
Pyrenomycetes of the Great Smoky Mountains National Park. VI. *Kretzschmaria*, *Nemania*, *Rosellinia* and *Xylaria* (Xylariaceae)

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Keys and descriptions are provided for nineteen taxa of *Kretzschmaria*, *Nemania*, *Rosellinia* and *Xylaria* collected in the Great Smoky Mountains National Park in Tennessee and North Carolina of eastern United States.

Key words: Ascomycota, Southern Appalachians, taxonomy, temperate forests, Xylariaceae

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Introduction

This paper represents the 6th contribution to an inventory of pyrenomycetes of the Great Smoky Mountains National Park (GSMNP, see Vasilyeva and Stephenson, 2004, 2005, 2006; Vasilyeva *et al.*, 2007a, b) and includes genera of family Xylariaceae that have not been previously covered. Specimens are deposited in ILLS, WSP, VLA (see address of LNV) and, temporarily, the private collection of JDR. All of the fungi described herein have been previously described from other locations by JDR and others. References cited should be consulted for additional information on described fungi.

General description and key to genera discussed herein

The genera discussed have the following common characteristics; they will not be repeated in discussions and keys. *Ascospores* of taxa of all genera that have easily observable germ slits have them inserted on the concave (most flat) side of the spore. Perisporia of ascospores are not dehiscent in potassium hydroxide

(KOH). All taxa discussed herein have eight ascospores per ascus. *Stromata* lack bright colors and do not release pigments in KOH.

1. Stromata of all known species from GSMNP upright, more or less digitate..... *Xylaria*
1. Stromata never upright, but pulvinate, applanopulvinate, irregular or perithecioid..... 2
2. Stromata resembling perithecia, occasionally several fused..... *Rosellinia*
2. Stromata pulvinate, usually containing numerous perithecia..... 3
3. Stromata large, several to 10 cm long and 1-several cm thick, containing numerous large (ca. 1 mm diam) perithecia, becoming hollow at maturity..... *Kretzschmaria*
3. Stromata usually small, containing numerous perithecia usually less than 1 mm diam and not usually becoming hollow..... *Nemania*

Key to species of *Kretzschmaria*, *Nemania*, and *Rosellinia* of GSMNP

1. Stromata resembling solitary perithecia..... 2
1. Stromata containing several to many perithecia, seldom resembling solitary perithecia..... 3
2. Stromata often embedded in coarse reddish brown subiculum..... *Rosellinia corticium*
2. Stromata often embedded in a cream-colored or sulphur yellow subiculum..... *Rosellinia subiculata*

3. Ascospores 27-35 × 7-9 μm, with germ slit much less than spore-length *Kretzschmaria deusta*
3. Ascospores not exceeding 16 μm long (*Nemania* spp.) 4
4. Ascospores (9-)9.5-11 × 4.5-5 μm, brown to dark brown, with obvious germ slit spore-length. Ascus apical ring bluing in Melzer's iodine reagent *Nemania diffusa*
4. Combination of characters different, e.g. ascospores longer or shorter; ascospores pale brown; ascospore germ slit not obvious or apparently lacking; ascus apical ring bluing or not bluing in Melzer's iodine reagent 5
5. Ascospores 11-12 × (3-)3.5-4.5 μm, pale brown, without obvious germ slit, with one end rounded and the other acute. Ascus apical ring bluing in Melzer's iodine reagent *Nemania illita*
5. Ascospores various lengths, but lacking acute end(s), with germ slits obscure, sometimes apparently absent. 6
6. Ascospores (10.5-)13-25 × (4.5-)5-6 μm. Ascus apical ring not bluing in Melzer's iodine reagent *Nemania aenea* var. *aureolutea*
6. Ascospores similar to above in length or shorter. Apical ring bluing in Melzer's iodine reagent 7
7. Ascospores 12.5-15 × 6 μm *Nemania* cf. *serpens*
7. Ascospores 9.5-12 × 4.5-5 μm *Nemania serpens* var. *colliculosa*

Kretzschmaria deusta (Hoffm.: Fr.) P.M.D. Martin, J. South Afr. Bot. 36: 80 (1970).

(Fig. 1)

- Sphaeria deusta* Hoffm., Veg. Crypt. 1: 3 (1787).
Nemania deusta (Hoffm.) Gray, Nat. Arr. Brit. Plant. 1: 516 (1821).
Sphaeria deusta Hoffm.: Fr., Syst. Mycol. 2: 345 (1823).
Stromatosphaeria deusta (Hoffm.: Fr.) Grev., Fl. Edin.: 355 (1824).
Hypoxylon deustum (Hoffm.: Fr.) Grev., Scott. Crypt. Fl. 6: 324 (1828).
Ustulina deusta (Hoffm.: Fr.) Lind, Danish Fungi: 252 (1913).

Illustrations: Miller, 1961, figs 119, 147; Rogers and Ju, 1998, figs 6, 41, 42.

