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THE XYLARIACEAE OF THE HAWAIIAN ISLANDS

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Abstract: Keys, species notes, references, hosts, and collection locations of the following xylariaceous genera are included: *Annulohypoxylon*, *Ascovirgaria*, *Biscogniauxia*, *Daldinia*, *Hypoxylon*, *Jumillera*, *Kretzschmaria*, *Lopadostoma*, *Nemania*, *Rosellinia*, *Stilbohypoxyton*, *Xylaria*, and *Xylotumulus*. *Camarops* and *Pachytrype*--non-xylariaceous genera--are included. *Anthostomella*, well-covered elsewhere, is not included here. A Host-Fungus Index is included. A new name, *Xylaria alboareolata*, is proposed. All of the Hawaiian Islands are included, but Lanai was not visited.

Key words: Hawaiian Islands, Xylariaceae, including genera included in the Abstract (above).

Introduction: The senior author became interested in a mycobiotic study of the Hawaiian Islands owing to experience studying xylariaceous specimens sent to him over a period of years by Donald Gardner, Roger Goos, W. Ko, Don Hemmes, Robert Gilbertson, and others. He

was joined in the work of identifying the collections of the senior author and others by his former student and colleague, Yu-Ming Ju.

The Hawaiian Islands are generally recognized as one of the best locations in the world for

studying evolution and speciation (e.g., Roderick & Gillespie, 1998). Their isolation from other land masses, diversity of environments, and the separation of the individual Islands by relatively short distances has resulted in an unusually high proportion of endemic species (Roderick & Gillespie, 1998). The Islands themselves have been formed successively over the past 75-80 million years through volcanic activity over a hotspot in the earth's mantle, from which they have drifted in a westerly and northwesterly direction (Carson & Clague, 1995). As Islands form and drift from the hotspot point of origin, they undergo a pattern of changes involving subsidence, erosion, and catastrophic collapses and slumping of large portions of Islands onto the adjacent sea floor. The resulting chain of Island volcanoes consists mostly of submerged sea mounts, in addition to the eight major "high Islands" (Carson & Clague, 1995). These high Islands range in age from about 5 million years (Kaua'i) to 500,000 years (Hawai'i), arranged in linear series according to age with the youngest Island, Hawai'i, occupying the easternmost position (Funk & Wagner, 1995). Biota of the Islands consists of a combination of endemic species, species introduced by Polynesians, and more recent introductions by Europeans and Americans. Extinction of endemic species has been traced to human involvement since the arrival of Polynesians, but has intensified since the involvement of Europeans in the late 18th century (Kirch, 1983).

Features of the Islands of particular interest to systematists include the following. The long distance from other land masses has reduced the number of colonization events by fungi, and by plant hosts, likely simplifying the evolutionary history of xylariaceous fungi in the Islands compared to relatives found on continental land masses. The molecular studies of Wright et al. (2000) on the Pleistocene dispersal of *Metrosideros* species from New Zealand via wind-borne seeds to Hawai'i and elsewhere is particularly instructive. Molecular studies of various xylariaceous taxa would be helpful in determining the origins of their dispersal to Hawai'i. The diversity of environments within and among Islands, and separation of ecological zones on Islands by features such as mountains and ravines, provide great opportunity for ecological specialization, and radiative evolution, of Xylariaceae and their plant hosts.

The known geologic age of the Islands, as well as datable events ranging from Polynesian colonization of the Islands, and more recent involvement of Europeans and North Americans, provide scientists with an unusual opportunity to incorporate the dimension of time into studies of evolutionary processes. In addition, the great wave of environmental change and species extinction caused by introduction of exotic species and disruption of habitats adds a sense of urgency to characterizing any group of organisms in the Islands, including Xylariaceae.

Although considerable effort has been devoted to characterizing many groups of organisms in the Islands, much less attention has been paid to fungi. For example, a recent comprehensive account of biogeography of the Islands included only one passing reference to a single fungus (Funk & Wagner, 1995). More recently, an erudite treatment of the mushrooms of the Hawaiian Islands has been published (Hemmes & Desjardin, 2002). An extensive account of the basidiomycetous wood-decay fungi has been produced (Gilbertson et al., 2002). However, no pyrenomycetous group had been studied in detail. Didrichsen during 1845-47 apparently made the first collection of a xylariaceous fungus, *Xylaria curta* (see Saccardo, 1882). Reichert (1877) collected several xylariaceous fungi. Stevens (1925), whose major interest was foliar fungi, included a number of xylariaceous taxa in his treatment. Raabe et al. (1981) in their checklist of plant diseases list a number of Xylariaceae and hosts, mostly from the literature. Over the years numerous mycologists deposited xylariaceous specimens in the Bishop Museum and elsewhere. Most of the collections were made on O'ahu near the University of Hawai'i by visiting mycologists. The senior author's work in the Hawaiian Islands is the first systematic study of any group of pyrenomycetes and has demonstrated that Xylariaceae are common and diverse, and include some species not encountered elsewhere. The following publications specific to the Hawaiian Islands, or including data from the senior author's activities on the Islands, are extant (Rogers, Ju & Hemmes, 1992; Van der Gucht, Ju & Rogers, 1995; Ju & Rogers, 1996; Ju, Rogers, San Martín & Granmo, 1998; Rogers & Ju, 1998; Gilbertson, Desjardin, Rogers & Hemmes, 2001; Rogers, Scott & Ju, 2001; Ju & Rogers, 2002; Rogers & Ju, 2002 a, b; Rogers, Hemmes & Ju, 2003).

