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SPECIES OF *HYPOMYCES* AND *NECTRIA* OCCURRING ON DISCOMYCETES

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ABSTRACT

Hypomyces papulasporae (synanamorphs = *Papulaspora* sp., *Sibirina* sp.), *H. papulasporae* var. *americanus* (synanamorphs = *Papulaspora candida, Sibirina clavisedum*), *H. mycogones* (anamorph = *Mycogone*-like) on *Geoglossum* spp. and *Trichoglossum* spp.; *Hypomyces stephanomatis* (synanamorphs = *Stephanoma strigosum, Sibirina* sp.) on the operculate discomycete *Humaria hemisphaerica*; *Hypomyces leotiicola* (synanamorphs = *Sepedonium leotiarum, Sibirina* sp.) on *Leotia lubrica,* and *Nectria discophila* (anamorph = ?*Acremonium* sp.) on *Lachnum* spp. are proposed. *Nectria albidopilosa* and *N. discicola,* occurring on unidentified, inoperculate Discomycetes, are also described. *Hypomyces sepulcralis* on soil and possibly on *Peziza* sp., and *Nectria sepultariae,* on *Sepultaria arenicola,* are redescribed. *Stephanoma tetracoccum* and its *Sibirina*-like synanamorph, both found on members of the Geoglossaceae, are illustrated and described briefly.

Key Words: Ascomycetes, Fungi Imperfecti, taxonomy.

Many species of the Hypocreales occur on Pyrenomycetes, Loculoascomycetes, and Basidiomycetes but only five on Discomycetes: *Hypomyces ekmanii* Petrak & Ciferri on an unidentified discomycete, possibly a *Peziza* sp. (Petrak and Ciferri, **1930**), *H. sepultariae* Ade on *Sepultaria arenicola* (Lév.) Rehm (Ade, **1923**), *H. cervinigenus* Rogerson & Simms on *Helvella* sp. (Rogerson and Simms, **1971**) and *H. geoglossi* Ellis & Everhart (Ellis and Everhart, **1886**, **1887**), and *Nectriella geoglossi* van Overeem (van Overeem, **1923**) on *Trichoglossum* and *Geoglossum* species.

Of the foregoing species of *Hypomyces,* only *H. ekmanii* can be retained in *Hypomyces* and is now recognized to be a taxonomic synonym of *H. sepulcralis* Patouillard, a species originally described from soil. *Hypomyces sepultariae* has been placed in *Nectria* as *N. sepultariae* (Ade) Petrak (Petrak, **1929**) and *H. geoglossi* is an inoperculate discomycete, *Micropyxis geoglossi* (Ellis & Everhart) Seeler (Pfister, **1976**; see illustrations in Seeler, **1943**). Specimens of *Nectriella geoglossi* (BO) were not available for this study. In the present paper four species and one variety of *Hypomyces* and four species of *Nectria* are described or redescribed.

The species of *Hypomyces* on Discomycetes do not fit the usual concept of *Hypomyces* in the morphology of their ascospores. Ascospores in *Hypomyces* are typically bicellular, fusiform, apiculate and warted. Ascospores of the new taxa described below are unicellular, naviculate, non-apiculate, and smooth while ascospores of H. *sepulcralis* are bicellular, ellipsoidal, non-apiculate, and spinulose. However, their anamorphs, perithecial anatomy and mycoparasitic habit confirm their close affinity to other species of *Hypomyces* (Tubaki, **1975**; Gray and Morgan-Jones, **1980**; Arx, **1981**; Samuels, **1971**, **1976**). The ascal apex in these species has a ring that, although minute, does not differ greatly from the apical ring found for other species of *Hypomyces* (Samuels, **1971**) or *Hypocrea* (Doi, **1972**), and in many species of *Nectria* Fries (Samuels, **1976**, and unpubl. observations). The ascal ring has been used, in part, to separate *Hypomyces* into its own family, the Hypomycetaceae (see for example Müller and Arx, **1973**), but ascal features in the Hypocreales have little taxonomic utility at the generic level.

Hypomyces papulasporae and *H. papulasporae* var. *americanus* have thallodic propagules, "papulaspores," that arise when one or more ". . . central cells of a hyphal branch are encircled by branches that arise primarily from the hyphae on which the central cells themselves are borne" (Weresub and Le Clair, **1971**: 2204, 2205). At maturity each propagule is dehiscent and consists of one or more enlarged, relatively thick-walled central cells that are ensheathed by smaller, globose cells (FIGS. 3, 8). The propagules formed by *H. papulasporae* var. *americanus* agree with those found on the isotype specimen of *Papulaspora candida* Saccardo; the propagules formed by *H. papulasporae* var. *papulasporae* are smaller than those of *P. candida.*

Although Weresub and Le Clair (**1971**) excluded *Papulaspora candida* from *Papulaspora,* asserting that its sheathing cells arise from the central cells as in *Stephanoma* Wallroth, it is clear from FIGS. 3 and 8 that *P. candida* can easily be accommodated in their concept of *Papulaspora.*

The aleuriospore of *Stephanoma strigosum* Wallroth, the anamorph of *H. stephanomatis,* is morphologically similar to the propagule of *Papulaspora candida* but differs in its development. In *S. strigosum* the tip of a short hyphal branch swells and successively produced hemispherical swellings arise directly from this central cell. Ultimately the aleuriospore is dehiscent and consists of a thick-walled central cell with 6–8, thin-walled, hemispherical swellings and is supported by a thin-walled basal cell (FIG. 14; see also Tubaki, **1963**).

Stephanoma tetracoccum Zindern-Bakker (Zindern-Bakker, **1934**; Howell, **1939**) also occurs on geoglossaceous Ascomycetes. It differs from *S. strigosum* in having spinose aleuriospores. In a recent collection of *S. tetracoccum* (Minnesota, Lake Itaska, on *Microglossum arenarium* Rostrup, Bandoni 5422: NY, FIGS. 34–37) we found that the aleuriospores consisted of a coarsely spinose, 9–13 μm diam central cell with 2–3 spinulose, 5–8 μm diam peripheral cells visible in one plane of view and supported by a basal cell.

Synanamorphs accompany *Papulaspora candida,* the *Papulaspora* phase of *Hypomyces papulasporae* var. *papulasporae, Stephanoma strigosum,* and *S. tetracoccum.* Conidiophores of the synanamorph of *P. candida* (FIG. 8) and S. *strigosum* (FIG. 14) are verticillately branched while in *H. papulasporae* var. *papulasporae* (FIG. 3) and *S. tetracoccum* (FIGS. 36, 37) they are unbranched or infrequently branched. The conidia of all four are hyaline and unicellular and are held apparently singly at the tip of each conidiogenous cell. At the base of each conidium a minute, refractive scar is sometimes seen with phase contrast microscopy. The tips of the conidiogenous cells most often appeared to be rounded and closed and sometimes appeared to have a minute, cicatrized scar. Periclinal thickening was not seen at the tips of the conidiogenous cells. These observations at least suggest holoblastic conidiogenesis.

These synanamorphs resemble *Verticillium* or *Acremonium* in their overall morphology but conidiogenesis in species of these two genera is phialidic and the conidia are produced in basipetal succession and held in a drop of liquid at the tip of each conidiogenous cell. The verticillately branched synanamorphs of *Papulaspora candida, Stephanoma strigosum* and *S. tetracoccum* are similar to conidiophores of *Sibirina* G. Arnold (type species: *S. fungicola* Arnold; Arnold,

1970). As described, *Sibirina* differs from *Verticillium* only in the production by its species of bicellular conidia. Gams (**1973**) re-examined the type specimen of *S. fungicola* and found that conidia are borne singly. He suggested that each conidiogenous cell is a phialide that produces only one conidium with a new phialide formed for each conidium. He illustrated periclinal thickening at the tip of each conidiogenous cell but did not explain how a thickening in the conidiogenous apex, i.e., an accumulation of wall material from successively produced conidia, could develop if only a single conidium arises at each locus. The two known species of *Sibirina* do not have associated thallodic or aleuriosporic synanamorphs. If, as we believe, conidiogenesis in the verticillate phases of *H. papulasporae* and *H. stephanomatis* is holoblastic, these phases cannot be accommodated in *Verticillium*. Because of the verticillate branching and the apparent formation of only one conidium on each conidiogenous cell, we believe that the synanamorphs of these hyperparasites can be accommodated in *Sibirina* in spite of the fact that their conidia are unicellular. Gams (**1983**), in reaching the same conclusion, attributed unicellular conidia to the *Sibirina* synanamorph of *Mycogone calospora* (Karsten) Hohnel.

The aleuriosporic anamorph of *Hypomyces mycogones* also poses problems for generic placement. The mature conidium arises at the tip of a short lateral branch of a hypha and comprises three cells: a globose, spinulose, thin-walled apical cell and a larger, globose, spinose, thick-walled middle cell, both of which derive from the tip cell of the lateral branch, and a stalk cell. The conidial walls are tan and the conidia are dehiscent. This anamorph has close biological and morphological affinities to *Sepedonium* Link and *Mycogone* Link, both of which are aleuriosporic, have unbranched or verticillately branched synanamorphs, are mycoparasites, and are anamorphs of *Hypomyces* spp. In morphology the anamorph of *H. mycogones* is closest to *Mycogone,* differing only by having a third, thin-walled terminal cell. The conidium of *Mycogone* is bicellular having a globose, pigmented, thick-walled, tuberculate or spinose cell supported by a stalk cell. Although we do not know of any species of *Mycogone* having three cells, we find the overall morphological similarity between the anamorph of *Hypomyces mycogones* and species of *Mycogone* to be overwhelming and we propose to expand the concept of *Mycogone* to include this 3-celled species.

In addition to the species of *Hypomyces* just discussed, four species of *Nectria* have been found growing on apothecia: *N. discophila* sp. nov., N. *sepultariae* (Ade) Petrak, *N. albidopilosa* sp. nov., and *N. discicola* sp. nov. The affinities of *N. sepultariae* within *Nectria* are not clear; the red perithecia and mycoparasitic habit suggest a relationship to *N. episphaeria* (Tode: Fries) Fries and its relatives. *Nectria discophila, N. albidopilosa* and *N. discicola* have small, pale yellow perithecia and a perithecial wall 10 μm wide or less. Because of their coloration, small size, and perithecial anatomy, these species are similar to *N. perpusilla* (Mont.) Mont., a species occurring on perithecia or Pyrenomycetes and also to the group of species that includes *N. leucorrhodina* (Mont.) Samuels and that occurs on meliolaceous leaf parasites (Samuels, **1976**).

Nectriella geoglossi (van Overeem, **1923**) was described as a parasite of *Trichoglossum walteri* (Berkeley) Durand from Java. According to the description, perithecia of *N. geoglossi* are immersed in the hymenium of a *Trichoglossum* species. The perithecia are colorless, 134–144 μm high × 66–84 μm wide and have a wall composed of intertwined hyphae. Asci are 8-spored and clavate; each has a long, pedicellate base and a *ca.* 30 μm long sporiferous portion. Ascospores are ellipsoidal to naviculate, hyaline, bicellular, smooth, 8.6–14.9 × 2.3–2.7 μm. Van Overeem did not describe an anamorph for this species. *Nectriella geoglossi* does not appear to be related to *N. fuckelii* Fuckel, the type species of *Nectriella* Fuckel, and may be a species of *Nectria*. Because we have not seen material of *N. geoglossi,* we do not feel justified in making the transfer to *Nectria.*

In the following descriptions all measurements were made from dry material that was rehydrated briefly in 3% KOH and then mounted in 100% lactic acid.