Stromata pulvinate, up to 10 cm diam, 0.5-3 cm thick, at first dull brown becoming black with age. Outer part carbonaceous; interior white, soft, disintegrating, with aging stromata becoming hollow. *Perithecia* up to 1.5 mm diam., ostioles papillate. *Asci* up to ca. 500 μm long, 10-14 μm broad, the spore-bearing parts up to 210 μm long, with apical ring bluing in Melzer's iodine reagent, up to 6 μm high. *Ascospores* brown to dark brown, fusoid-inequilateral with acute ends, smooth, 25-35 ×

7-9 μm, with germ slit less to much less than spore-length.

Habitat: On wood, perhaps most commonly on decaying angiospermous stumps.

Localities: Alum Cave Trail; Appalachian Trail; Cades Cove (Gregory Ridge Trail, Gum Swamp); Cosby (Gages Mountain Trail, Low Gap Trail); Grotto Falls (Trillium Gap Trail).

Notes: This fungus is encountered in the north temperate regions of the world. When overmature the stroma is brittle and hollow with perithecia attached as sacs on the inner surface. More data are available in Rogers and Ju (1998).

Rosellinia corticium (Schwein.: Fr.) Sacc., Syll. Fung. 1: 253 (1882).

Sphaeria corticium Schwein., Schrift. Nat. Ges. Leipzig. 1: 44 (1822).

Sphaeria aquila Fr.: Fr. var. *corticium* (Schwein.) Fr., Syst. Mycol. 2: 442 (1823).

Byssosphaeria corticium (Schwein.: Fr.) Cooke, Grevillea. 15: 122 (1887).

Hypoxylon corticium (Schwein.: Fr.) P.M.D. Martin, J. South Afr. Bot. 34: 156 (1968).

Illustrations: Petrini, 1993, figs 9e-j.

Stromata perithecioid, 1-1.5 mm diam, blackish brown, embedded in reddish brown subiculum (sometimes absent in old material), brittle. *Surface* more or less smooth. *Perithecia* 0.5-1 mm diam., flattened at the tops, ostioles papillate. *Asci* 170-200 μm total length, 8-12 μm broad, the spore-bearing part 140-180 μm long, with large apical ring 8-12 × 5 μm, bluing in Melzer's iodine reagent. *Ascospores* brown, ellipsoid-inequilateral, often with a hyaline appendage on one or both ends, smooth, 26-29 × 7-9 μm, with germ slit nearly spore-length.

Habitat: On dead branches of deciduous trees.

Localities: Cosby (Gages Mountain Trail); Greenbrier (Porters Creek Trail).

Notes: This species was already found in North Carolina (Petrini, 1993). It is very similar to *Rosellinia aquila* (Fr.: Fr.) De Not., but has consistently longer ascospores and a large apical ring in the asci.

Rosellinia subiculata (Schwein.: Fr.) Sacc., Syll. Fung. 1: 255 (1882). (Fig. 2)

Sphaeria subiculata Schwein., Schrift. Nat. Ges. Leipzig. 1: 44 (1822).

Sphaeria subiculata Schwein.: Fr., Syst. Mycol. 2: 443 (1823).

Byssosphaeria subiculata (Schwein.: Fr.) Cooke, Grevillea. 15: 123 (1887).

Illustrations: Petrini, 1993, figs 14 f-k.

Stromata perithecium-shaped, ca. 0.6 mm diam, containing single perithecia, at first brown, blackening with age, brittle, usually surrounded by a sulfur yellow, orange or cream-colored subiculum. *Perithecia* ca. 0.5 mm diam., ostioles papillate. *Asci* 90-150 μ m total length, 7-9 μ m broad, the spore-bearing part 70-80 μ m long, with apical ring bluing in Melzer's iodine reagent, small. *Ascospores* brown, ellipsoid, 9-12(-13) \times 5-6 μ m, with spore-length germ slit.

Habitat: On decayed wood.

Localities: Deep Creek (Indian Creek Trail); Greenbrier (Old Settlers Trail); Oconaluftee (Mingus Creek Trail).

Notes: This fungus is found in various parts of the world. See Petrini (1993) for further information.

Nemania aenea (Nitschke) Pouzar var. ***aureolutea*** (L.E. Petrini & J.D. Rogers) Y.-M. Ju & J.D. Rogers, Nova Hedwigia 74: 84 (2002).

Hypoxyton aeneum Nitschke var. *aureoluteum* L.E. Petrini & J.D. Rogers, Mycotaxon 26: 413 (1986).

Nemania aureolutea (L.E. Petrini & J.D. Rogers) Granmo, Sommerfeltia 27: 45 (1999).

Illustrations: Granmo *et al.*, 1999, figs 21, 26.

Stromata pulvinate, irregular in shape and size, up to 2 mm thick, dull black externally and internally, carbonaceous. *Perithecia* 0.5-0.7 mm diam., ostioles finely papillate. *Asci* not seen intact; apical ring not bluing in Melzer's iodine reagent. *Ascospores* brown, ellipsoid to somewhat inequilateral, smooth, 12-15 \times (4.5-)5-6 μ m, with germ slit obscure, probably shorter than spore-length.