The principal objectives of these studies were to produce keys to the taxa of Xylariaceae encountered on the Islands and to produce fungus-host and host-fungus indices for the Islands. Much of the formal taxonomy on the cited taxa has been published. The present study is viewed as a contribution to the understanding of the ecology of the Islands and to provide basal information for future evolutionary studies.

Seven general collecting trips have been made to the Islands by the senior author since 1998. Collecting expeditions in the five major Hawaiian Islands have emphasized general collecting on most of the extant woody hosts. Collections, when divisible, are, or will be, deposited in BISH and WSP. Holotypes of new taxa are deposited in BISH. Data from collections residing in BISH are included when sufficient host and/or location information is included with the material.

The following xylariaceous genera are among the collections made so far: *Annulohypoxylon*, *Anthostomella*, *Ascovirgaria*, *Biscogniauxia*, *Daldinia*, *Hypoxylon*, *Jumillera*, *Kretzschmaria*, *Lopadostoma*, *Nemania*, *Rosellinia*, *Stilbohypoxyton*, *Xylaria* and *Xylotumulus*. In addition, *Camarops* and *Pachytrype* are included because of their resemblance to xylariaceous taxa.

Notes on Genera of Xylariaceae treated:

Sixteen genera—14 of them undoubtedly xylariaceous—are dealt with herein. A brief discussion of these genera follows.

Annulohypoxylon Y.-M. Ju, J. D. Rogers & H. M. Hsieh—The members of this genus were long considered as species of *Hypoxylon* Bull. with annulate discs surrounding the ostiolar orifice. There are about 27 species, with worldwide representation (Hsieh et al., 2005; Ju & Rogers, 1996). The genus is considered to be well-known, with adequate keys, etc. to make confident identifications.

Anthostomella Sacc.—This genus is represented by at least 9 species in the Hawaiian Islands. It is not covered in this treatment. Refer to the monograph by Lu & Hyde, 2000.

Ascovirgaria J. D. Rogers & Y.-M. Ju—This is a monotypic genus which is known only from the type collection from Hawaii. However, its

anamorph—*Virgaria nigra* (Link) Nees—has a world wide distribution. It is possible that *Ascovirgaria* is extant elsewhere, but has not been discovered owing to its cryptic nature (Rogers & Ju, 2002 b).

Biscogniauxia Kuntze—This genus has been monographed by Ju et al., 1998. There are perhaps 30 species, including some that have been described after the publication of the monograph. Taxonomically, the genus is considered to be well-known.

Camarops Karst.—This genus is not of the Xylariaceae, but rather of the Boliniaceae. It is included here because of its resemblance to xylariaceous taxa and its historical inclusion among xylariaceous taxa.

Daldinia Ces. & DeNot.—A monograph of *Daldinia* was published by Ju et al. (1997) and an important paper correcting an error in the monograph was published later (Rogers et al., 1999). Numerous papers dealing with *Daldinia* have been published since the monograph (see Kirk et al., 2008).

Hypoxylon Bull.—Miller (1961) produced a monograph of the genus. This is a highly useful publication, but included as *Hypoxylon* taxa now considered to belong to *Annulohypoxylon*, *Biscogniauxia*, *Kretzschmaria*, *Nemania* and others. A more recent monograph circumscribes *Hypoxylon* more tightly (Ju & Rogers, 1996). Since that time a number of additional species have been described (see Index of Fungi, 1996-present) for references to species described after publication of the monograph.

Jumillera J. D. Rogers, Y.-M. Ju & F. San Martin—This small genus was separated from *Biscogniauxia* primarily on the morphology of the *Libertella*-like conidial states (Rogers et al., 1997; Rogers and Ju, 2002 b). Culturing is often necessary to make an accurate identification.

Kretzschmaria Fr.—A monograph of *Kretzschmaria* has been published (Rogers & Ju, 1998). The genus is considered to be taxonomically well-known; taxa are usually readily identified.

Lopadostoma (Nitschke) Traverso—This is a small genus that has been inadequately studied.