KEY TO SPECIES OF *Hypomyces* AND *Nectria* ON DISCOMYCETES

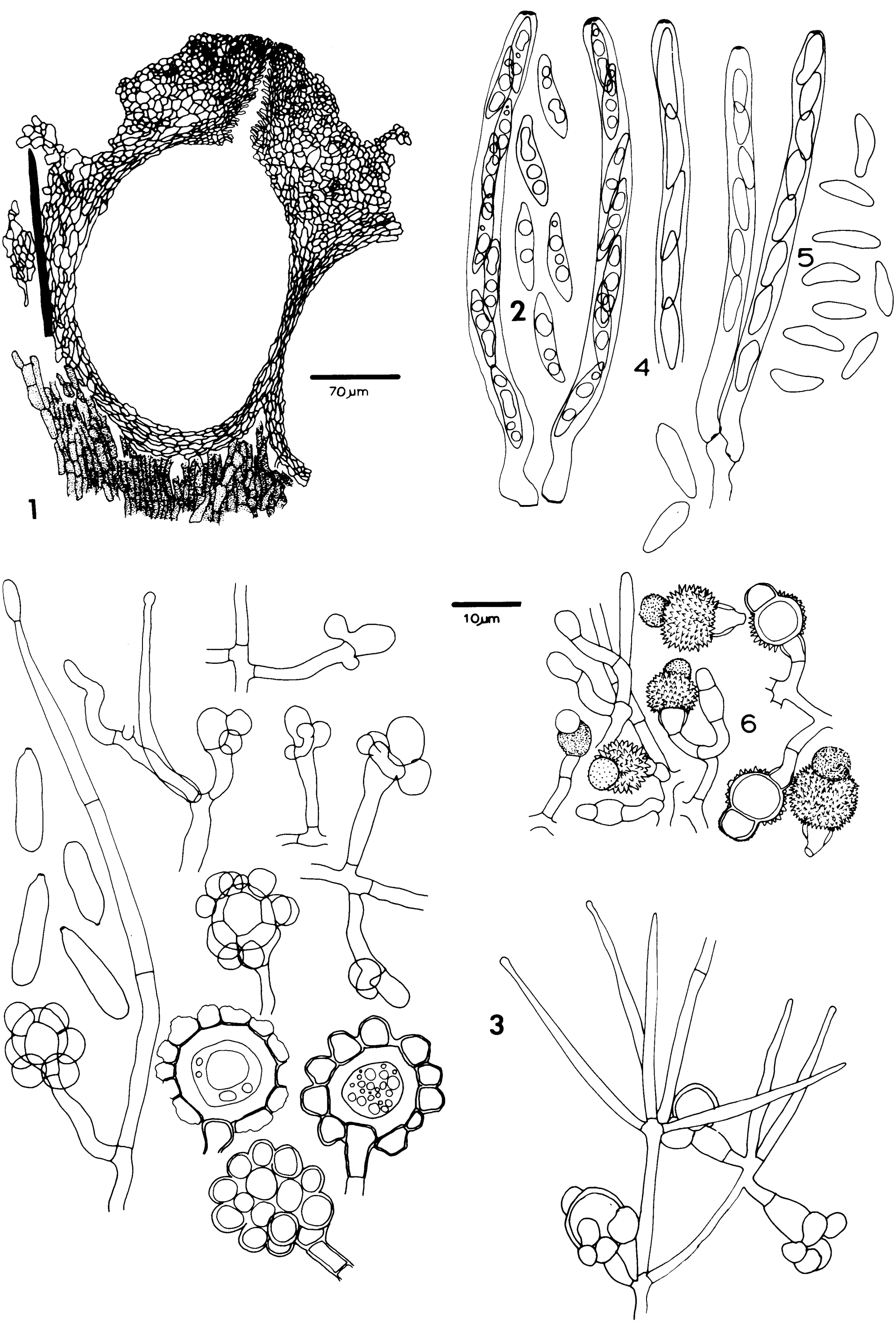
1. Occurring on *Geoglossum* or *Trichoglossum* 2
1. Not occurring on *Geoglossum* or *Trichoglossum* 7
   2. Ascomata cupulate .... *Micropyxis geoglossi* (Seeler, **1943**; Pfister, **1976**)
   2. Ascomata perithecial or lacking 3
3. Ascospores bicellular .... *Nectriella geoglossi* (van Overeem, **1923**)
3. Ascospores unicellular or perithecia lacking 4
   4. *Mycogone*-like anamorph present .... 4. *Hypomyces mycogones*
   4. *Papulaspora* or *Stephanoma* anamorph present 5
5. *Papulaspora* anamorph present 6
5. *Stephanoma* anamorph present .... *Stephanoma tetracoccum* (FIGS. 34–37; Zindern-Bakker, **1934**; Howell, **1939**)
   6. *Papulaspora* propagules averaging 20–28 μm diam, conidia of *Sibirina* anamorph 12–17 μm long .... 1. *Hypomyces papulasporae* var. *papulasporae*
   6. *Papulaspora* propagules averaging 25–37 μm diam, conidia of *Sibirina* anamorph 8.5–11.5 μm long .... 2. *Hypomyces papulasporae* var. *americanus*
7. On *Humaria hemisphaerica, Stephanoma* anamorph present, ascospores shorter than 11 μm .... 6. *H. stephanomatis*
7. Host not *Humaria,* anamorph unknown or not *Stephanoma,* ascospores longer than 11 μm 8
   8. On *Helvella* .... *Hypomyces cervinigenus* (Rogerson and Simms, **1971**)
   8. Not on a member of the Helvellaceae 9
9. On *Leotia* .... 3. *Hypomyces leotiicola*
9. Not on *Leotia* 10
   10. Perithecia red in 3% KOH, asci 4-spored, ascospores 24–28 × 10–13 μm .... 8. *Nectria sepultariae*
   10. Perithecia yellow to orange, not red in 3% KOH, asci 8-spored, ascospores less than 20 × 10 μm 11
11. Perithecia with scattered, thick-walled (2–3 μm), unbranched setae as long as or longer than perithecial diameter .... 9. *Nectria albidopilosa*
11. Perithecia glabrous or setae shorter, not thick-walled 12
   12. Ascospores broadly ellipsoidal, 11–14 × 7–8 μm .... 10. *Nectria discicola*
   12. Ascospores narrowly ellipsoidal to fusiform, narrower than 6 μm 13
13. On soil or operculate discomycete; ascospores ellipsoidal, spinulose, 11–14 × 4–5 μm .... 5. *Hypomyces sepulcralis*
13. On *Lachnum* (Hyaloscyphaceae); ascospores fusiform, ends acute, 11–20 × 2–3 μm .... 7. *Nectria discophila*

DESCRIPTIONS OF THE SPECIES

1. **Hypomyces papulasporae** Rogerson & Samuels, sp. nov., var. **papulasporae** FIGS. 1–3

SYNANAMORPHS: *Sibirina*-like.
Papulaspora sp.

Perithecia globosa vel globoso-papillata, 125–409 × 125–289 μm, hyalina vel pallide lutea, levia; asci cylindrici, (69–)82–122(–135) × (3–)4.5–5(–6) μm, octospori, apice annulo minuto cincto; ascosporae fusiformes vel naviculiformes, (12–)13.7–16.3(–18) × (2.5–)2.8–3.3(–5) μm, continuae, leves, hyalinae; subiculum album, byssoideum; conidiophori eis *Sibirina* e accedentes, macronemati, haud vel raro ramosi, hyalini, cellulam conidiogenam unicam integratam terminalem rectam levem (19–)28–47(–67) μm longam, ab 2–3 μm basim versus ad *ca.* 1 μm ad apicem aequabiliter attenuatam, conidia holoblastice producentam ex apice haud distincto gerentes; conidia oblonga vel elliptica, (8–)12–17(–21) × (3–)3.5–5 μm, continua, hyalina, cicatrice disjunctionis prominente, applanata, saepe refractili, basali notata; propagula eis *Papulasporae* accedentia e mycelio aerio orta, globum sphaericum (18–)20–25(–30) μm diametro e cellulis ochraceis, centrali (11–)12–16(–20) μm diametro, crasse tuni-



FIGS. 1–3. *Hypomyces papulasporae* var. *papulasporae.* 1. Longitudinal section of mature ascoma (GJS 81-87). 2. Asci and ascospores (GJS 81-87; as seen in lactic acid by phase contrast microscopy). 3. *Papulaspora* and *Sibirina*-like synanamorphs (GJS 81-87). FIG. 4. *Hypomyces papulasporae* var. *americanus,* apex of ascus with ascospores (CTR 61-100, as seen in lactic acid by phase contrast microscopy). FIGS. 5, 6. *Hypomyces mycogones.* 5. Asci and ascospores (Dumont-EC 592, as seen in lactic acid by phase contrast microscopy). 6. *Mycogone*-like anamorph.

cata, dilute colorata, a pluribus globosis, tenuitunicatis, dilute coloratis, 7–15 μm diametro, circumdato compositum, efformans, in cellula basali instar stipitis gestum; conidia dehiscentia. In ascomatibus *Trichoglossi hirsuti* crescens.

Mycelium white, cottony, spreading from fertile portion of host downwardly to the base of the stipe. At first producing macronematous, unbranched or infrequently branched, hyaline, 40–100 μm long conidiophores; each conidiophore bearing a single, integrated, terminal, straight, smooth, (19–)28–47(–67) μm long conidiogenous cell that tapers evenly from 2–3 μm basally to *ca.* 1 μm apically, producing a single conidium holoblastically from the undifferentiated tip; conidia oblong to ellipsoidal with a protuberant, flattened, refractive or unrefractive basal abscission scar, (8–)12–17(–21) × (3–)3.5–5 μm, unicellular, eguttulate or with one circular guttule at each end of each conidium, hyaline, held singly at the tip of each conidiogenous cell. *Papulaspora* conidia eventually arising in the aerial mycelium, often at the base of *Sibirina*-like conidiophores giving the mycelium a tan, powdery aspect; produced singly at the tips of 10–15 μm long × 2–3 μm wide lateral branches of vegetative hyphae. Conidia forming when the tip of lateral branch swells, short lateral branches arising from and wrapping around the swollen tip cell, cells of enveloping hyphae becoming globose and eventually producing a ball of cells (16–)20–25(–30) μm in diam, comprising a globose, (11–)12–16(–20) μm diam, thick-walled, lightly pigmented, multiguttulate central cell surrounded by an indefinite number of globose, 7–15 μm diam, thin-walled, lightly pigmented, eguttulate cells and a basal stalk cell; conidia dehiscent. Perithecia forming after cessation of conidial production directly on the hymenium of the geoglossaceous host without any obvious subiculum or stroma, forming a continuous layer, pyriform, nonpapillate or with a short, acute papilla, 125–410 μm high × 125–290 μm wide, colorless to pale yellow, smooth, collapsing by lateral pinching; nearly colorless in 3% KOH or 100% lactic acid. Cells at surface of perithecial wall angular to textura epidermoidea, wall <1 μm thick. Perithecial wall 10–15 μm wide, cells in longitudinal section elliptical, 5–7 μm long × 2–3 μm wide, walls <1 μm thick; cells around the ostiolar area arranged in a thick mantle, cells pseudoparenchymatous, 8–13 μm in greatest dimension, walls <1 μm thick. Ostiolar canal periphysate. Asci cylindrical, (69–)82–122(–135) × (3–)4.5–5(–6) μm; apex with a minute ring; base refractive as are septa of croziers and ascogenous hyphae; 8-spored, ascospores 1-seriate with overlapping ends or partly biseriate, forming throughout the entire length of each ascus or the lower 20–50 μm of many asci devoid of ascospores. Pseudoparaphyses not seen. Ascospores fusiform to naviculate with the apical end somewhat more pointed than the basal end, (12–)13.7–16.3(–18) × (2.5–)2.8–3.3(–5) μm, unicellular, smooth, hyaline.

Ascospores of one collection (GJS 81-87) germinating on Difco cornmeal dextrose agar (CMD) within 12 h at *ca.* 18 C. Colonies grown at 15–18 C, diffused daylight for 3 wk on CMD barely growing away from the original inoculum, white, raised, waxy with scant aerial mycelium; colony eventually becoming tan and powdery from production of abundant *Papulaspora* propagules. *Sibirina*-like conidiophores arising from the surface of the agar, at most 2 conidia borne at the tip of each conidiophore. *Papulaspora* propagules borne from the base of each conidiophore, eventually entire colony converted to production of *Papulaspora* propagules. Conidiophores, conidia and propagules as found in nature.