Habitat: Angiosperm bark.

Localities: Cosby (Gages Mountain Trail).

Notes: This seems to be the first report of *N. aenea* var. *aureolutea* from North America. However, var. *macrospora* is fairly common in northwestern United States (Ju and Rogers, 2002; unpublished data).

Nemania diffusa (Sowerby) Gray, Nat. Arr. Brit. Plant. 1: 517 (1821). (Fig. 4)

Sphaeria diffusa Sowerby, Col. Fig. Engl. Fungi 3: Pl 373, Fig. 10 (1803).

See Ju and Rogers, 2002 for extensive synonymy for this species.

Illustrations: Granmo *et al.*, 1999, fig. 37, A-C; 43.

Stromata pulvinate, widespreading following contours of wood, up to 1.5 mm thick, dull blackish brown, then black at maturity, carbonaceous; internally black. *Perithecia* 0.4-0.7(-1.2) mm diam., ostioles papillate, sometimes in ill-defined discs. *Asci* long-stipitate, ca. 118 μ m total length, ca. 6 μ m broad, with apical ring bluing in Melzer's iodine reagent, 3 μ m high, 2 μ m broad. *Ascospores* brown, ellipsoid-inequilateral, smooth, (9-)9.5-10.5(-12.5) \times 4.5-5 μ m, with germ slit spore-length.

Habitat: Angiosperm bark and decayed wood.

Localities: Cades Cove (Gum Swamp); Chimney Tops.

Notes: This fungus is probably cosmopolitan in the temperate regions of the world. Granmo *et al.* (1999) and Ju and Rogers (2002) describe and discuss it in more detail.

Nemania illita (Schwein.) Pouzar, Ceska Mykol. 39: 24 (1985). (Fig. 3)

Sphaeria illita Schwein., Trans. Amer. Phil. Soc., N. Ser., 4: 192 (1832).

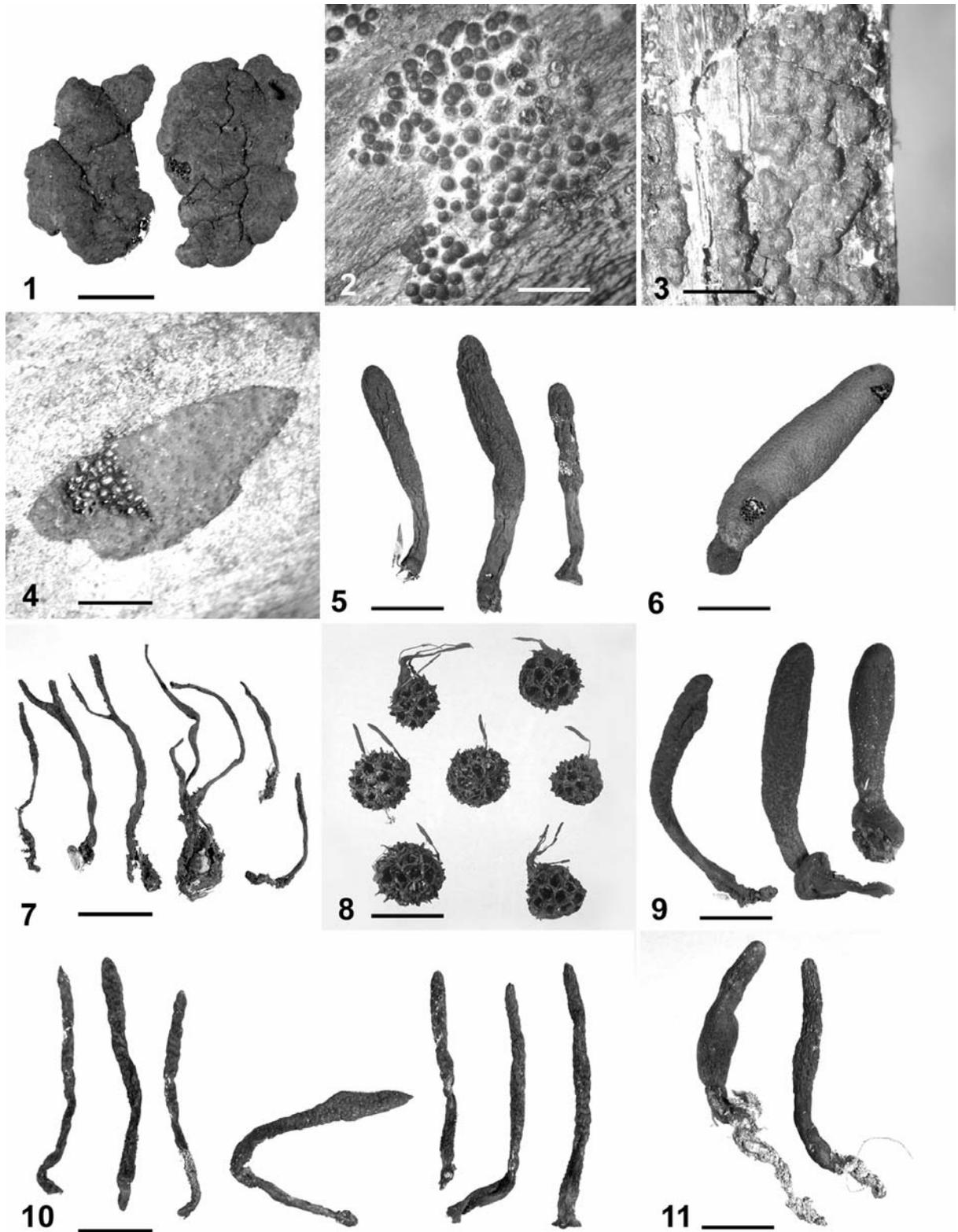
Hypoxyton illitum (Schwein) M.A. Curtis, Geol. Nat. Hist. Survey North Carolina 3: 140 (1867).