In its *Libertella*-like anamorph it resembles *Jumillera*. However, *Lopadostoma* does not appear to have a bipartite stroma, as does *Jumillera* (see Rogers & Ju, 2002 b and references cited therein).

Nemania Gray—This genus comprises about 50 species, including those described after a monograph was published (Ju & Rogers, 2002). *Nemania* is considered to be taxonomically reasonably well-known; identification of collections is usually possible.

Rosellinia DeNot.—This is a large and poorly understood genus. Many taxa have been collected infrequently and often in poor condition. Most of them have not been cultured. Petrini & Petrini (2005) have arranged them in Clusters, based on morphological features. This valuable treatment allows one to make tentative identifications and then go to appropriate literature. Most Hawaiian collections are not referable to known species and morphologically similar collections are referred to artificial groups

for convenience pending further studies in the genus.

Pachytrype Berl. Ex M. E. Barr, J. D. Rogers & Y.-M. Ju—This small genus is not xylariaceous, but the stromata are superficially similar. It is included in this treatment because it is common in the Hawaiian Islands. See Barr et al., 1993.

Stilbohypoxylon Henn.—This is a small genus related to *Rosellinia*. See Rogers & Ju, 1997 and Petrini, 2004.

Xylaria Hill ex Schrank—This is the type genus of the Xylariaceae. It is a large and complicated genus with perhaps 600 species. Identifications are often problematic. The genus is certainly paraphyletic (Hsieh et al., 2010). See literature cited with individual species.

Xylotumulus J. D. Rogers, Y.-M. Ju & Hemmes—This is a monotypic genus known only from the type location (Rogers et al., 2006)

Key to Genera of Xylariaceae in the Hawaiian Islands

1. Genera not of Xylariaceae, but with stromata resembling Xylariaceae.....2
1. Genera of Xylariaceae.....3
  2. Stromata green, horny when dry, warty. Ascospores allantoid (sausage-shaped).....*Pachytrype*
  2. Stromata pulvinate to more or less hemispherical. Ascospores < 10 µm long, with a germination pore in one end .....*Camarops*
  3. Stromata encasing one or occasionally several perithecia. Superficial on substrate.....4
  3. Stromata containing numerous perithecia or, if perithecia single, embedded in substrate.....5
    4. Stromata resembling perithecia, often seated in a subiculum (hyphal nest).....*Rosellinia*
    4. Stromata resembling perithecia, bearing spines or warts (broken spines); usually with yellow areas.....*Stilbohypoxylon*
  5. Perithecia embedded in wood beneath a superficial blackened area.....*Ascovirgaria*
  5. Perithecia embedded in well-developed stromata or perithecia solitary, embedded in leaves or stems 6
    6. Perithecia solitary, embedded in leaves or stems.....*Anthostomella**
    6. Perithecia one to several to many, embedded in stromata.....7
  7. Stromata mound-shaped, 1-5 mm diameter, bearing 1-4 perithecia. Ascospores ± fusoid with spiral or sigmoid germination slits.....*Xylotumulus*
  7. Stromata often larger with more numerous perithecia. Ascospores usually not fusoid nor with spiral germination slits.....8
    8. Stromata of various shapes. Mostly colored at maturity. Often releasing colored pigments in KOH.....9
    8. Stromata of various shapes. Mostly blackish at maturity. Seldom releasing colored pigments in KOH.....10
  9. Stromata pulvinate or somewhat applanate, lacking internal concentric rings.....*Hypoxylon*
AND differing only in having a disc surrounding the ostiolar area.....*Annulohypoxylon*
  9. Stromata usually ± hemispheric, bearing internal concentric rings.....*Daldinia*

- 10. Stromata upright, often, digitate, from several millimeters to 10 cm high.....*Xylaria***
- 10. Stromata pulvinate or applanate, 1-2 mm to 2 cm thick, 5 mm to 10 cm long.....11
- 11. Stromata sessile, pulvinate, up to 2 cm thick (formerly *Ustulina*) OR stromata with short or long stipes bearing convex fertile parts that often fuse into a crust (traditional *Kretzschmaria*). Ascospores usually over 25 µm long.....*Kretzschmaria*
- 11. Stromata sessile, pulvinate to applanate, usually no more than 3 mm thick, usually with ascospores less than 20 µm long.....12
- 12. Stromata pulvinate, 5 mm to 2 cm long or widespreading by fusion of stromata.....*Nemania*
- 12. Stromata more or less applanate or applanopulvinate.....13
- 13. Stromata thin, often sunken below surface of substrate.....*Lopadostoma*
- 13. Stromata usually more widespreading than above and not sunken below substrate surface.....14
- 14. Stromata often widespreading and robust.....*Biscogniauxia****
- 14. Stromata usually less widespreading and robust than *Biscogniauxia*.....*Jumillera****

*Anthostomella is not discussed in detail herein. See monograph by Lu & Hyde in the Literature Cited.

