. 4) free, acute, formed of thin-walled, septate, clavate hyphae; hyphae 2–3 μ in diam at the tips; periphyses ca. 10 μ long, bases 2 μ in diam, tips rounded, 1 μ in diam; hyphae (FIG. 21) arising from the upper half of the perithecial wall white, septate, branching, anastomosing, spinulose, 3–4 μ in diam, forming a network around the papillae. Asci (FIG. 22) cylindrical, (36–)45–55(–61) × 3–4(–5) μ, 8-spored, sessile, apices with a nonchitinoid ring, bases rounded. Ascospores (FIG. 23) obliquely uniseriate with overlapping ends, equally 2-celled, cylindrical, smooth, frequently (5–)6–7.5(–8.7) × 2–3 μ, not constricted, hyaline; while in ascus, ends with a cap not staining in congo red, cotton blue, lactic acid-fuchsin Melzer's reagent, nigrosin, Skrip blue-black ink, or trypan blue; caps not visible when ascospores discharged, ascospores then appearing doliform, both ends with an indistinct ring.

Characteristics in culture.—Colonies derived from solitary ascospores on CMD, 2 cm in diam, margin entire in 1 week; mycelium white, mostly submerged with little aerial hyphae, conidiophores arising from the surface of the agar and from the aerial hyphae; colonies derived from solitary ascospores on OA and V-8, 2 cm in diam, margin entire in 1 week, mycelium white, tomentose, conidiophores arising from the surface of the agar and from the aerial hyphae. Conidiophores (FIG. 24), on CMD, OA and V-8, white, unbranched phialides or two phialides arising from the tip of one axis; phialides aseptate or uniseptate, smooth, 40–80 μ long, bases 2 μ in diam, tips 1 μ in diam, a short, sterile, branch occasionally arising from the bases of the phialides. Conidia (FIG. 25), on CMD, OA and V-8, unicellular, rarely 2-celled, smooth-walled,

hyaline, elliptical, (5–)7.5–9.5(–14) × 3–4 μ, in solitary, hyaline slime heads. Perithecia forming within 2 weeks on OA and V-8 in cultures derived from solitary ascospores, forming at first immediately behind margin of the colony, eventually the whole colony converting into perithecial production; haploid chromosome number = 4.

Lectotype.—England: Bathford Downs, Plowright, 1880 (K, lectotype designated herewith!; NY, ISOLECTOTYPE!)

Habitat.—Found on sporangia or aethalia of *Amaurochaete* ? *ferruginea* Macbr. & Martin, *A. fuliginosa* (Sow.) Macbr., *Diachea* ? *subsessilis* Peck, *Didymium megalosporium* Berk. & Curt., *D. melanospermum* (Pers.) Macbr., *Diderma simplex* (Schroet.) G. List., *Fuligo intermedia* Macbr., *F. muscorum* Alb. & Schw., *F. septica, Physarum* sp., *Stemonitis fusca* and *S. trechispora* (Berk.) Macbr.; July to October in eastern U.S.A., common.

Distribution.—U.S.A.: Maine (3), Massachusetts (4), Michigan (1), New Hampshire (1), New York (33), Pennsylvania (1), Tennessee (1), West Virginia (1). CANADA: British Columbia (1), Quebec (1). EUROPE: England (5), Germany (1), Sweden (3). ASIA: Ceylon (1).

Representative specimens examined.—U.S.A. Massachusetts: Williamstown, on myxomycete, W. G. Farlow, Sept. 1901 (NY: Reliquiae Farlowianae. Fungi. no. 36, as *Hypomyces candicans*). New York: Adirondack Mountains, on *Spumaria alba,* Dr. Geo. A. Rex, Aug., 1882 (NY; LECTOTYPE of *Nectria rexiana*); Saratoga County, near inlet to Lake Ann, Mt. McGregor, near Wilton, on *Fuligo septica,* C. T. Rogerson (culture 68-152) & S. J. Smith, 10 Oct., 1968 (NY); near outlet to Lake Ann, Mt. McGregor, near Wilton, on *Diderma simplex,* C. T. Rogerson (culture 68-150) & S. J. Smith, 10 Oct., 1968 (NY). Tennessee: Sevier County, along Roaring Fork Trail, near Trillium Gap, Great Smoky Mountains National Park, on *Fuligo septica,* C. T. Rogerson (culture 68-64), 12 Aug., 1968 (NY). West Virginia: Nuttalburg, L. W. Nuttall, July, 1883 (NY; HOLOTYPE of *Hypocrea tenerrima;* North American Fungi: Second Series, no. 3009). EUROPE: England: Warwickshire, Trickley Coppice, 7.9.84 (K, as *Hypomyces candicans*).

Notes.—*Nectria candicans* is the most frequently encountered of the myxomyceticolous species of *Nectria.*

The conidial states of *N. candicans* and *N. violacea* are similar. The average length of the conidia of *N. candicans* is greater than that of the

conidia of *N. violacea*. The shape of the conidia of *N. candicans* is uniform. Most of the conidia of *N. violacea* are ellipsoidal but many of them elongate, becoming allantoid or bacillar.