Illustrations: Miller, 1961, figs 117, 145.

Stromata pulvinate, widespreading following contours of wood, ca. 1.5 mm thick, externally dull black, internally white between perithecia, carbonaceous. *Perithecia* 0.5-0.7 mm diam., ostioles coarsely papillate in discoid areas. *Asci* long-stipitate, ca. 130 μ m total length, 5-6 μ m broad, the spore-bearing part ca. 80 μ m, with apical ring bluing in Melzer's iodine reagent, 2 μ m high, 1.5 μ m broad. *Ascospores* light brown, somewhat fusoid to ellipsoid-inequilateral with one end rounded, the other end more or less acute, 11-12 \times 3-4 μ m; germ slit not seen.

Habitat: Wood.

Locality: Cades Cove, Chimney Tops.



Figs 1-11. Stromata of *Kretzschmaria*, *Nemania*, *Rosellinia* and *Xylaria* from GSMNP. **1.** *Kretzschmaria deusta*. **2.** *Rosellinia subiculata*. **3.** *Nemania illita*. **4.** *Nemania diffusa*, cut in lower left part to expose perithecia. **5.** *Xylaria corniformis*. **6.** *Xylaria cubensis*, cut near stipe to expose perithecia. **7.** *Xylaria hypoxylon*. **8.** *Xylaria liquidambar*. **9.** *Xylaria longipes*. **10.** *Xylaria multiplex*. **11.** *Xylaria polymorpha*. Scale bars: Fig. 4 = 2 mm; Figs 2, 3 = 3 mm; Fig. 10 = 5 mm; Figs 1, 6 = 10 mm; Figs 5, 9 = 11 mm; Fig. 7 = 14 mm; Figs 8, 11 = 20 mm.

Notes: This is among the most distinctive species of *Nemania*. It can be easily identified on the morphology of its ascospores. It is collected sporadically in Europe and North America.

Nemania cf. serpens (Pers.: Fr) Gray, Nat. Arr. Brit. Plant. 1: 516 (1821).

Sphaeria serpens Pers., Obs. Mycol. 1: 18 (1796).

Gamosphaera serpens (Pers.) Dumort., Comm. Bot.: 90 (1822).

Sphaeria serpens Pers.: Fr., Syst. Mycol. 2: 341 (1823).

Hypoxylon serpens (Pers.: Fr.) J. Kickx f., Fl. Crypt. Env. Louvain: 115 (1835).

For complete synonymy see Ju and Rogers, 2002.

Illustrations: Granmo *et al.*, 1999, figs 55, 56; 65, 66.

Stromata pulvinate, up to 5 cm long, 1 cm broad, less than 1 mm thick, dull blackish grey, interior brownish, soft. *Perithecia* 0.3-0.5 mm diam., ostioles finely papillate. *Asci* long-stipitate, ca. 130 μ m total length, ca. 7 μ m broad, the spore-bearing part ca. 80 μ m, with apical ring bluing lightly or not at all in Melzer's iodine reagent, 4.5 μ m high, 3 μ m broad. *Ascospores* brown, ellipsoid-inequilateral, smooth, (10.5-)12-15 \times 4.5-6 μ m, with germ slit obscure.

Habitat: On wood of *Quercus rubra* and ?*Betula* sp.

Localities: Alum Cave Trail, Purchase Knob.

Notes: Concepts of *N. serpens* vary somewhat, especially as to whether the ascus apical ring becomes blue in iodine (amyloid reaction), reddish in iodine (dextrinoid reaction), or does not become colored at all (Granmo *et al.*, 1999; Petrini and Rogers, 1986, as *Hypoxylon serpens*).

Nemania serpens (Pers.: Fr.) Gray **var. *colliculosa*** (Schwein.) Y.-M. Ju & J.D. Rogers, Nova Hedwigia 74: 106 (2002).

Sphaeria colliculosa Schwein., Schrift. Nat. Ges. Leipzig. 1: 36 (1822).

Sphaeria colliculosa Schwein.: Fr., Syst. Mycol. 2: 341 (1823).