**Some taxa that are not upright were previously named *Penzigia*. This is an untenable generic name and some of these taxa have been placed in *Xylaria* despite their resupinate habits. A key is presented to “penzigoid” species.

***These genera are difficult to separate unless cultured. The asexual states differ among them. Please refer to the literature cited with the descriptions.

Keys to Species of Xylariaceae in the Hawaiian Islands

Key to Hawaiian *Biscogniauxia*

- 1. Ascospores brown, with hyaline cellular appendage.....2
- 1. Ascospores brown, lacking a hyaline appendage.....4
- 2. Ascospores 12-15 x 6-7 µm (excluding appendage 1.5-2 µm long). Contents of perithecia, when cut, sticking to knife.....*B. viscosicentra* var. *macrospora*
- 2. Ascospores various. Contents of perithecia, when cut, not sticking to knife.....3
- 3. Stromatal surface black. Ascospores (9-)10-14 x 5-7 µm (excluding appendage 2-2.5 µm long).....*B. uniapiculata*
- 3. Stromatal surface lead grey (plumbeus) at maturity. Ascospores 12-14.5 x 6-7 µm (excluding appendage 1.5-2 µm long).....*B. plumbea*
- 4. Ascospores 10.5-12.5 x 5.5-7.5 µm, strongly inequilateral to almost “c” shaped. Contents of perithecia, when wet, sticking to the knife.....*B. citrifomis*
- 4. Ascospores 8.5-15 x 5-7.5 µm, nearly equilateral. Contents of perithecia not sticky when wet.....*B. capnodes* var. *capnodes*
(*B. capnodes* var. *rumpens* has ascospores (14-)15-22 x 8-11(-12) µm).

Key to Hawaiian *Nemania*

- 1. Ascospores 4 or at least fewer than 8 per ascus, (9.5-)10.5-12(-13.5) x (4.5-)6-6.5(-7.5) µm...*N. abortiva*
- 1. Ascospores usually 8 per ascus.....2
- 2. Ascospores 15 - 18 µm long, with a short broad germination slit.....*N. aenea* var. *aureolutea*
- 2. Ascospores seldom as long as 18 µm and lacking a broad germination slit.....3
- 3. Ascospores not longer than 11 µm.....4
- 3. Ascospores longer than 11 µm.....6
- 4. Ascospores (7.5-)8-11 µm long. Stroma at first with a yellowish surface.....*N. chrysoconia*
- 4. Ascospores similar in size or shorter. Stroma without yellowish surface.....5
- 5. Ascospores 6-8.5 µm long. Perithecia 0.4-0.5 mm diam.....*N. effusa*
- 5. Ascospores 8-10 µm long. Perithecia 0.3-0.5 mm diam.....*N. albocincta*
- 5. Ascospores 8.5-10.5 µm. Perithecia 1-1.5 µm diam.....*N. macrocarpa*
- 6. Ascospores 10-13.5 µm long; without a flattened ostiolar disc.....*N. diffusa*
- 6. Ascospores 10-14(-16) µm long; with or without a flattened ostiolar disc.....7
- 7. Stroma with flattened areas (often indistinct) surrounding some, or all, ostiolar papillae..*N. bipapillata*

7. Stromata lacking flattened areas around ostiolar papillae.....8
  8. Ascospores with germination slits short and indistinct.....9
  8. Ascospores with germination slits long and $\pm$ distinct.....10
9. Perithecia 0.3-0.6 mm diam. Ascospores (9-)10-13(-14) μ m long.....*N. caries*
9. Perithecia 0.6-0.9 mm diam. Ascospores (10-)11.5-14(-18).....*N. serpens*
  10. Stromata with sunken areas surrounding ostiolar papillae. Perithecia 0.6-1 mm diam. Ascospores (10-)11-14(-16) μ m long..... *N. immersidiscus*
  10. Stromata lacking sunken ostiolar discs.....11
11. Stromata occurring principally (only?) on mangrove wood. Perithecia 0.5-0.6 mm diam. Ascospores 9-12 μ m long with germination slit much less than spore-length.....*N. maritima*
11. Stromata not principally associated with mangrove wood. Ascospore germ slits spore-length.....12
  12. Stromata often appearing as perithecioid, easily separable from enclosed perithecia (rosellinoid). Perithecia 0.5-1 mm diam. Ascospores 12-13.5(-16) μ m long.....*N. kauaiensis*
  12. Stromata often appearing as perithecioid, hard, not easily separable from enclosed perithecia. Ascospores (12-)13.5-15 μ m.....*N. pouzarii*