HABITAT: On geoglossaceous ascomycetes. Known only from New Zealand.

HOLOTYPE: NEW ZEALAND: Northland, Hokianga County, S of Kaitaia, vic. Mangamuka Bridge, Omahuta State Forest, vic. forest headquarters, on ascomata of *Trichoglossum hirsutum* (Persoon: Fries) Boudier, Samuels (81-87) & Horak, 10 May 1981 (PDD 42199, ISOTYPE: NY).

ADDITIONAL SPECIMENS EXAMINED: **Teleomorph.** NEW ZEALAND: Auckland, Waitakere Ranges, Waitemata City, Cascade Kauri Park, on *Geoglossum glutinosum* Pers.: Fr., Spencer, 3 Jul 1972 (PDD

30130); Waitemata City, Titirangi, on *Trichoglossum hirsutum*, McNabb, 8 Jul 1964 (PDD 23555). Northland, Hokianga County, S of Kaitaia, vic. Mangamuka Bridge, Omahuta State Forest, forest headquarters, on *Trichoglossum hirsutum*, Samuels (81-86) & Horak, 12 May 1981 (PDD 42204); Hokianga County, S of Kaitaia, Puketi State Forest, bush walk from picnic area along Waipapa River, on *Trichoglossum hirsutum*, Samuels (81-89) & Horak, 13 May 1981 (PDD 42205), Hokianga County, Waipoua Forest, forest headquarters, vic. swing bridge over Waipoua River, on *Trichoglossum hirsutum*, Petersen, 23 Jun 1981 (PDD 42203); Waipoua Forest, vic. forest headquarters, along Waipoua River, on *Trichoglossum octopartitum*, Samuels (82-81) *et al.*, 29 May 1982 (PDD 43061, NY). **Anamorph**. NEW ZEALAND: Auckland, Waitemata City, Waitakere Ranges, Mountain Road, on *Trichoglossum hirsutum*, S. D. Brook, 18 Aug 1956 (PDD 24564); off Mountain Road, Fairy Falls Track, on *Geoglossum fallax* Durand, Samuels *et al.*, 12 Aug 1981 (PDD 42200); second collection, on *Trichoglossum hirsutum* (PDD 42207); Waitakere Ranges, Cascades, on *Geoglossum nigritum* (Fr.) Cooke var. *heterosporum* Mains, Samuels *et al.*, 14 Aug 1981 (PDD 42201); Cascades, on *Geoglossum fallax*, Samuels *et al.*, 12 Aug 1981 (PDD 42202); Waitemata City, Titirangi, Titirangi Beach Reserve, on *Geoglossum ? fallax*, Samuels *et al.*, 12 Aug 1981 (PDD 42206). Coromandel, vic. Thames, Kauaeranga Valley, on *Trichoglossum hirsutum*, McNabb, 25 Mar 1968 (PDD 30014). Northland, Hokianga County, Waipoua Forest, vic. forest headquarters, on *Trichoglossum* sp., Samuels *et al.*, 29 May 1982 (PDD 43060); Waipoua Forest, between forest headquarters and a point *ca.* ½ h walk North of headquarters on Yakas Track, on *Trichoglossum hirsutum*, Samuels (82-80) & Johnston, 30 May 1982 (PDD 43062). Gisborne: Urewera National Park, *ca.* 15 km SE of Ruatahuna along S.H. 38, Taupeupe Saddle, on *Geoglossum* sp., Samuels *et al.*, 3 Nov 1982 (PDD 43147); Urewera National Park, Lake Waikaremoana, Ngamoko Track between giant Rata and Ngamoko Trig, on *Geoglossum glutinosum* Pers.:Fr., Samuels, 23 May 1981 (PDD 43881).

2. **Hypomyces papulasporae** Rogerson & Samuels var. **americanus** Rogerson & Samuels, var. nov. FIGS. 4, 7, 8

SYNANAMORPHS: *Papulaspora candida* Saccardo, Michelia **2**: 576. 1 Dec 1882.
Sibirina clavisedum (Sacc.) Rogerson & Samuels, comb. nov.
≡ *Verticillium agaricinum* (Link) Bonorden var. *clavisedum* Saccardo, Michelia **2**: 577. 1 Dec 1882.

Var. *papulasporae* similis, sed conidiophori eis *Sibirina* e accedentes verticillate ramosi et conidia 8.5–11.5(–14) × 3–5 μm; propagula papulasporiformia, (20–)25–27(–40) μm diametro.

TELEOMORPH: Identical to *H. papulasporae* var. *papulasporae*. The variety differs from var. *papulasporae* in the following features of the synanamorphs:

Papulaspora propagules (20–)25–37(–40) μm diam.
Sibirina conidiophores verticillately branched.
Sibirina conidia 8.5–11.5(–14) × 3–5 μm.

HABITAT: On geoglossaceous ascomycetes. Known from the USA and China.

HOLOTYPE: USA: SOUTH CAROLINA, Pickens County, Route 178, North of Rocky Bottom, along Estatoe Creek, on *Trichoglossum* sp., Petersen & Rogerson (CTR 61-86), 17 Aug 1961 (NY).

ADDITIONAL SPECIMENS EXAMINED: **Teleomorph**. USA: VIRGINIA, Bull Run Mts., Bull Run, on *Trichoglossum hirsutum*, Allard, 14 Aug 1939 (NY, BPI). **Anamorph**. On *Geoglossum difforme* Fries: NEW YORK: Essex County, Twin Valleys Camp, near Wadhams, Rogerson (67-114) & S. J. Smith, 9 Sep 1967 (NY). On *Geoglossum glabrum* Persoon:Fries: CONNECTICUT: Poquonock, Sturgis, 4 Aug 1895 (NY). MASSACHUSETTS: Walnut Hill, isolated by J. W. Hotson, 1 Jul 1911 (NY); Concord, D. Pfister, 27 Aug 1978 (NY); NEW JERSEY: Gloucester County, Newfield, Ellis, Aug 1887 (NY); NEW YORK: Hamilton County, bog, south end of Brown Tract Campsite, near Raquette Lake, Rogerson (67-113) & S. J. Smith (NY); NORTH CAROLINA: Macon County, along upper Ammon's Branch of Chattooga River, Bull Pen Road, Rogerson, 3 Aug 1961 (NY); Nantahala Lake Road, northwest of Rainbow Springs, Rogerson, 19 Aug 1961 (NY). On *Geoglossum nigritum* (Fries) Cooke: NEW JERSEY: Cumberland County, Bear Swamp West, near Maurice River Bridge, 2 miles south of Port Elizabeth, Rogerson (82-63), 18 Sep 1982 (NY). On *Geoglossum simile* Peck: MICHIGAN: Cheboygan County, Mud Lake, near University of Michigan Biological Station, 28 Jul 1962; same locality, 5 Aug 1971, Rogerson (NY); Reese's Bog, north side of Burt Lake, Rogerson, 9 Aug 1971 (NY); junction of Bryant and Robinson Roads, west of Douglas Lake, Rogerson, 13 Aug 1971 (NY); NEW JERSEY: Burlington County, 1 mile east of Wading River, Rogerson (69-166), 2 Oct 1969 (NY); pine barrens along Route 70, Noraevian, 2 Oct 1969 (NY); NEW YORK: Essex County, woods along Saranac River, east of Bloomingdale, Rogerson 65-67, 11 Sep 1965 (NY); Steuben County, *Thuja* bog, 2 miles east of

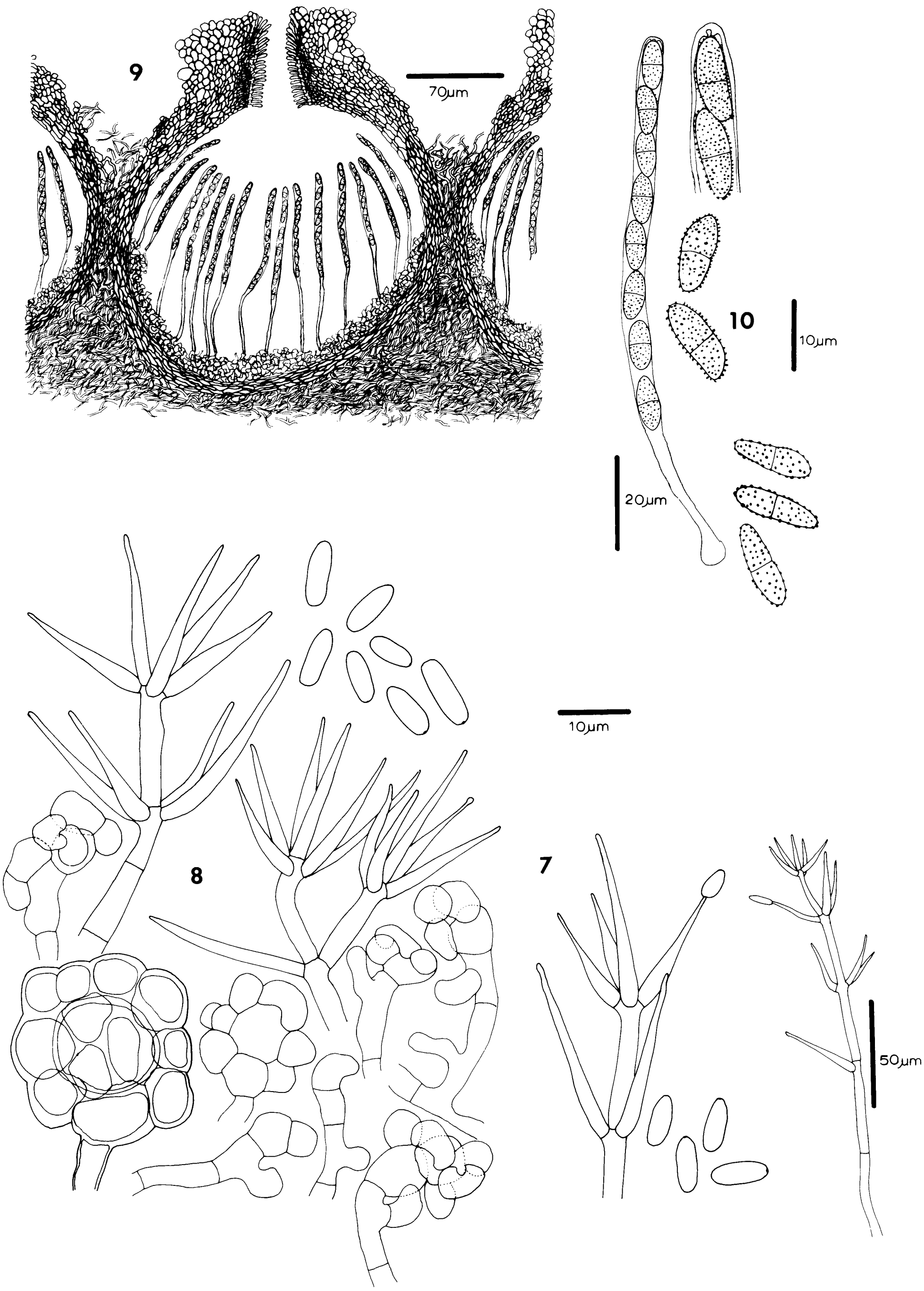


FIG. 7. *Hypomyces papulasporae* var. *americanus*, *Sibirina*-like anamorph (CTR 61-86). FIG. 8. *Papulaspora candida* and its *Verticillium agaricinum* var. *clavisedum* synanamorph (Aug, 1887). FIGS. 9, 10. *Hypomyces sepulcralis*. 9. Longitudinal section of mature ascoma (isotype *ex* S). 10. Asci and ascospores. (Asci and ascospores above from isotype of *H. ekmanii ex* S, ascospores below from holotype specimen of *H. sepulcralis,* as seen in lactic acid by phase contrast microscopy.)