Hypoxylon colliculosum (Schwein.: Fr.) M.A. Curtis, Geol. Nat. Hist. Surv. North Carolina 3: 140 (1867).

Nemania colliculosa (Schwein.: Fr.) Granmo, Sommerfeltia 27: 53 (1999).

The synonymy of this taxon is highly complicated. See Ju and Rogers, 2002.

Illustrations: Granmo *et al.*, 1999, figs 28, 30, 40, 41 (as *Nemania colliculosa*); Petrini, Rogers, 1986, fig. 7 (as *Hypoxylon atropurpureum* var. *brevistipitatum*).

Stromata pulvinate, up to 5 mm diam, 1 mm thick, black externally and internally, carbonaceous. *Perithecia* 0.3-0.43 mm diam., ostioles finely papillate. *Asci* long-stipitate, not seen intact, with ascus ring bluing in Melzer's iodine reagent, 3 μ m high, 2 μ m broad. *Ascospores* brown, ellipsoid-inequilateral, smooth, 9.5-11 \times 4.5-5 μ m, with germ slit obscure, but probably shorter than spore-length.

Habitat: Decayed wood.

Locality: Cades Cove (Methodist Church).

Notes: This taxon has a complicated taxonomic and nomenclatural history. It is discussed in Ju and Rogers (2002) and Granmo *et al.* (1999).

Key to *Xylaria* of GSMNP

1. Fungus specific to a particular host 2
1. Fungus not highly associated with a particular host
..... 3
2. *Stromata* always on fruits of *Liquidambar styraciflua*.
Ascospore germ slit spiraling ***X. liquidambar***
2. *Stromata* always on fruits of *Magnolia*. *Ascospores*
pale yellow with germ slit obscure
..... ***X. magnoliae***
3. *Ascospores* often exceeding 20 μ m in length 4
3. *Ascospores* not longer than 17 μ m 6
4. *Stromata* usually exceeding 1 cm diameter, unbranched
or sparingly branched. *Ascospores* 20-28 μ m
long with germ slit much less than spore-length
..... ***X. polymorpha***
4. *Stromata* slender, seldom exceeding 1 cm diameter,
often caespitose and/or highly branched. *Ascospores*
usually not exceeding 22 μ m long, with germ slits
various 5
5. *Ascospores* 16-22(-25) μ m long with germ slit much
less than spore-length. *Stromata* often caespitose
..... ***X. cornu-damae***
5. *Ascospores* 18-21 μ m long with germ slit spore-
length, often with a hyaline appendage on one or both
ends. *Stromata* mostly solitary with very distinct
perithecial contours ***X. tentaculata***
6. *Ascospores* (11-)13-15(-17) \times (5-)6(-7) μ m, with
spiraling germ slits ***X. longipes***
6. *Ascospores* similar in length to above or shorter.
Germ slits not spiraling, straight 7

7. Ascospores 12-16 × 5-6.5 μm, with nearly spore-length slit *Xylaria hypoxylon*
7. Ascospores shorter. Germ slit morphology various ... 8
8. Ascospores 9-10 × 5-6.5 μm, with germ slit obscure. Stroma light brown, up to 1 cm diameter, smooth except for ostiolar papillae *X. cubensis*
8. Ascospores similar in length to above, but with obvious germ slit 9
9. Ascospores (8-)9-10(-11) × (3.5-)4.5-6 μm. Stroma dark brown to blackish, often wrinkled, up to 1 cm diameter *X. corniformis*
9. Ascospores similar in size to above. Stromata less than 5 mm diameter 10
10. Stromata at first whitish, becoming black at maturity, solitary to caespitose. Often associated with *Quercus* wood and bark *X. longiana*
10. Stromata at first dark brown to blackish with paler brown shredding outer layer that is obvious with a hand lens. Usually densely caespitose *X. multiplex*

Xylaria corniformis Fr.: Fr., Summa Veg. Scand.: 381 (1849). (Fig. 5)

Sphaeria corniformis Fr.: Fr., Elench. Fung. 2: 57 (1828).

Illustrations: Rogers, 1983 (as *X. curta*), figs 3-6; 18-20; 34-35.

Stromata clavate on short or long concolorous stipes, up to 5 cm high, 8 mm broad, dull blackish brown at maturity with minute tan scales at 10 X magnification, white inside, woody to carbonaceous. Surface roughened with minute wrinkles and ostioles. *Perithecia* 0.3-0.5 mm diam., ostioles minutely papillate. *Asci* stipitate, ca. 117 μm total length, 7 μm broad, the spore-bearing part ca. 70 μm long, with apical ring bluing in Melzer's iodine reagent, cuboid, 2-2.5 μm high, 2-2.5 μm broad. *Ascospores* dark brown, ellipsoid-inequilateral, smooth, 8-9 × 4.5-6 μm, with germ slit long, sometimes difficult to discern.

Habitat: Angiospermous wood.

Localities: Alum Cave Trail; Big Creek (Baxter Creek Trail); Cataloochee (Caldwell Fork Trail).