Key to Hawaiian Kretzschmaria

1. Stromata stipitate or at least with narrow connective to substrate.....2
1. Stromata sessile.....4
  2. Stromata convex to $\pm$ plane, 2-5 mm diam on stipes. Often fused into crusts. Ascospores (26-) 27-36(-40) x 7-10(-12) μ m.....*K. clavus*
  2. Stromata usually smaller. Attached to substrate with narrow connectives.....3
3. Stromata obconical, 1-2.5 mm diam, bearing 1 or more spines on top. Ascospores 30-40 x 8-12(-13.5) μ m.....*K. micropus*
3. Stromata obconical, 2-5 mm diam, smooth. Ascospores (25-)29-32 x 7.5-9 μ m.....*K. cf. neocaledonica*
  4. Stromata $\pm$ pulvinate, 0.3-7 cm diam, discrete or aggregated. Ascospores 35-54(-56) x 7.5-11 μ m, with acute apices.....*K. pavimentosa*
  4. Stromata $\pm$ pulvinate, often widespreading. Ascospores (30-)33-46 x 8.5-11-5 μ m, with blunt apices.....*K. sandvicensis*

Key to Hawaiian Annulohypoxylon

1. Pigment in KOH lacking. Papillate ostioles surrounded by disc ca. 0.5 mm diam.....*A. bovei*
1. Pigment in KOH green. Ostiolar disc diam. various.....2
  2. Stromata rosy grey. Ostiolar disc ca. 0.15 mm.....*A. atroroseum*
  2. Stromata blackish. Ostiolar disc diam. various.....3
3. Ostiolar disc up to 0.5 mm diam.....4
3. Ostiolar disc 0.2 mm diam. or less.....5
  4. Stromatal surface moriform (berry-like), dull greenish black. Dehiscence of perispores in KOH inconsistent, i. e. some dehisce, some do not.....*A. moriforme*
  4. Stromatal surface smooth, shiny black. Ascospore perispores dehiscent in KOH.....*A. nitens*
5. Stromata reddish brown. Ostiolar disc 0.1 mm diam. Ascospores 9-10.5 x 4-5 μ m with perispore dehiscent in KOH.....*A. archeri*
5. Stromata blackish with reddish tone. Ostiolar disc 0.1-0.2 mm diam. Ascospores 5-7 x 2-3 μ m with perispore dehiscent in KOH.....*A. stygium*

Keys to Hawaiian Hypoxylon

I. Species lacking pigment in KOH

1. Taxa with ascospore perispore indehiscent in KOH.....2
1. Taxa with ascospore perispore dehiscent in KOH.....3
  2. Stromata with brown tones. Ascospores 6-11 x 3-4 μ m.....*H. dieckmannii*
  2. Stromata shiny black. Ascospores 9-13.5 x 4-5 μ m.....*H. submonticulosum**
3. Stromata at first white, becoming brownish vinaceous. Ascospores 6-8 x 3-4 μ m.....*H. munkii**

3. Stromata never white, of various colors.....4
  4. Stromata grayish rose to vinaceous. Ascospores 5-7 x 2.5-3.5 μm .....*H. ravidoroseum*
  4. Stromata shiny black. Ascospores 7-11 x 3.5-4.5 (-5) μm .....*H. monticulosum**

*These taxa show intense purple pigment in KOH when immature (prior to maturation of ascospores).

II Species with orange pigment in KOH

1. Taxa with indehiscent ascospore perispore in KOH.....2
1. Taxa with dehiscent ascospore perispore in KOH.....4
  2. Stromatal surface blackish, roughened in a manner reminiscent of rough lava or "pele" .....*H. peleae*
  2. Stromatal surface color various. Surface not notably roughened.....3
3. Stromatal surface with orange tones. Ascospores 9.5-14 x 5-7.5 μm .....*H. cinnabarinum*
3. Stromatal surface with brown tones. Ascospores 7-12 x 3-5 μm .....*H. samuelsii*
  4. Ascospores 13.5 μm or longer.....5
  4. Ascospores not longer than 13.5 μm 6
(But see *H. crocopeplum*, #10).
5. Stromata often hemispherical or at least several mm thick. Ascospores 13.5-19 x 7-8.5 μm .....*H. haematostroma*
5. Stromata not hemispherical or notably thickened. Ascospores 17-23 x 8.5-10 μm .....*H. diatrypoides*
  6. Ascospores small, 7-9.5 μm long.....*H. erythrostroma*
  6. Ascospores longer.....7
7. Ascospores 8-12 μm long with sigmoid germination slit.....*H. fendleri*
7. Ascospore lengths various with straight germination slits.....8
  8. Stromata subdiscoid. Ascospores 11.5-13.5 x 6-7.5 μm .....*H. subdisciforme*
  8. Stromata pulvinate or applanopulvinate. Ascospores various lengths.....9
9. Stromata usually with orange tones.....10
9. Stromata with brown or brown vinaceous tones. Ascospores 8-12 x 4.5-5 μm .....*H. rubiginosum*
  10. Ascospores with large length range, 9.5-17.5 μm .....*H. crocopeplum**
  10. Ascospores with small length range, ca. 7-11 μm .....*H. jecorinum* * and *H. subgilvum**

*These species are most reliably distinguished from each other by the morphology of their conidial states and cultural characteristics.