Wayland, S. J. Smith (13900) & Ogden, 31 Jul 1953 (NY); NORTH CAROLINA: Macon County, along Big Creek, south of Horse Cove, Rogerson (61-29), 31 Jul 1961 (NY). On *Trichoglossum walteri* (Berkeley) Durand: NEW JERSEY: Gloucester County, below Malaga Lake, along Scotland Run, junction of Routes 40 and 47, Rogerson (70-237), 12 Oct 1970 (NY); NEW YORK: Albany county, ½ mile southeast of Rensselaer Lake, S. J. Smith (15119), 27 Sep 1953 (NY); woods near Karner, S. J. Smith (51340, 51341), 17 Sep 1974 (NY). On *Trichoglossum hirsutum*: MICHIGAN: Cheboygan County, Reese's Bog, north side of Burt Lake, Rogerson (64-45), 4 Aug 1964 (NY); Emmet County, southwest side of Wycamp Lake, northeast of Cross Village, Rogerson, 10 Aug 1971 (NY); MINNESOTA: vicinity of Lake Itasca, Pfister, Aug 1980 (NY); NEW JERSEY: Sussex County, Stokes State Forest, Ristich, 27 Aug 1982 (NY); NEW YORK: Putnam County, woods near Towners, Rogerson (62-76), 13 Sep 1972 (NY); Ulster County, Ashokan Campus State University College New Paltz, south of Ashokan Reservoir, Rogerson (72-217), 9 Sep 1972 (NY); NORTH CAROLINA: Henderson County, Upper Green Cove along Green River, south of Tuxedo, Rogerson (74-93), 13 Sep 1974 (NY); Macon County, Nantahala Road, northwest of Rainbow Springs, Rogerson, 19 Aug 1961 (NY); Swain County, along Indian Creek, Great Smoky Mountains National Park, Rogerson, 14 Aug 1968 (NY); Transylvania County, along Toxaway River near junction with Bear Wallow Creek, Rogerson (61-12), 29 Jul 1961 (NY); east slope of Whitewater River, below Upper Falls of Whitewater River, Rogerson, 1 Aug 1961 (NY); TENNESSEE: Sevier County, Cherokee Orchard, along LaConte Creek, Great Smoky Mountains National Park, Rogerson, 12 Aug 1968 (NY). On *Trichoglossum* sp.: CHINA: Sichuan, between Chaoxiting and Zhuangguantai, Quingschensshan, Gun Xian, Zheng & Korf (CUP-CH 2407, 2408), 18 Sep 1981 (NY).

The two collections of *Papulaspora candida* from China have bulbils which are sooty brown in color and larger in size, 30–42 × 25–32 μm, than other collections of this anamorph. *Sibirina* conidia are sparse in these collections; they are mostly ellipsoidal, hyaline, 10 × 5 μm.

3. **Hypomyces leotiicola** Rogerson & Samuels, sp. nov. FIGS. 28–33

SYNANAMORPHS: *Sibirina*-like.
Sepedonium leotiarum (Fayod) Rogerson & Samuels, comb. nov.
≡*Hypomyces leotiarum* Fayod, Ann. Sci. Nat. Bot. Paris VII, **2**: 49. 1885.

Perithecia globosa, papillata, 225–242 × 150–182 μm, primum albida vel pallide argillacea, denique cyaneo-viridia vel viridi-nigra; papilla typice conica, 120 × 40 μm. Asci cylindrici, 60–70 × 4–5 μm, tenuiter tunicati, unitunicati, poro apicali haud viso, octospori. Ascosporae unicellulares, fusiformi-ellipticae, crebre inaequalilaterales vel naviculiformes, (6–)7–8(–9) μm, tunica levi, in asco oblique seriatae. In ascomatibus *Leotiae* sp. crescens.

Mycelium white, forming on hymenium, less frequently on stipe, of host, consisting of mononematous, macronematous, unbranched or verticillately branched, 40–60 μm long conidiophores arising from enlarged cells within hymenium of host; conidiogenous cells straight, curved or sinuous, (20–)25–33(–36) μm long, tip *ca.* 1 μm wide, base (2–)3–4(–5) μm wide, hyaline, smooth, monoblastic, tip lacking periclinal thickenings, not flared. Conidia narrowly ellipsoidal to oblong, less frequently naviculate with tip narrower than base, (7–)12.5–16.3(–23.5) × (2.5–)3.1–4.2(–5) μm, lacking an obvious basal abscission scar or, rarely, with a minute, refractive basal frill, hyaline, smooth, apparently produced holoblastically at tip of each conidiogenous cell. Aleuriospores arising laterally from hyphae within host tissue, solitary, globose, (17–)19–22(–25) μm diam, unicellular, smooth, pale green, wall 4–5 μm thick, subtended by a *ca.* 5 μm diam, unicellular, smooth, thin-walled suspensory cell; suspensory cell soon disintegrating, aleuriospores dehiscent. Perithecia densely aggregated, or sometimes in lines, forming a continuous layer on hymenium and occasionally on stipe of host, at first immersed in host tissue, when young covered with hyaline hyphae, globose to broadly pyriform, nonpapillate or with a short, acute papilla, (185–)225–242 (–250) × (125–)150–185 μm, whitish to pale buff at first, becoming bluish green to black at maturity, not changing color in 3% KOH or 100% lactic acid. Cells at surface of perithecial wall textura epidermoidea, wall <1 μm thick. Perithecial wall 10–15 μm wide, cells in longitudinal section flattened to elliptical, 5–7 μm long × 2–3 μm wide, walls < 1 μm thick; cells of papilla hyphal, *ca.* 3 μm wide, loosely joined along the length, tips rounded, walls < 1 μm thick, merging with periphyses within. Asci cylindrical to narrowly clavate, (60–)66–86(–100) × 4–5(–6) μm, apex with a minute ring; 8-spored, ascospores 1-seriate with overlapping ends or biseriate above, 1-seriate below; ring-bounded pores not seen in ascal base or ascogenous hyphae. Pseudoparaphyses not seen. Ascospores naviculate, broader above than below, to ellipsoidal, (6–)7.6–9.6(–11) × (2–)2.3–3.4(–5) μm, unicellular, hyaline, smooth.

HABITAT: On ascocarps of *Leotia lubrica* Fries. Known from Switzerland, eastern USA, and New Zealand.

HOLOTYPE: USA: NORTH CAROLINA, Transylvania County, woods along Corbin Creek, branch of Whitewater River, on *Leotia lubrica* Fries, Rogerson (61-53) & Petersen, 4 Aug 1961 (NY).

ADDITIONAL SPECIMENS EXAMINED (all on *Leotia lubrica*): **Teleomorph.** USA: NORTH CAROLINA, Cranberry, 3250 ft, Thaxter 706, Jul–Aug 1887 (FH, as *Hypomyces leotiarum*); Jackson County, above Upper Falls of Whitewater River, west side, Rogerson & Petersen, 4 Aug 1961 (NY); Macon County, Highlands Biological Station, Rogerson & Petersen, 12 Aug 1961; Transylvania County, below Toxaway Falls along Toxaway River, Rogerson (61-15) & Petersen, 27 Jul 1961 (NY); same data, Rogerson (61-56) & Petersen, 17 Jul 1961; same data, Rogerson & Petersen, 2 Aug, 11 Aug, 12 Aug 1961 (NY); along Corbin Creek, branch of Whitewater River, Rogerson (61-70) & Petersen, 4 Aug 1961 (NY); same data, Rogerson & Petersen, 9 Aug 1961 (NY). SOUTH CAROLINA, Oconee County, 3.2 miles south of State Line, 4 miles south of Upper Falls of Whitewater River, Rogerson (61-85) & Petersen, 14 Aug 1961 (NY). TENNESSEE, Eastern Tenn., Burbank, 30–3600 ft, Thaxter 684, Aug 20–Sep 5, 1887 (FH, as *Hypomyces* sp.). NEW ZEALAND: Northland, Hokianga County, vic. Mangamuka Bridge, Omahuta State Forest, along Waikoropoupu River, Samuels & Horak, 15 May 1981 (PDD 43772, 44115). **Anamorph.** SWITZERLAND: "*Hypomyces viridis* nob. sur *Leotia lubrica*" (G: GK 8353, HOLOTYPE of *Hypomyces leotiarum*). USA: CONNECTICUT, West Haven, Thaxter 707, Aug 1889 (FH, as *Hypomyces leotiarum*). NEW YORK, Albany County, Guilderland, Pine Bush, Willow Street Extension, Rogerson (77-142), 11 Sep 1977 (NY). NORTH CAROLINA, Macon County, NNE of Highlands, Flat Mountain Road, Rogerson & Petersen, 20 Aug 1961. NEW ZEALAND: Auckland, Waitakere Ranges, Johnston & Horak, 19 May 1981 (PDD 44113).

The dark green to black coloration of the perithecia is no doubt due to the color of host tissue.

The original description of *Hypomyces leotiarum* included only descriptions and illustrations of conidia and aleuriospores, no mention of a sexual phase was made. The holotype consists of a water color illustration of both conidial types. Vuillemin (**1887**) recognized that the original description of *H. leotiarum* was of an anamorphic fungus but he considered it to be the conidial phase of *Melanospora fayodi* Vuillemin which he found on *Leotia* Pers. The description of *M. fayodi* presented by Vuillemin (**1887**) is of a species of *Melanospora* and not of *Hypomyces*. A connection between *M. fayodi* and *Sepedonium leotiarum* would be unusual. It is likely that Vuillemin's report of a connection between the two fungi is based on chance juxtaposition of a teleomorph and an unrelated anamorph.

Attempts to germinate ascospores from several collections of *Hypomyces leotiicola* were unsuccessful; therefore, the connection between the *Hypomyces* and the synanamorphs described above remains unproven. However, because the three spore forms are nearly constantly associated with each other, and because such a connection would be consistent with other species of *Hypomyces*, we have no doubt that they are part of a single life cycle.

4. **Hypomyces mycogones** Rogerson & Samuels, sp. nov. FIGS. 5, 6

ANAMORPH: *Mycogone*-like.

Perithecia inter formam globosam et pyriformem variantes, 150 μm diametro, dilute aurantiace, levia, haud papillata, dense gregaria; asci cylindrici, (59–)60–71(–72) × (3–)4–5 μm, octospori, apice annulo minuto cingulato; ascosporae naviculiformes, (7–)8–10(–11) × (2–)2.3–3 μm, continuae, leves, hyalinae; conidia eis *Mycogones* accedentia, dehiscentia, tricellularia, in ramis lateralibus hypharum vegetabilium efformata, cellula terminali globosa, 5 μm diametro, spinulosa, dilute colorata, tunica tenuiore quam 0.5 μm, cellula sustendente globosa, 8–19 μm diametro, spinosa (spinis ad 1 μm longis), tunica colorata, *ca.* 2 μm crassa, cellula basali instar caulis crassa, cuneata, laevi. In ascomatibus *Geoglossi pumili* crescens.