Notes: This little *Xylaria* has been variously misidentified as *X. cubensis*, *X. bulbosa*, *X. castorea*, and *X. curta*. The latter two taxa are closely related to *X. corniformis*, but are not found in GSMNP (see Rogers, 1983).

Xylaria cornu-damae (Schwein.) Fr., Nova Acta Regia Soc. Sci. Upsal., Ser. 3, 1: 128 (1851).

Sphaeria cornu-damae Schwein., Trans. Amer. Phil. Soc., N. Ser., 4: 189 (1832).

Xylosphaera cornu-damae (Schwein.) Dennis, Kew Bull., 13: 103 (1958).

Illustrations: Rogers, 1984, figs 1-5, 14, 17, 18, 33-39.

Stromata cylindrical, clavate or irregular, up to 7 cm high, 2-5 mm broad, including short or long concolorous stipe, white when young, black at maturity, often with traces of white, white internally, carbonaceous. Surface roughened by longitudinal wrinkles, perithecial elevations and ostioles. *Perithecia* 0.5-0.7 mm diam., ostioles slightly papillate, usually inconspicuous. *Asci* long-stipitate, ca. 225 μm total length, 5-7 μm broad, the spore-bearing part ca. 100 μm long, the apical ring bluing in Melzer's iodine reagent, ca. 4 μm high, 3 μm broad. *Ascospores* brown, ellipsoid-inequilateral, sometimes crescentic, smooth, 17-21 × 5-6 μm, with short, straight germ slit.

Habitat: Wood.

Locality: Big Creek (Baxter Creek Trail).

Notes: This species is encountered throughout the eastern United States. There is no evidence that it occurs off of the North American continent. In stature and color it resembles *X. hypoxylon*. Rogers (1984) discusses *X. cornu-damae* in detail.

Xylaria cubensis (Mont.) Fr., Nova Acta Regia Soc. Sci. Upsal., Ser. 3, 1: 126 (1851).

(Fig. 6)

Hypoxylon cubense Mont., Ann. Sci. Nat., sér. 2, 13: 345 (1840).

Xylosphaera cubensis (Mont.) Dennis, Kew Bull., 13: 103 (1958).

Xylosphaera papyrifera (Link: Fr.) Dennis subsp. *cubensis* (Mont.) Dennis, Bull. Jard. Bot. État. 31: 122 (1961).

Xylaria papyrifera (Link: Fr.) Fr. subsp. *cubensis* (Mont.) D. Hawksw., Trans. Brit. Mycol. Soc. 61: 200 (1973).

Illustrations: Rogers, 1984, figs 1-3; 10-15; 27, 28.

Stromata erect, cylindrical-clavate, up to 5 cm high, 8 mm broad, with short concolorous stipe from pannose base, copper-colored to blackish brown with interior white or becoming hollow, carbonaceous. Surface smooth except for tiny cracks around ostioles (feels like fine sandpaper to the touch). *Perithecia* ca. 0.5 mm diam., ostioles finely papillate. *Asci* stipitate, 88-133 μm total length, 7 μm broad, the spore-

bearing part ca. 60 μm long, with apical ring bluing in Melzer's iodine reagent, cylindrical, 3 μm high, 2 μm broad. *Ascospores* brown, ellipsoid-inequilateral, smooth, 9-10.5 \times 4.5-5 μm , with germ slit apparently absent to slightly discernible.

Habitat: Wood.

Localities: Cades Cove (Methodist Church); Elkmont; Greenbrier (Porters Creek Trail); Oconaluftee; Sugarlands (Old Sugarlands Trail).

Notes: The taxonomic limits of *X. cubensis* are somewhat unclear. Taxa under this name occur in various parts of the world. One of the specimens was cultured and produced the distinctive *Xylocoremium* anamorph (see Rogers, 1984). Care must be taken not to misidentify *X. cubensis* as *X. corniformis*. They are easily separable on surface features of mature stromata (see descriptions herein).

Xylaria hypoxylon (L.: Fr.) Grev., Fl. Edin.: 355 (1824). (Fig. 7)

Clavaria hypoxylon L., Sp. Pl.: 1182 (1753).

Sphaeria hypoxylon (L.) Pers., Obs. Mycol. 1: 20 (1796).

Xylosphaera hypoxylon (L.) Dumort., Comm. Bot.: 91 (1822).

Sphaeria hypoxylon L.: Fr., Syst. Mycol. 2: 327 (1823).

Illustrations: Dennis, 1977, plate 11, B.

Stromata cylindrical to irregular, several often originating from common base, often branched and flattened toward apex, with short or long concolorous stipes, up to 8 cm high, 2-7 mm broad, at first white, becoming dull black, interior white, woody to carbonaceous. Surface fairly smooth or roughened from distinct perithecial elevations. *Perithecia* 0.3-0.4 mm diam., ostioles umbilicate to slightly papillate. *Asci* stipitate, ca. 135 μm total length, ca. 6 μm broad, the spore-bearing part 75-90 μm long, with apical ring bluing in Melzer's iodine reagent, subcylindrical, 3 μm high, 1.5 μm broad. *Ascospores* brown, ellipsoid-inequilateral, smooth, 11.5-15 \times 4.5-6 μm , with germ slit slightly less than spore-length.