III Species with greenish pigment in KOH

1. Ascospore perispore indehiscent in KOH.....2
1. Ascospore perispore dehiscent in KOH.....4
  2. Stromata peltate to hemispherical. Ascospores 9.5-16 μm long, often misshapen, with germination slit much less than spore-length.....*H. tortisporum*
  2. Stromata applanopulvinate to pulvinate. Ascospores with spore-length germination slits.....3
3. Ascospores 6.5-10 μm long.....*H. investiens*
3. Ascospores 12-16 μm long.....*H. fuscopurpureum*
  4. Ascospores no longer than 13 μm 5
  4. Ascospores usually longer than 13 μm 7
5. Stromata applanopulvinate. Ascospores 5.5-8 μm long.....*H. brevisporum*
5. Stromata various. Ascospores longer.....6
  6. Stromata with some or all ostioles plugged with white substance. Ascospores 8-13 μm long.....*H. perforatum*
  6. Stromata lacking white ostiolar openings. Ascospores 8.5-13 μm long.....*H. anthochroum*
7. Stromata glomerate to pulvinate. Ascospores 13-24 μm long with perispore bearing coil-like ornamentation.....*H. subrutileum*
7. Stromata often hemispherical or at least 2 mm thick.....8

- 8. Stromata often hemispherical, over 1 cm diameter. Perithecia tubular, up to 2 mm long. Ascospores 8-18 μ m long.....*H. placentiforme**
- 8. Stromata mostly pulvinate to hemispherical, often aggregated, with individual stromata usually less than 1 cm diameter. Perithecia globose, less than 1 mm high. ascospores 8-20 μ m high.....*H. fuscum***

*Molecular evidence indicates that this is a *Daldinia*.

**This is a complex taxon and probably includes several species.

IV Species with yellowish, brownish or purple pigments in KOH

- 1. Species with ascospore perispore indehiscent in KOH.....2
- 1. Species with ascospore perispore dehiscent in KOH.....3
  - 2. Pigment in KOH hazel (brownish). Ascospores 7-8.5 μ m long.....*H. gilbertsonii*
  - 2. Pigment in KOH brick. Ascospores 11-14.5 μ m long.....*H. parksianum*
- 3. Pigment in KOH purple.....4
- 3. Pigment in KOH other than purple.....5
  - 4. Ascospores 6-7.5 μ m long.....*H. lienhwacheense*
  - 4. Ascospores 11-14 μ m long.....*H. vandervekenii*
- 5. Pigment in KOH isabelline (brownish yellow). Stroma 4-8 mm thick, with tubular perithecia up to 0.9 mm long. Ascospores 21-29 μ m long.....*H. begae*
- 5. Pigment in KOH yellow. Stromata usually less than 4 mm thick. Perithecia more or less globose.....6
  - 6. Ascospores 8-11 μ m long.....*H. trugodes*
  - 6. Ascospores 11-16 μ m long.....*H. notatum*

Key to Hawaiian penzigoid Xylaria*

- 1. Ascospores less than 20 μ m long.....2
- 1. Ascospores over 20 μ m long.....3
  - 2. Stromata pulvinate with perithecia 0.2-0.3 mm diam. Ascus apex not bluing in Melzer's iodine. Ascospores flattened, 9-10.5 x 6-8 x 5-6 μ m.....*X. discolor*
  - 2. Stromata $\pm$ pulvinate to discoid, on narrow stipe or connective, the margins usually drooping (parasol- shaped). Ascospores (8-)12-13.5 x 6-7.5(-8).....*X. berteri*
- 3. Stromata subglobose, 1.5 cm diam, 1.2 cm high, black, hollow, on narrow connective. Ascospores 23-27 x 7.5 μ m with pinched ends and short germination slit.....*X. cf. atrosphaerica*
- 3. Stromata and/or ascospores different.....4
  - 4. Stromata globose, ca. 1 cm diam, often fused into masses; surface warty. Ascospores 25-30 x 9 μ m with acute apices and short sigmoid germ slit....."*Penzigia*" *cf. cadigensis*
  - 4. Stromata pulvinate or discoid. Ascospores lacking acute apices.....5
- 5. Stromata pulvinate, 1-5-7 mm diam, 1-1.5 mm thick, blackish with white scales. Ascospores 25 x 10 μ m with long straight germination slit....."*Penzigia*" *cantareirensis*
- 5. Stromata button-shaped, 2-3 mm thick, whitish with black ostiolar papillae. Ascospores 29-36 x 10.5-12 μ m.....*X. alboareolata*

*Ju & Rogers (2001) showed that the type species of *Penzigia*, *P. cranioides*, is a *Xylaria* and accepted the new combination, *Xylaria cranioides*, made by Dennis (1974). Thus, *Penzigia* is not a valid genus.