With the hand lens, *Nectria candicans* and *N. myxomyceticola* are indistinguishable. These two species are distinguished by microscopic examination of the perithecial hairs, ascospores and the conidial states.

Plowright cited two collections in the original description of *Hypomyces candicans:* Leziate, Aug., 1880, and Bathford Downs, Oct., 1880. The Bathford Downs collection agrees in all respects with the original description of *H. candicans* and I have, accordingly, designated it the lectotype. I have not seen the Leziate specimen.

The type specimen of *Nectria rexiana* is in two parts. One portion is in a round pill-box and one portion is in a packet. They are on the same herbarium sheet and have the same data. The specimen in the pill box agrees in all respects with the type specimen. The specimen in the packet is *Nectria squamulosa* Ellis.

5. **Nectria sporangiicola** Samuels, sp. nov. FIGS. 6, 26–31

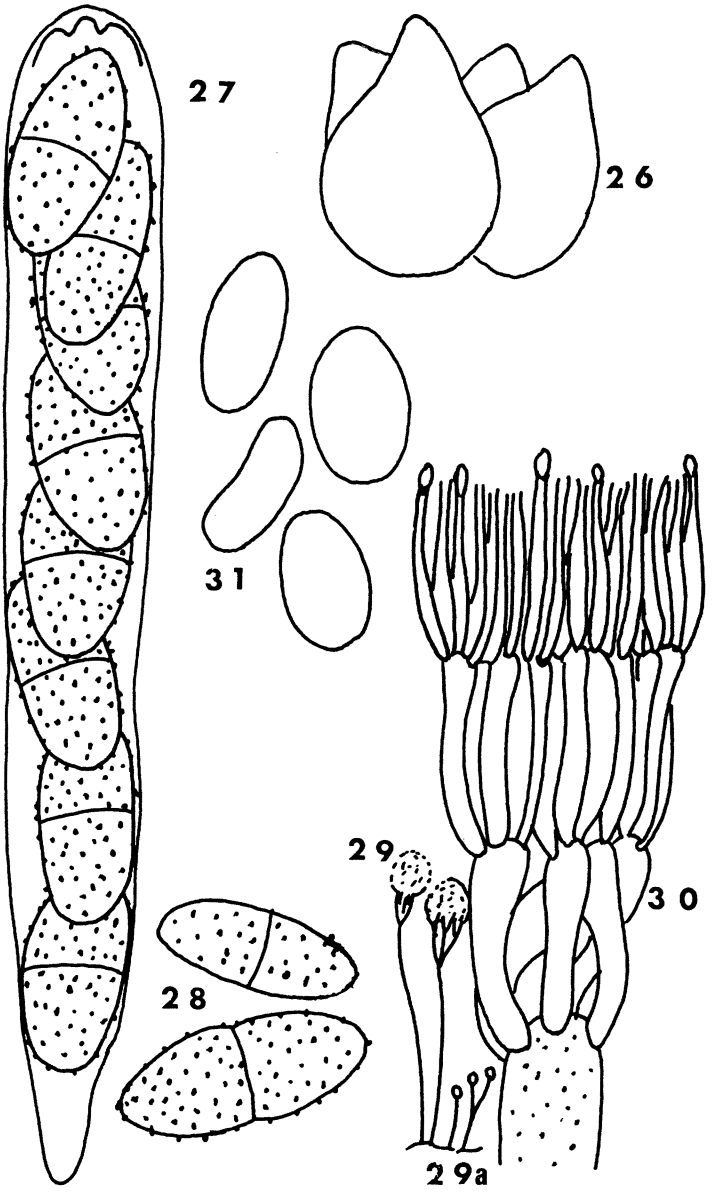
Perithecia late pyriformia, (130–)140–170(–220) μ alta, (100–)120–130(–159) μ lata, succinea; asci clavati, 30–45 μ longi, (3.6–)5–6(–7) μ lati, sessiles, ad apicem cum annulo instructi; ascosporae aeque bicellulares, cylindricae vel ellipsoideae, (7–)8–9(–9.5) μ longae, 2–3.5 μ latae, hyalinae, spinulosae.

Conidial state.

Gliocladium sp.

Mycelium white, floccose, covering the surface of the sporangia of the host. Conidiophores hyaline, produced throughout the colony, long; conidia in hyaline slime heads at the tips of solitary penicilli. Perithecia (FIGS. 6, 26) half immersed in the mycelium, gregarious, broadly pyriform, (130–)140–170(–220) × (100–)120–130(–159) μ, brownish yellow; walls smooth, 10 μ thick, cells of the surface thin-walled, angular, 10–15 μ across in greatest dimension; papillae free, acute, formed of thin-walled, septate, unbranched hyphae, 2 μ in diam at the rounded tips. Asci (FIG. 27) clavate 30–45 × (3.6–)5–6(–7) μ, 8-spored, sessile, apices with a nonchitinoid ring, bases pointed. Ascospores (FIG. 28) biseriate above, uniseriate below, equally 2-celled, cylindrical, ellipsoidal, spinulose, (7–)8–9(–9.5) × 2–3.5 μ, not or slightly constricted, hyaline.