Habitat: Wood of *Aesculus flava* and a wide variety of other woods.

Localities: Alum Cave Trail; Chimney Tops; Greenbrier (Porters Creek Trail).

Notes: *Xylaria hypoxylon* is frequently encountered in eastern United States. It is probably common throughout the park.

Xylaria liquidambar J.D. Rogers, Y.-M. Ju & San Martín, Sydowia 54: 92 (2002).

(Fig. 8)

Misapplied name: *Xylaria persicaria* (Schwein.: Fr.) Berk. & M.A. Curtis

Illustrations: Rogers *et al.*, 2002, figs 1-4.

Stromata cylindrical to long conic, usually unbranched or branched, up to 6 cm high, 1-3 mm thick, with short or long concolorous stipes, usually with acute apices, brown to black, interior white, soft. Surface often somewhat tomentose, especially near the base of stipe, otherwise smooth or roughened with perithecial elevations. *Perithecia* 0.2-0.3 mm diam., ostioles slightly papillate. *Asci* stipitate, ca. 170 μm total length, 6-7 μm broad, the spore-bearing part ca. 110 μm long, with apical ring bluing in Melzer's iodine reagent, cylindrical, ca. 3 μm high, 1.5 μm broad. *Ascospores* brown, ellipsoid-inequilateral to somewhat crescentic, smooth, (10-)12-15 \times 4-6.5 μm , with spiraling germ slit.

Habitat: Known only from fruits of *Liquidambar styraciflua* on the ground.

Localities: Big Creek (Baxter Creek Trail); Greenbrier.

Notes: This fungus was long considered to be *Xylaria persicaria*. It is discussed in detail by Rogers *et al.* (2002).

Xylaria longiana Rehm, Ann. Mycol. 2: 17 (1904).

Illustrations: Rogers and Chacko, 1981, p. 422, fig. 20 (as *X. hypoxylon* "small-spored collection" in culture.).

Stromata much as described for *X. hypoxylon* herein. *Ascospores* ca. 9-11 \times 4-5 μm , otherwise as in *X. hypoxylon*.

Habitat: Wood, probably *Quercus*.

Locality: Alum Cave Trail.

Notes: This taxon has often been considered as a small-spored form of *X. hypoxylon*. It seems to be most commonly collected from *Quercus* wood and bark.

Xylaria longipes Nitschke, Pyren. Germ.: 14 (1867). (Fig. 9)

Illustrations: Rogers, 1983, figs 7-9; 24-33.

Stromata subcylindric to clavate, with short to long concolorous stipe from swollen pannose base, up to 5 cm high, 8 mm diam, dull blackish brown with light brown scales, white internally, carbonaceous. Surface roughened by wrinkles and ostiolar papillae. *Perithecia* ca. 0-5 mm diam., ostioles papillate. *Asci* stipitate with ascospores often in partially biseriate arrangement, 133-150 μm total length, 7-9 μm broad, with spore-bearing part 70-80 μm long, with apical ring bluing in Melzer's iodine reagent, ca. 3 μm high, 2 μm broad. *Ascospores* brown, ellipsoid-inequilateral, smooth, (9-)13-14(-15) \times 5-6 μm , with germ slit spiraling around spore.

Habitat: Wood.

Locality: Greenbrier.

Notes: This is one (of two) *Xylaria* species in GSMNP with spiral ascospore germ slits, the other being *X. liquidambar*. The latter species is specific for *Liquidambar* fruits. *Xylaria longipes* is often associated with *Acer* spp. in northeastern USA and in Europe (Rogers, 1983). With only one collection from GSMNP we have no additional data to add to host range.

Xylaria magnoliae J.D. Rogers, Can. J. Bot. 57: 941 (1979).

Illustrations: Rogers, 1979, figs 1-3; 10-12.

Stromata long conic, tapering to acute apex, branched or unbranched, up to 12 cm long, up to 5 mm diam at base, somewhat tomentose to glabrous, arising from pannose base, brown to dull black, woody. Surface usually roughened by perithecial elevations. *Perithecia* ca. 0.3 mm diam., ostioles finely papillate or basically umbilicate. *Asci* stipitate, 90-120 μm total length, 6-8 μm broad, the spore-bearing part ca. 50-70 μm , with apical ring bluing in Melzer's iodine reagent, inverted hat-shaped, 2 μm high, 1.5 μm broad. *Ascospores* pale yellow, ellipsoid-inequilateral to crescentic, smooth, 11-15(-17) \times 3-5(-6) μm , with germ slit apparently lacking.

Habitat: *Magnolia* fruits.

Localities: Big Creek (Chestnut Branch Trail); Grotto Falls.