Aerial hyphae scant, forming on hymenium. *Mycogone*-like conidia produced singly on the tips of apparently undifferentiated, 5–10 μm long, lateral branches of vegetative hyphae, dehiscent, giving a powdery aspect to the colony. Conidia forming when tip of lateral branch swells slightly and becomes separated from the rest of the branch by a septum, terminal cell apparently dividing, producing a new, papillate terminal cell and a slightly swollen subtending cell; the newly delimited cells continuing to swell, ultimately resulting in a dehiscent conidium comprising a globose, spinulose, *ca.* 5 μm diam, lightly pigmented apical cell with a wall <0.5 μm thick except at the tip where the wall is perceptibly thinner, a globose, spinose (spines up to 1 μm long), 8–10 μm diam, pigmented central cell with wall *ca.* 2 μm thick, and a thin-walled, finely punctate, pale tan stalk cell. Perithecia forming over the hymenial surface of host, without any obvious subiculum or stroma, densely gregarious, globose to pyriform, non-papillate, *ca.* 150 μm diam, light orange, smooth, collapsing by lateral pinching; not changing color in 3% KOH or 100% lactic acid. Cells at surface of perithecial wall textura epidermoidea, walls <1 μm thick. Perithecial wall 10–15 μm wide, cells in longitudinal section ± elliptical, 10–15 μm long × 3–5 μm wide. Ostiolar canal periphysate. Asci cylindrical, (59–)60–71(–72) × (3–)4–5 μm, apex with a minute ring; base with 2 refractive, ring-bounded pores at a point corresponding to each of the two septa in the crozier, rings also present in the ascogenous hyphae; 8-spored, ascospores 1-seriate with overlapping ends, forming throughout the entire length of each ascus or the lower 16–20 μm of many asci devoid of ascospores. Pseudoparaphyses not seen. Ascospores naviculate, (7–)8–10(–11) × (2–)2.3–3 μm, unicellular, smooth, hyaline.

HABITAT: On Geoglossaceae. Known from Ecuador, Bermuda and the USA (New York).

HOLOTYPE: ECUADOR: 21 km above Toachi, on the Toachi-Palo Quemado Rd., Prov. Pichincha, elev. *ca.* 3400 ft, on *Geoglossum pumilum* Winter on soil, Dumont, Carpenter & Buriticá, 19 Jul 1975 (Dumont-EC 592: NY).

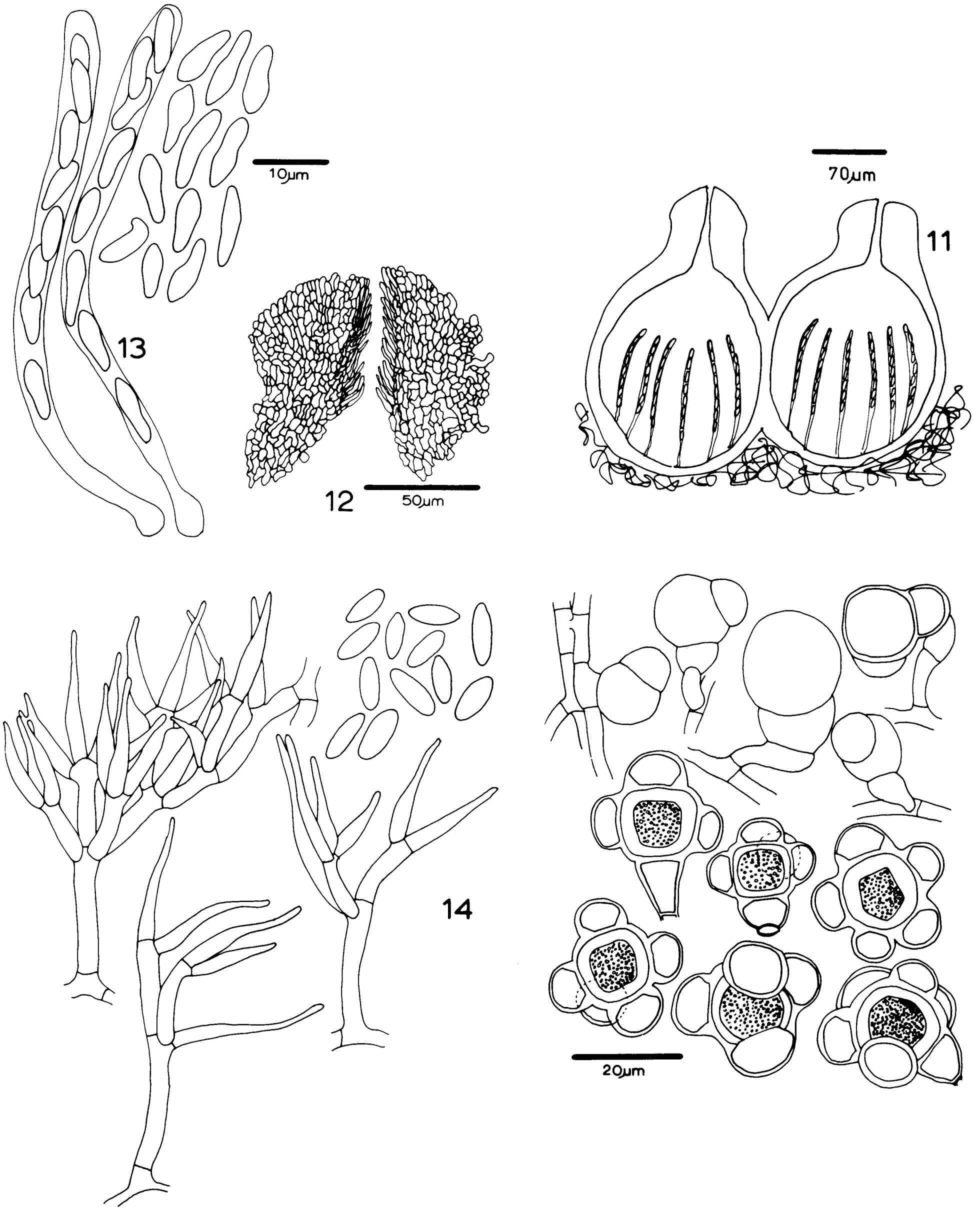
ADDITIONAL SPECIMENS EXAMINED: BERMUDA: on *Geoglossum nigritum,* Brown, Britton & Seaver 1564, 29.xi–14.xii.1912 (NY-Exploration of Bermuda 1564, *Mycogone* phase only). USA: NEW YORK, Albany County, Meadowdale, on ground in boggy woods, on *Trichoglossum hirsutum,* S. J. Smith (12120) & Brooks, 13 Sep 1952 (NY).

5. HYPOMYCES SEPULCRALIS Patouillard, Bull. Soc. Mycol. France **18**: 179. 15 May 1902. FIGS. 9, 10

=*Hypomyces ekmanii* Petrak & Ciferri, Ann. Mycol. **28**: 382. 30 Dec 1930.
≡*Nectria ekmanii* (Petrak & Ciferri) G. R. W. Arnold, Zeitschr. Pilzk. **37**: 192. 1971 (Mar 1972).

ANAMORPH: None known.

Perithecia forming within a subiculum of tan, branching, septate 3–4 μm wide hyphae, with only papillae free, forming a continuous layer; perithecia pyriform, with a short, rounded papilla, (280–)295–340(–360) μm high × 185–250(–290) μm wide, orange, smooth, collapsing by lateral pinching, not changing color in 3% KOH or 100% lactic acid. Perithecial wall *ca.* 15 μm wide; cells at surface indistinct; cells in longitudinal section elliptical to fusiform, 5–8 × 3–4 μm wide, wall 1 μm thick; cells around the ostiolar area nearly circular in outline, 5–12 μm diam, wall 1 μm thick. Ostiolar canal periphysate. Asci cylindrical, 110–125 × 5–6 μm; apex with a ring; base not refractive; 8-spored, ascospores 1-seriate, lower



FIGS. 11–14. *Hypomyces stephanomatis*. 11. Diagram of mature perithecia (CTR 61-100). 12. Perithecial papilla (CTR 970). 13. Asci and ascospores (CTR 61-100, as seen in lactic acid by phase contrast microscopy). 14. *Stephanoma* and *Sibirina*-like synanamorphs (CTR 61-100).

up to 50 μm devoid of ascospores. Pseudoparaphyses not seen. Ascospores ellipsoidal, 11–14 × 4–5 μm, equally 2-celled, spinulose, hyaline.

HABITAT: Reported to be on a discomycete, possibly *Peziza* sp., and on soil. Known from Guadeloupe and the Dominican Republic.

HOLOTYPE: GUADELOUPE: Cemetiere du Camp Faul, sur la terre argileuse, Duss (371), (FH: Patouillard, ISOTYPE: NY).

ADDITIONAL SPECIMEN EXAMINED: SANTO DOMINGO: Moncion, on ?*Peziza* sp., Dr. E. L. Ekman, ii.1929 [HOLOTYPE: *H. ekmanii,* W; ISOTYPES (2): S].

Petrak and Ciferri (**1930**) identified the host of *H. ekmanii* as a discomycete, possibly a *Peziza* species. It was not possible for us to identify the host to any major group of fungi and we cannot confirm that the host was a discomycete. Perithecia of the type specimen of *H. sepulcralis* are on soil and compacted debris. We cannot rule out the possibility that the substrate was a terricolous discomycete that has completely broken down.

6. **Hypomyces stephanomatis** Rogerson & Samuels, sp. nov. FIGS. 11–14

SYNANAMORPHS: *Sibirina*-like.

Stephanoma strigosum Wallroth, Flora Crypt. German. **4**: 269. 1833.

≡*Hypomyces strigosus* (Wallroth) Schroeter in Cohn, Krypto.-Flora Schlesien **3**(2): 268. Nov 1894.

≡*Asterophora strigosa* (Wallr.) Farlow, Bibl. Index N. Amer. Fungi, p. 297, 1905.

=*Asterophora pezizae* Corda in Zobel, Iconum Fungorum **6**: 3. 1854.

≡*Hypomyces pezizae* (Corda) Tulasne, Ann. Sci. Nat. Bot. Paris IV, **13**: 16. 1868.

=*Synthetospora electa* Morgan, Bot. Gaz. **17**: 192. Jun 1892.

=*Sepedonium tuberculiferam* Ellis & Everhart, Amer. Nat. **31**: 430. May 1897.

Perithecia pyriformia vel globoso-papillata, 190–250(–280) × (125–)135–210(–225) μm, pallide lutea, levia, papillis acutis; asci cylindrici, (60–)72–96(–115) × (4–)4.5–6(–7.5) μm, octospori, apice annulo minuto cincto; ascosporae naviculiformes, (7.8–)9–11.6(–12.3) × (2–)2.5–3.6(–4.6) μm continuae, leves, hyalinae; subiculum album byssoideum; conidiophori eis *Sibirina* e accedentes macronemati, verticillate vel irregulariter ramosi, hyalini, ramo omni gerente cellulas conidiogenas 2–6 terminales, rectas, leves, 20–26(–28) μm longas, ab 2–3 μm ad basim ad *ca.* 1 μm apicem versus attenuatas, conidia holoblastice ex apice haud distincto producentes; conidia oblonga vel elliptica, 8–11(–13) × (3–)3.4–4(–4.6) μm, continua, hyalina, ab cicatrice disjunctionis prominente applanta basali notata vel ea carentia; propagula eis *Stephanomatis* accedentia primo e cellula basali cuneiformi et terminali dilatata globosa composita, serius tumefactionibus hemisphaericis lateraliter et continue e cellula terminali ortis, matura dehiscentia, cellula terminali globosa, (10.8–)13–19 μm diametro, tunica 1.6–2 μm crassa, tumefactionibus 4–8 hemisphaericis, 6–8 μm altis, ornata, lutea. In ascomatibus *Humariae hemisphaericae* crescens.