However, the affinities of some of the above-keyed species have not yet been established and, thus, have not been moved to valid genera.

Key to large Xylaria species on wood (usually 5 mm or greater in diameter)

- 1. Ascospores usually less than 11 μ m long.....2
- 1. Ascospores usually longer than 11 μ m.....4
  - 2. Stromata usually 4 cm high or less, with conspicuous white scales when young. Ascospores 7.5-9(-9.5) x 3-4(-4.5) μ m.....*X. curta*
  - 2. Stromata similar, but lacking white scales.....3

3. Stromata brownish, smooth. Ascospores (7.5-)9-10.5 x 4.5-5 μ m, with indistinct germ slit.....*X. pannosa*
3. Stromata blackish, usually roughened with wrinkles and warts. Ascospores 9 x 4.5 μ m, with distinct germ slit.....*X. cf. feejeensis*
  4. Ascospores usually less than 16 μ m.....5
  4. Ascospores usually longer than 16 μ m.....6
5. Stromata usually flattened, light brown with darker ostioles in sunken discs. Ascospores 12-13.5(-14.5) x 4.5-5 μ m.....*X. adscendens*
5. Stromata with conic heads 1.5 cm x 2 mm, on stipe up to 7 cm long. Ascospores (12-)12.5-13.5 x 6 μ m...
.....*X. cf. cuspidata*
  6. Ascospores usually less than 22 μ m long.....7
  6. Ascospores usually longer than 22 μ m long.....8
7. Stromata up to 10 cm high, often compressed, brownish, when young bearing peg-like remains of anamorph or pitted from dehiscence of anamorphic pegs. Ascospores 19-22 x 6-7.5 μ m, with short oblique germination slit.....*X. moelleroclavus*
7. Stromata subglobose to irregular, up to 3 cm diam, on short stipe. Ascospores 17.5-22 x 6.5-7.5 μ m with short sigmoid germ slit.....*X. cf. scruposa*
  8. Stromata subglobose to irregular, up to 3 cm diam on short stipe. Ascospores (22-)25-27(-28) x 6-7.5(-9) μ m, often with tiny hyaline appendage on one or both ends, with short straight germination slit.....*X. kaumanae*
  8. Stromata of different shape or, if subglobose, smaller. Ascospores usually lacking hyaline appendages.....9
9. Stromata usually sessile on narrow connective, blackish with roughened surface. Ascospores 23-30(-31) x 7.5-10.5 μ m, with short oblique to spiraling germination slit.....*X. anisopleura*
9. Stromata usually with definite short to long stipe.....10
  10. Stromata clavate on short stipe, very smooth, hollow, ca. 2 cm high, 8 mm diam. Ascospores 25-29 x 6-9 μ m, with straight germ slit less than spore-length.....*X. tuberoideus*
  10. Stromata various shapes, not hollow at maturity.....11
11. Stromata subglobose to irregular, up to 1.5 mm diam, blackish, roughened with warts and wrinkles. Ascospores 25-31 x 7.5-9 μ m, with short sigmoid slit and hyaline sheath.....*X. polymorpha complex*
11. Stromata clavate to globoid, ca. 2 cm diam, smooth, on short thin stipe. Ascospores with acute or "pinched" apices, 26.5-29 x 9-9.5 μ m, with short oblique germ slit.....*X. schweinitzii*

Key to *Xylaria* species on seeds, fruits, and leaves

1. Fertile head cylindrical to $\pm$ conical. Ascospores (7.5-)8-11(-12) x 4.5-5 μ m.
On seeds of *Psidium guajava*.....*X. psidii*
1. Fertile parts variously shaped. On leaves of various species.....2
  2. Fertile parts subglobose to conic. Ascospores 10-12.5 x 5-6 μ m, with hyaline sheath. On dead leaves of *Pisonia brunoniana* hanging on tree.....*X. pisoniae*
  2. Fertile parts various. On leaves other than *Pisonia brunoniana* on the ground.....3
3. Fertile part subglobose on narrow pubescent stipe. Ascospores 9-5-12 x 5-6 μ m, with thin sheath and secondary appendages.....*X. cf. delicatula*
3. Fertile areas of individual perithecia or clusters of perithecia scattered on long hair-shaped rachis. Ascospores 10.5-12(-13) x 4.5-6 μ m, with sheath and secondary appendages.....*X. sp. (?sp. nov.)*