Notes: *Xylaria magnoliae* is common in the United States and apparently is restricted to *Magnolia* fruits (Rogers, 1979).

Xylaria multiplex (Kunze: Fr.) Fr., Nova Acta Regia Soc. Sci. Upsal., Ser. 3, 1: 127 (1851).

(Fig. 10)

Sphaeria multiplex Kunze: Fr. in Fr., Linnaea 5: 536 (1830).

Xylosphaera multiplex (Kunze: Fr.) Dennis, Kew Bull., 13: 105 (1958).

Illustrations: Dennis, 1956, fig. 20.

Stromata cylindric, up to 3 cm high, 1-2 mm diam, caespitose, dull blackish brown with remains of light brown peeling layer, interior white, soft to woody. Surface undulate from slight perithecial elevations, with some tomentum on fertile part and base. *Perithecia* ca. 0.3 mm diam., ostioles slightly papillate. *Asci* in intact condition not seen; ascus apical rings bluing in Melzer's iodine reagent, 3 μm broad. *Ascospores* brown, ellipsoid-inequilateral, smooth, 9.5-11 \times 4.5-5 μm , with germ slit spore-length or slightly less.

Habitat: *Quercus* wood.

Locality: Big Creek.

Notes: This little *Xylaria* has been reported from various parts of the world. Our concept of the species follows Dennis (1956).

Xylaria polymorpha (Pers.: Fr.) Grev., Fl. Edin.: 355 (1824). (Fig. 11)

Sphaeria polymorpha Pers., Comm. Fung. Clav.: 17 (1797).

Xylosphaera polymorpha (Pers.) Dumort., Comm. Bot.: 92 (1822).

Sphaeria polymorpha Pers.: Fr., Syst. Mycol. 2: 326 (1823).

Illustrations: Rogers and Callan, 1986, figs 1-10.

Stromata cylindric-clavate to irregular, often on a long stipe that is buried in soil, ca. 10 cm high, 1 cm broad, the stipe often ca. $\frac{1}{2}$ total height, dull brown to blackish brown, white inside, woody to carbonaceous. Surface wrinkled and minutely warted. *Perithecia* 0.5-1 mm diam., ostioles papillate, usually not obvious among surface warts. *Asci* long-stipitate, 160-230 μm total length, 6-14 μm broad, the spore-bearing part 90-145 μm long, with apical ring bluing in Melzer's iodine

reagent, urn-shaped, 4-6 μm high, 3-4 μm broad. *Ascospores* brown, ellipsoid-inequilateral, with narrowly rounded to acute ends, 20-28 \times 6-8 μm , with short straight to slightly oblique germ slit.

Habitat: Wood, sometimes buried in soil.

Locality: Abrams Creek (Rabbit Creek Trail).

Notes: Various *Xylaria* species are misidentified as *X. polymorpha*, most frequently, perhaps, *X. longipes* and *X. corniformis*. In our experience, *X. polymorpha* is infrequently encountered. Our material corresponds to the form of *X. polymorpha* that seems most common in the southern and southeastern United States (see Rogers and Callan, 1986).

Xylaria tentaculata Berk. & Broome, Grevillea. 4: 48 (1875).

Illustrations: Callan and Rogers, 1990, figs 66-71.

Stromata subcylindric, up to 4 cm high. The fertile part ca. 2 mm diam, from abrupt narrow concolorous stipe, dull blackish brown, interior white, soft. Surface rough from strong perithecial elevations and prominent ostiolar papillae. *Perithecia* 0.7-1 mm diam., ostioles conspicuously papillate. *Asci* stipitate with ascospores arranged in partially biserial manner, ca. 135 μm total length, ca. 10 μm broad, the spore-bearing part ca. 105 μm , with apical ring bluing in Melzer's iodine reagent, urn-shaped, 9 μm high, 4.5 μm broad. *Ascospores* dark brown, ellipsoid-inequilateral to crescentic, often with a cellular appendage on one end and a mucilaginous appendage on the other end, the spore body without appendages 19-22 \times 7.5-9 μm , with germ slit slightly less than spore-length.

Habitat: Forest floor.

Localities: Cades Cove.

Notes: This fungus has a distinctive anamorphic state in which elongated processes extend from the apical part of an upright rachis in a floral or stellate arrangement; thus the epithet *tentaculata*. No trace of the anamorphic state is usually seen on the mature stroma. The fungus is discussed by Brown (1913) and Callan and Rogers (1990).

Prospects for additional records of xylariaceous fungi in GSMNP

There are undoubtedly additional xylariaceous fungi to be recorded from GSMNP. Moreover, some of the taxa described herein are represented by only one or several collections. The publications of Hanlin (1963, 1964) on the ascomycetes of Georgia and a host index to the ascomycetes of Georgia, respectively, are useful in predicting the occurrence of taxa that have not yet been reported from GSMNP. The names of many of the fungi therein, however, have been changed and the collector must go to more recent literature for citations. Likewise, the publication of Rogers (1986) can be useful in tentative identifications.

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