Mycelium white, cottony, spreading over hymenium of host, at first producing macronematous, verticillately or irregularly branched, hyaline conidiophores of indeterminate length, each branch bearing 2–6 terminal, straight, smooth conidiogenous cells, 20–26(–28) μm long, tapering evenly from 2–3 μm basally to *ca.* 1 μm apically, producing conidia holoblastically from the undifferentiated tip; conidia oblong to ellipsoidal, hyaline, unicellular, 8–11(–13) × (3–)3.4–4(–4.6) μm, with or without a protuberant, flattened basal abscission scar, eguttulate. *Stephanoma* conidia eventually arising in the aerial mycelium, giving the mycelium a tan, powdery aspect; produced singly, sessile or at tips of 10 μm long lateral branches of vegetative hyphae, consisting at first of a wedge-shaped basal cell and an enlarged, globose terminal cell, hemispherical swellings arising laterally and successively from the terminal cell; mature conidium dehiscent, tan, consisting of a wedge-shaped basal cell with a truncate base, a globose, (10.8–)13–19 μm diam central cell with a 1.5–2 μm thick wall and granular contents, and 4–8 hemispherical protuberances, 6–8 μm high × *ca.* 10 μm wide basally with wall 1 μm thick. Perithecia forming after cessation of conidial production, either directly on hymenium of the host without any obvious subiculum or stroma forming in white mycelium, forming a continuous layer, perithecia pyriform, with an acute papilla, 190–250(–280) μm high × (125–)135–210(–225) μm wide, pale yellow, smooth, collapsing by lateral pinching, becoming nearly colorless in 3% KOH and 100% lactic acid. Cells at surface of perithecial wall angular to textura epidermoidea, wall < 1 μm thick. Perithecial wall 15–25 μm wide; cells in longitudinal section elliptical to fusiform, 5–10 μm long × 2–3 μm wide, wall 1 μm thick; cells around the ostiolar area nondescript, walls 1 μm thick. Ostiolar canal periphysate.

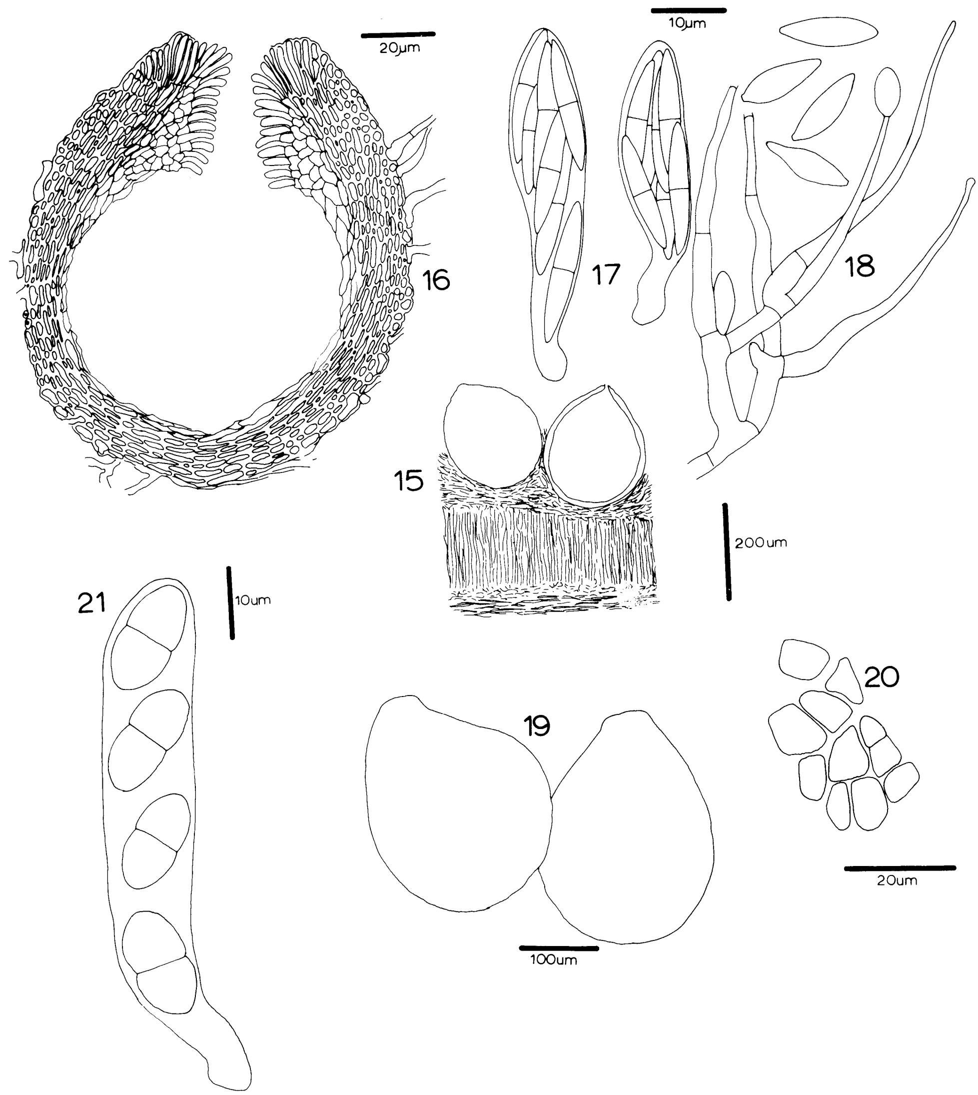
Asci cylindrical, (60–)72–96(–115) × (4.8–)4.5–6(–7.5) μm; apex with a minute ring; base refractive as are septa of croziers and ascogenous hyphae; 8-spored, ascospores 1-seriate with overlapping ends or partially biseriate, forming throughout the entire length of each ascus or lower 20–50 μm of many asci devoid of ascospores. Pseudoparaphyses not seen. Ascospores naviculate or slipper-shaped, with apical end somewhat more pointed than basal end, (7.8–)9–11.6(–12.3) × (2–)2.5–3.6(–4.6) μm, unicellular, smooth, hyaline.

HABITAT: On apothecia of *Humaria hemisphaerica* (Wiggers: Fries) Fuckel. Known from eastern USA.

HOLOTYPE: USA: NORTH CAROLINA, Macon Co., along Nantahala Lake road, north west of Rainbow Springs, on apothecia of *Humaria hemisphaerica,* Rogerson (61-100) & Petersen, 19 Aug 1961 (NY).

ADDITIONAL SPECIMENS EXAMINED (all on apothecia of *Humaria hemisphaerica*): **Teleomorph.** USA: NEW YORK, Genesee County, Bergen Swamp, Rogerson (970) & Muenscher, 16 Aug 1946 (NY); Tompkins County, Enfield Glen near Ithaca, 20 Aug 1935, Conners & White (DAOM 2979, NY). Ohio, Hocking County, The Gulf, W. B. & V. G. Cooke (41087), 26 Jul 1969 (NY). MASSACHUSETTS, north Williamstown, collector unknown, 13 Sep 1901 (FH, NY). **Anamorph.** USA: CONNECTICUT, Litchfield County, southwest of Litchfield, Rogerson (78-118), 30 Sep 1978 (NY); Hartford County, Poquonock, Sturgis s.n., 4 Aug 1895 (NY). GEORGIA, Clarke County, 5 miles south of Athens, Rogerson, 25 Aug 1978 (NY). INDIANA, Brown County, State Park, 1958 (NY). KANSAS, Cherokee County, 1 mile south of Baxter Springs, Rogerson s.n., 11 Jun 1957 (NY). MASSACHUSETTS, Middlesex County, near Concord, Pfister *et al.* (CTR 74-171), 5 Oct 1974 (NY). MICHIGAN, Emmet County, 3 miles southwest of Cross Village, Morris County, Hackelbarney State Park, Ristich, 7 Sep 1975 (NY); Sussex County, High Point State Park, Rogerson (77-88), 19 Aug 1977 (NY). NEW YORK, Orange County, east of Lake Stahahe, Rogerson (60-72), 28 Jul 1960 (NY); Orleans County, Lyndonville, Fairman, Aug 1902 (NYS), northwest of West Barre, S. J. Smith (14506) & Ogden, 12 Aug 1953 (NY, NYS); Rennselaer County, Averill Park, Rogerson (77-131), 9 Sep 1977 (NY); Rockland County, Stony Brook, east of Sloatsburg, Rogerson (60-87, 60-90), 1 Aug 1960 (NY); Schuyler County, southeast of Cayuta, Rogerson (70-136) & Samuels, 19 Sep 1970 (NY); Sullivan County, near Woodridge, Rogerson (69-186), 5 Oct 1969 (NY); Tompkins County, Cornell Plantations, near Ithaca, Rogerson (2191), 17 Sep 1947 (NY); near Ithaca, Rogerson (2530), 11 Aug 1948 (NY); Six Mile Ravine near Ithaca, Rogerson (2587) & Trejo, 26 Aug 1948 (NY); Coy Glen, Rogerson (2530), 11 Aug 1948 (NY); Lloyd-Cornell Reservation, Ringwood, Rogerson (2654), 21 Sep 1948 (NY); Lloyd-Cornell Reservation, McLean, Rogerson (3593) & Shaffer, 5 Sep 1952 (NY); Ulster County, near Esopus Gorge, 12 miles south of Kingston, Rogerson & S. J. Smith s.n., 17 Sep 1960 (NY); south of Ashokan Reservoir, Rogerson & Samuels s.n., 9 Sep 1972 (NY); near Oliverea, Stein (CTR 74-136), Aug 1974 (NY); Warren County, 5 miles north of Warrensburg, Pack Forest, Rogerson (71-361), 25 Sep 1971 (NY). NORTH CAROLINA: Henderson County, south of Tuxedo, Rogerson (74-71), 14 Sep 1974 (NY), Rogerson (80-218), 20 Sep 1980 (NY); Swain County, Indian Gap, Great Smoky Mountains National Park, Rogerson *et al.*, 8 Aug 1961 (NY); Great Smoky Mountains National Park, Rogerson (68-85), Rogerson s.n., 14 Aug 1968 (NY, TENN). PENNSYLVANIA: Bethlehem, no other data, Ellis herb. (NY); Monroe County, Buckfalls, Mrs. Delafield, no date (NY); no locality or date, Sumstine (NYS). TENNESSEE, Blount County, Great Smoky Mountains National Park, Rogerson s.n., 11 Aug 1968 (NY). West Virginia, Nuttall, Jul 1896 (BPI, ISOTYPE of *Sepedonium tuberculiferum*); same collecting data, Nuttall (FH, BPI). CANADA: Ontario, London, Dearness (2491), 5 Sep 1897 (NY). GERMANY: Leipzig, Winter (2919), 15 Aug 1886 (BRSL, as *Asterophora pezizae*); Rheinauer Wald bei Rastatt, Schroeter, 26 Jun 1875 (BRSL, as *Hypomyces pezizae*); Snuffer b. Rastatt in Baden, Schroeter, Aug 1877 (BRSL, as *Hypomyces pezizae*); locality in illegible, handwritten German script, (BRSL, as *Hypomyces strigosus*); Zeitz, Kittelholz, Arnold, 25 Aug 1962 (NY).

Two packets of *Sepedonium tuberculiferum* Ellis & Everhart, remains of Ellis' herbarium purchased by C. L. Shear, were found at BPI. Both have the data "on *Peziza hemisphaerica,* West Va., Nuttall." Only one of these has a date, "July 1896." These data fit the protologue (Nuttalberg, W. Va., July 1896, alt. 1800 ft, Nuttall no. 883). A packet at FH from Ellis' herbarium and labelled "authentic" bears the date 8/3/96 and thus the date does not match the protologue. In all of these collections the host is *Humaria hemisphaerica*; we did not detect any evidence of *Peziza fusicarpa* which is cited in the protologue along with *Peziza hemisphaerica.* Of the three specimens, the BPI "July 1896" collection most closely matches the protologue and we herewith designate it the lectotype of *Sepedonium tuberculiferum.*



FIGS. 15–18. *Nectria discophila*. 15. Diagram of mature perithecia. 16. Longitudinal section of a mature perithecium. 17. Ascus and ascospores. 18. *Acremonium* anamorph. (FIGS. 15–18 from holotype specimen.) FIGS. 19–21. *Nectria sepultariae*. 19. Diagram of mature perithecia. 20. Cells at surface of perithecial wall. 21. Ascus with ascospores. (FIGS. 19–21 from holotype specimen.)

7. **Nectria discophila** Rogerson & Samuels, sp. nov. FIGS. 15–18

ANAMORPH: ?*Acremonium* sp.