Characteristics in culture.—Cultures derived from solitary ascospores on CMD, 3–5 cm in diam, margin entire in 1 week, mycelium white, mostly submerged, with floccose concentric rings, conidiophores arising from the surface of the agar, or from the aerial mycelium at the concentric



FIGS. 26–31. *Nectria sporangiicola,* holotype, representative sketches. 26. Perithecia, × 280. 27. Ascus, × 3,400. 28. Ascospores, × 3,400. 29. Two conidiophores of *Gliocladium,* each with a solitary slime-head, × 300. 29a. Two conidiophores of *Acremonium,* each of the phialides with a solitary slimehead, × 300. 30. Penicillus, five of the phialides with developing conidia, × 2,100. 31. Conidia × 4,000.

rings; colonies derived from solitary ascospores on OA and V-8, 3–5 cm in diam, margin entire in 1 week, mycelium white, tomentose, on OA mycelium slightly raised at the few concentric rings, conidiophores arising from the surface of the agar or from the aerial hyphae. Conidiophores (FIG. 29), on CMD, OA and V-8, white, erect, unbranched, septate, finely spinulose, 250–460 μ long, bases 10 μ in diam, with solitary, apical penicilli. Penicillus (FIG. 30) composed of 3–5 primary metulae arising from the apex of the main axis, 13–15 μ long, 4 μ in diam at the slightly swollen apices; each primary metula producing ca. 4, cylindrical, secondary metulae, 13 μ long, 2 μ in diam; each secondary metula producing 3–4 cylindrical phialides, 12 μ long, 2 μ in diam; an *Acremonium* state (FIG. 29a) also forming in culture, conidiophores white, unbranched phialides, or two phialides arising from the tip of one axis, phialides uniseptate, smooth, 25–75 μ long, bases 2 μ in diam, tips 1 μ in diam. Conidia (FIG. 31), on CMD, OA and V-8, of both imperfect states, unicellular, smooth-walled, hyaline, elliptical, (4–)5–6(–7.5) × 1.5–2 μ. Perithecia forming concentric rings within 2 weeks on OA in cultures derived from solitary ascospores.

Holotype.—U.S.A.: New Jersey, Cape May County, 3 mi southeast of Woodbine, on *Physarum polycephalum* Schweinitz, C. T. Rogerson (cultures 67-135, 67-136) & G. L. Smith, 14 Sept., 1967 (NY!).

Distribution.—Known only from the type collection.

Notes.—The *Gliocladium* state of *Nectria sporangiicola* matches the original description of *Gliocladium africanum* Eichelbaum (**1906**), which was described from wood in association with *Arcyria nutans* in Africa. I have not seen any material of *G. africanum*.

Gliocladium album (Preuss) Petch, frequently found on Myxomycetes, has much shorter conidiophores and shorter conidia (2.5–3.7 × 1.6–1.9 μ; Gams, **1971**) than the *Gliocladium* state of *N. sporangiicola*.

POORLY KNOWN SPECIES

HYPONECTRIA RACIBORSKII Penzig & Sacc., Malpighia **11**: 508. 1897.

Perithecia immersed in the sporangium, globose, 80–90 μ in diam, pale yellow. Asci cylindrical, 8-spored, 35–45 × 3.5–4 μ, apices rounded. Ascospores obliquely uniseriate with overlapping ends, oblong-elliptical, biguttulate, 6.5–7.5 × 3 μ, hyaline.

Holotype.—JAVA.: Tjibodas, on sporangia of *Physarum didermoides* Rost., 6 Feb., 1897 (BO!).

Distribution.—Known only from the type collection.

Notes.—The above description is adapted from the original description. The portion of the holotype in BO consists of one piece of a grass with white mycelium growing on it. There is no myxomycete present and there are no perithecia. There is apparently no specimen at PAD or W. According to Penzig and Saccardo, *H. raciborskii* is closely related to *Nectria rexiana* (*N. candicans*). Petch (**1941**) thought that *H. raciborskii* was synonymous with *N. violacea,* although he does not mention having seen the type specimen of *H. raciborskii.* The combination of characters of perithecia, asci and ascospores of this species, as presented in the original description, suggests that *H. raciborskii* is distinct from the five myxomyceticolous species discussed in this paper.

Hyponectria Saccardo was described for species of *Nectria* with perithecia which are immersed in the substrate and unicellular ascospores. The septum in the ascospores of species of *Nectria* is frequently obscure. For example, *N. violacea* has been placed in two genera, *Peckiella* Sacc. and *Byssonectria* Karsten, that are characterized by having unicellular ascospores. It is possible that Penzig and Saccardo overlooked the septum in the ascospores of *H. raciborskii.*

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