Perithecia in substrato dense gregaria, globosa vel late pyriformia, papillata, (170–)200–250 (–300) × (150–)170–200(–260) μm, sicca succinea, in aqua vel potassii hydroxidi solutione humectata pallide vel intense flava, apice dilute rubello, compressione laterali collapsa, apice acuto vel obtuso, tunica levi. Asci clavati, 32–50(–55) × (5–)6–10(–12) μm, unitunicati, apice tenui, octospori. Ascosporae fusiformes, hyalinae, 11–20 × 2–3 μm, aequaliter bicellulares, juvenes paulum verruculosae, maturae leves. In ascomatibus *Lachni* sp. crescens.

Mycelium forming on hymenium, white, cottony, at first producing conidia.

Conidiophores arising from aerial hyphae, solitary, unbranched, undulate in outline, hyaline, smooth, monophialidic, 33–48 μm long × 3.5–4 μm wide at base, wall <0.5 μm thick, 1(–2)-septate. Phialides terminal, monoblastic, 33–47 μm long; tip 1 μm wide, not thickened, not flared. Conidia ellipsoidal to fusoid, with or without a protuberant, flattened basal abscission scar, 11–14 × 4–5 μm, unicellular, hyaline, smooth. Perithecia forming within white myeclium, densely gregarious, ½–⅔ immersed, globose to broadly pyriform, apex obtuse to acute, smooth, (170–)200–250(–300) μm high × (150–)170–200(–260) μm wide, amber colored (dry), pale to bright yellow with a faint reddish apex (water, 3% KOH), collapsing by lateral pinching. Cells at surface of perithecial wall obscured by hyphae; hyphae 3–4 μm wide, branching, septate, smooth. Perithecial wall *ca.* 20 μm wide, surface with 2–3 layers of elliptic to nearly circular cells 3–4 μm diam, walls 1–1.5 μm thick; cells of the rest of the wall ± elliptic to flattened, 7–10 × 3–4 μm, walls 1–1.5 μm thick. Perithecial apex formed of a palisade of 2–3 μm wide hyphal elements having rounded ends, continuous with cells of inner layers of perithecial wall and merging with periphyses. Asci clavate, 32–50(–55) × (5–)6–10(–12) μm, apex simple; 8-spored, ascospores multiseriate, ≤15 μm of each ascal base devoid of ascospores. Ascospores fusiform, ends acute, 11–20 × 2–3 μm, equally 2-celled; slightly verruculose when young, smooth when mature, hyaline.

HABITAT: On apothecia of *Lachnum* spp. (Hyaloscyphaceae). Known from Java and Venezuela.

HOLOTYPE: VENEZUELA: Dto. Federal, *ca.* 10 km NE of Portachuelo, on *Lachnum brasiliense* (Mont.) Haines & Dumont, Dumont *et al.*, 22 Jan 1971 (Dumont-VE 455 part, NY).

ADDITIONAL SPECIMENS EXAMINED: JAVA: Tjibodas, jungle near Tjibodas River, on hymenium of *Lachnum indicum* (Cash) Haines & Dumont (CUP-SA 236 b part), Rifai *et al.* (CUP-SA 235), 14 Dec 1961 (CUP, NY); same collecting data, on *Lachnum sclerotii* (A. L. Smith) Haines & Dumont (CUP-SA 236 a), Rifai *et al.* (CUP-SA 235), 14 Dec 1961 (CUP, NY); near Tjibodas River, on hymenium of *Lachnum abnorme* (Mont.) Haines & Dumont (CUP-SA 237), Rifai & Korf (CUP-SA 238), 14 Dec 1961 (NY, specimen immature); near Tjibodas River, on hymenium of *Lachnum abnorme,* Rifai & Korf (CUP-SA 245), 14 Dec 1961 (NY, immature); near Tjibodas River, on hymenium of *Lachnum sclerotii,* Rifai *et al.* (CUP-SA 123), 10 Dec 1961 (NY, immature). VENEZUELA: Edo. Sucre, trail from Los Pocitos and the peak of Cerro Humo, NW of Irapa, on *Lachnum brasiliense,* Dumont *et al.,* 12 Jul 1972 (Dumont-VE 4814 part, NY).

8. NECTRIA SEPULTARIAE (Ade) Petrak, Ann. Mycol. **27**: 335. 30 Dec 1929. FIGS. 19–21

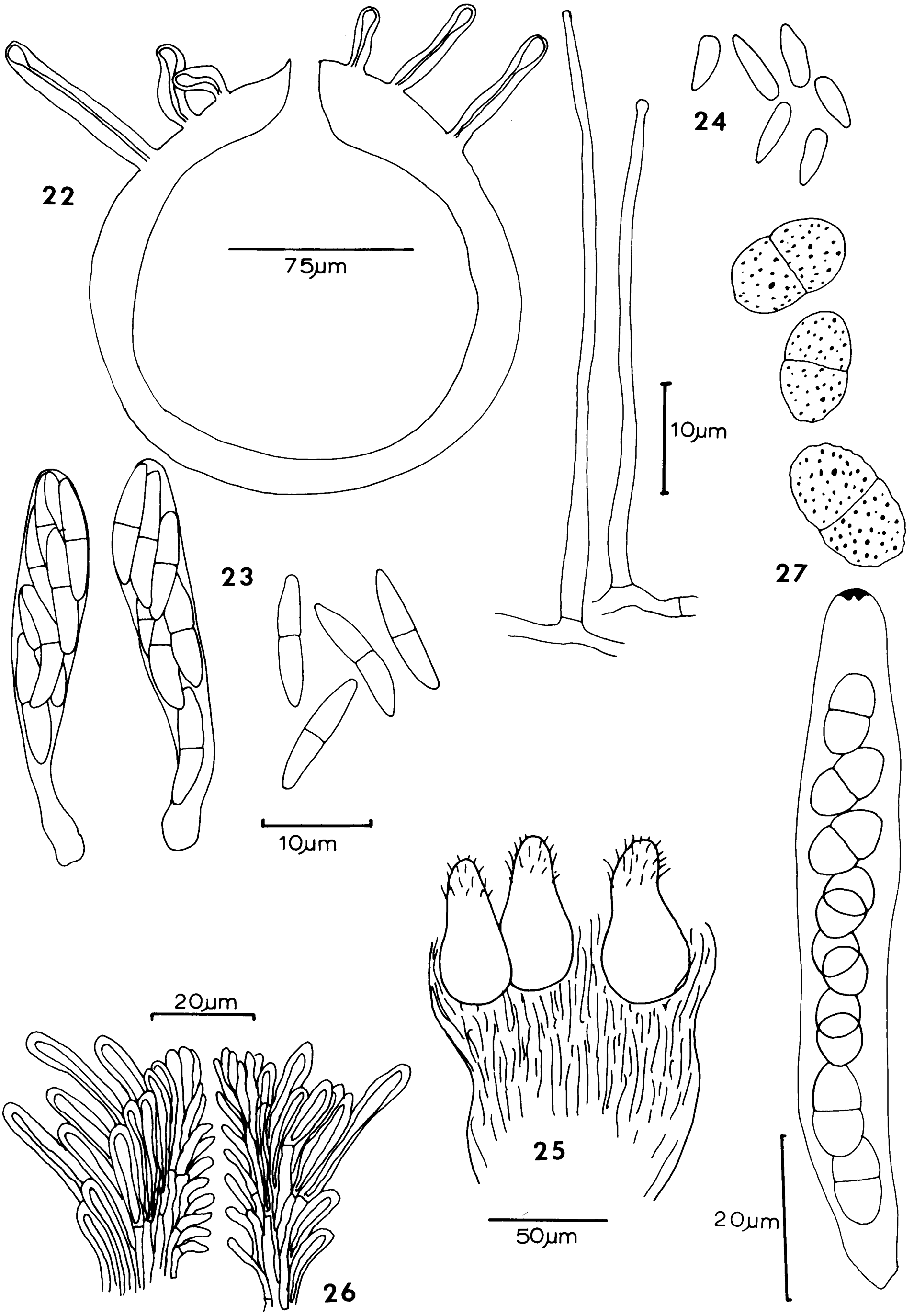
≡*Hypomyces sepultariae* Ade, Hedwigia **64**: 304. 29 Dec 1923.

ANAMORPH: None known.

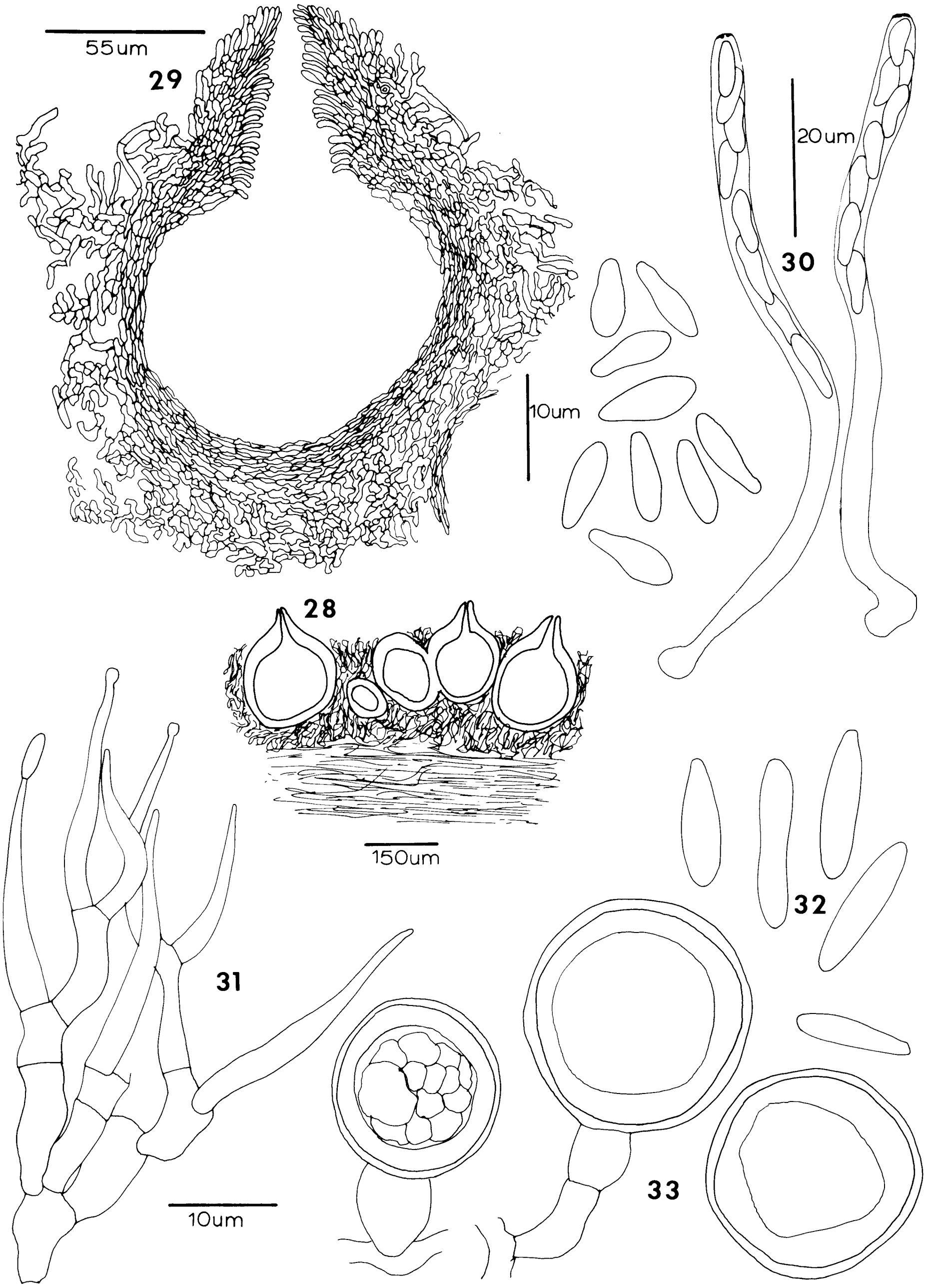
Perithecia nearly superficial to ⅔ immersed in hymenium of host, without obvious mycelium, gregarious, pyriform with a blunt apex, 275–310 μm high × 210–245 μm wide, red-orange, smooth, collapsing by lateral pinching; not changing color in 3% KOH or 100% lactic acid. Cells at surface of perithecial wall angular, <10 μm in greatest dimension, walls <1 μm thick. Perithecial wall 15–20 μm wide, composed of a single region of flattened cells; perithecial apex composed of 4–5 μm wide hyphal elements having rounded tips, merging with periphyses. Asci broadly cylindrical, (85–)95–140(–145) × 18–23(–25) μm; apex broadly rounded, simple; 4-spored, ascospores 1-seriate, forming throughout the entire length of each ascus or the lower 15–30 μm of many asci devoid of ascospores. Pseudoparaphyses not seen. Ascospores broadly ellipsoid to fusiform, equally 2-celled, constricted at the septum, smooth, hyaline, (23.5–)24.3–27.7 (–29) × (10–)10.6–12.7(–13) μm.

HABITAT: On the inoperculate discomycete *Sepultaria arenicola* (Lév.) Rehm. Known only from Germany (Bavaria).

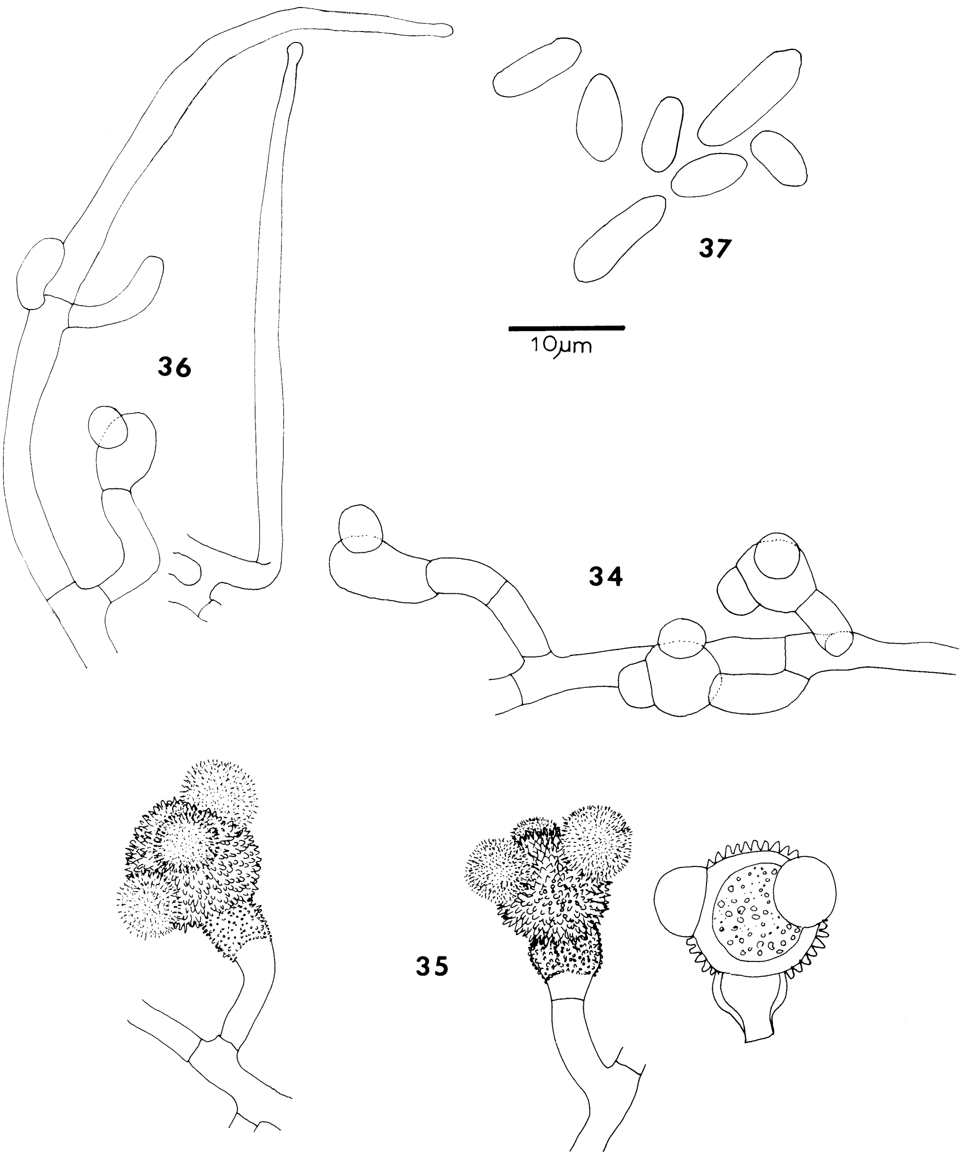
HOLOTYPE: [Ostand des], auf *Sepultaria arenicòla,* A. Ade, 14.X.1920 (W: Herb. Petrak 12287).



FIGS. 22–24. *Nectria albidopilosa.* 22. Diagrammatic sketch of a median longitudinal section of a mature perithecium showing thick-walled hairs. 23. Asci and ascospores (as seen in lactic acid by phase contrast microscopy). 24. Conidiophores and conidia. (FIGS. 22–24 from holotype specimen.) FIGS. 25–27. *Nectria discicola.* 25. Sketch of perithecia seated on the hymenium of the host discomycete. 26. Perithecial apex showing hairs. 27. Ascus and ascospores (as seen in lactic acid with phase contrast microscopy).



FIGS. 28–33. *Hypomyces leotiicola*. 28. Diagrammatic sketch of median longitudinal sections of perithecia on hymenium of host. 29. Median longitudinal section through a mature perithecium. 30. Asci and ascospores (as seen in lactic acid by phase contrast microscopy). 31. Conidiophores (as seen in lactic acid by phase contrast microscopy). 32. Conidia. 33. Aleuriospores. (FIGS. 28, 29: Toxaway Falls, Rogerson, 2 Aug 1961; FIG. 30: Rogerson 61-53; FIGS. 31, 32: Rogerson 61-15; FIG. 33: Rogerson 77-142.)



FIGS. 34–37. *Stephanoma tetracoccum.* 34. Three developing aleuriospores. 35. Three mature aleuriospores. 36. Two *Sibirina*-like conidiophores, the conidiophore on the left with a developing aleuriospore. 37. *Sibirina*-like conidia (Bandoni 5442).

9. **Nectria albidopilosa** Rogerson & Samuels, sp. nov. FIGS. 22–24

ANAMORPH: None known.

Perithecia singularia, in substrato superficialia, globosa vel late pyriformia, 145–175 × 135–175 µm, haud papillata, pallide lutea, compressione laterali collapsa, dimidia superiori a pilis rigidis, erectis, levibus, albis, haud ramosis, 30–60 × 8–10 µm strata. Asci clavati, (32–)34–45(–45) × (5–)6–8 µm, unitunicati, octospori, apice lato, tenui. Ascosporae biseriatae, anguste ellipticae vel fusiformes, (10–)11.6–13.5(–14.5) × 2–3 µm, aequaliter bicellulares, leves, hyalinae. In ascomatibus ascomycetis ignotae crescens.

Perithecia forming in thin, white mycelium on hymenium of host or forming on decorticated wood adjacent to apothecia, solitary, superficial, globose to broadly pyriform, nonpapillate, 145–175 μm high × 135–175 μm wide, pale yellow, not changing color in 3% KOH, collapsing by lateral pinching, with stiff, erect, smooth, white unbranched hairs arising from the upper half of the perithecium, 30–60 μm long × 8–10 μm wide at base × *ca.* 7 μm wide at tip, with wall *ca.* 3 μm wide except *ca.* 1 μm wide at tip. Cells at surface of perithecial wall obscured by hyphae. Perithecial wall *ca.* 10 μm wide, comprising a single region of flattened to elliptic cells; ostiolar canal periphysate. Pseudoparaphyses not seen. Asci clavate, (32–)34–45(–47) × (5–)6–8 μm, apex broad, simple; 8-spored, ascospores 2-seriate, filling each ascus or a small portion of the ascal base devoid of ascospores. Ascospores narrowly ellipsoidal to fusiform, (10–)11.6–13.5(–14.5) × 2–3 μm, equally 2-celled, smooth, hyaline.

HABITAT: On apothecia of an unidentified, inoperculate discomycete. Known only from Venezuela (Aragua).

HOLOTYPE: VENEZUELA: Edo. Aragua, path between hotel and hotel's water source, Rancho Grande, Parq. Nac. Henry Pittier, on apothecia of mollisioid discomycete on decorticated wood, Dumont *et al.*, 3 Jul 1971 (Dumont-VE 1196, NY).

An *Acremonium* species (FIG. 24) was associated with developing perithecia on the hymenium of the host. The conidiophores were scattered, erect, straight, smooth, hyaline, aseptate, 40–60(–115) μm long × 1.5–2 μm wide at the base and 1 μm wide at the unthickened and unflared tip. Conidia were ellipsoidal or broader at the apex than at the base, hyaline, unicellular, 5–7 × 2 μm. Hyphae from which the conidiophores arose grew within asci of the host.

10. **Nectria discicola** Rogerson & Samuels, sp. nov. FIGS. 25–27

ANAMORPH: None known.

Perithecia gregaria, in substrato partim immersa vel superficialia, globosa, papillata, 140–280 × 145–220 μm, pallide lutea vel alba, in colorem pallide rubram desinentia, compressione laterali collapsa, apice obtuso vel acuto, papilla ab capillarum fimbria circumdata, capillis haud ramosis nec septatis, albis, levibus, 40–50 × 5 μm. Asci cylindrici vel clavati, (75–)79–96(–100) × 10–15 μm, unitunicati, octospori, apice ab annulo refractili cincto. Ascosporae uniseriatae vel partim biseriatae, late ellipticae, (11–)12–14(–16) × (6–)6.7–7.7(–8) μm, aequaliter bicellulares, verrucosae, pallide brunneae. In ascomatibus discomycetis ignotae crescens.

Mycelium forming on hymenium, white, hyphae erect, straight, smooth, unbranched, septate, *ca.* 5 μm wide, walls *ca.* 1 μm thick, with many free ends visible. Perithecia forming within white mycelium, gregarious, ½ immersed to nearly free, pyriform, apex blunt to acute, 140–280 μm high × 145–220 μm wide, pale yellow, nearly white but eventually taking up coloration from host and becoming red, not changing color in 3% KOH, collapsing by lateral pinching when dry, with a fringe of hairs around the perithecial apex, hairs unbranched, aseptate, white, smooth, 40–50 μm long × *ca.* 5 μm wide, wall *ca.* 1 μm thick. Cells at surface of perithecial wall angular, ≤10 μm across, walls <0.5 μm thick. Perithecial wall <15 μm wide, consisting of a single region of flattened cells; perithecial papilla formed of hyphal elements with rounded tips, *ca.* 5 μm wide, many growing outwardly as hairs. Pseudoparaphyses not seen. Asci cylindrical to clavate, (75–)79–96(–100) × 10–15 μm, apex with a refractive ring; 8-spored, ascospores 1-seriate to partially 2-seriate. Ascospores broadly ellipsoidal, (11–)11.6–14.2(–16) × (6–)6.7–7.7(–8) μm, equally 2-celled, verrucose, pale brown.

HABITAT: On hymenium of *Bioscypha* sp. on sori of the fern *Lophosoria quadripinnata* (Gmel.) C. Chr. Known only from Ecuador (Pichincha).

HOLOTYPE: ECUADOR: Prov. Pichincha, *ca.* 49 km SW of Chillogallo, on the old road from Quito to Santo Domingo, elev. *ca.* 7200 ft, on *Bioscypha* sp. (Dumont-EC 330 part) on fern sori, Dumont *et al.*, 17 Jul 1975 (Dumont-EC 330, NY).

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