Key to small *Xylaria* species on wood (usually less than 5 mm diameter)

1. Stromata found only on bamboo, with head cylindrical, blackish, 1-2 (-3) cm long x 2-3 mm diam, on hairy stipe. Ascospores 9-12 x 4.5-5(-6) μ m, with long slit.....*X. bambusicola*
1. Stromata found principally or entirely on dicots. Morphological features various.....2
  2. Fertile part of stromata cylindrical to conical, blackish with brown peeling layer, up to 1 cm long x 2-3 mm diam, on short stipe. Ascospores 17.5-23.5 x (6-)7-9 μ m, with slit slightly less than full-length.....*X. apiculata*
  2. Fertile parts various shapes. Ascospores smaller.....3

3. Fertile part of stromata cylindrical to conical, blackish with grey to black peeling layer, up to 1 cm long x 2-3 mm diam, on narrow stipe. Ascospores (11.5-)13-16(-17) x 4.5-6(-7) μm , with slit less or much less than spore-length.....*X. arbuscula*
3. Fertile parts various. Ascospores smaller.....4
  4. Fertile part of stromata cylindrical to blackish with remnants of whitish peeling layer, up to 1.5 cm long x 1-1.5 mm diam. on hairy stipe. Ascospores 11.5-13.5 x 5-6 μm , with slits $\pm$ spore-length, often $\pm$ sigmoid.....*X. partita*
  4. Fertile parts cylindrical to flattened, often grotesque, blackish with evidence of paler peeling layer, surface smooth to undulate. Ascospores 9-11(-12) x 3.5-5 μm with spore-length slit.....*X. multiplex*

Key to Rosellinia species and groups based on morphological features

1. Taxa on monocots.....2
1. Taxa on dicots and conifers and rarely monocots.....3
  2. Stromata solitary up to 0.7 mm diam or several fused. No subiculum. Ascus apex 1.5 μm high x 3 μm broad. Ascospores 10.5 x 5-6 μm . On *Bambusa vulgaris*.....Monocot **Group 1**
  2. Stromata hemispherical on broad base, ca. 1 mm diam. On white subiculum. Ascus apex cylindrical, 2.2 x 2.2 μm . Ascospores 8-9 x 3.5-4.5 μm with germ slit straight or sigmoid. On *Bambusa vulgaris*.....Monocot **Group 2**
3. Stromata solitary, 1-1.5 mm diam. Asci not seen. Ascospores 73-103 x 10.5-12 μm , with long attenuated apices and short germ slit.....Sp. 1, *R. bunodes*
3. Stromata usually smaller. Ascospores much shorter.....4
  4. Stromata ca. 1 mm diam, on reddish brown subiculum. Ascus apex J+, but distorted. Ascospores 25-28 x 7-8 μm , with cellular appendage on one end .....Sp. 2, *R. corticium*
  4. Stromata various. Ascospores shorter.....5
5. Stromata various shapes. Ascospores not longer than 17 μm . Ascus rings cylindrical or broader than high.....6
5. As above, but ascospores not longer than 12 μm 10
  6. Stromata $\pm$ conical.....7
  6. Stromata $\pm$ hemispherical.....9
7. Stromata with acute ostioles, the stromatal base wide-spreading beyond ascoma-enclosing part. Ascus ring J+, 3 x 3 μm , with angular "shoulders." Ascospores 13-15.5 x 9-7 μm .....**Group 6**
7. Stromata lacking wide-spreading base.....8
  8. Stromata up to 1.2 mm diam. Ascus ring J+, 2.2 x 2.2 μm . Ascospores 14.5 x 16(-17.5) x 8-9 μm .....**Group 3**
  8. Stromata up to 1 mm. Ascus apex broader than high, 1.5 x 3 mm. Ascospores 13-15(-16) x (6-)6.5-7.5 μm . On wood and bamboo.....**Group 5**
9. Stromata ca. 1 mm diam, on thin white parchment-like subiculum. Ascus ring J+, 4.5 x 4.5 μm . Ascospores 14.5-16(-17.5) x 7-9 μm .....**Group 4**
9. Stromata up to 1.2 mm diam. No subiculum. Ascus ring J+, 3 x 3 μm . Ascospores 13-15(-16) x 6-8(-9) μm .....**Group 7**
  10. Stromata $\pm$ globose or hemispherical, often on whitish subiculum or bleached area of substrate. Ascus ring J+, broader than high, 1.5 x 3 μm or cylindrical, 3 x 3 μm . Ascospores (7.5-)8-12 x 4.5-6.5 μm .....**Group 8, R. subiculata**
  10. Stromata hemispherical. Ascospores not longer than 10 μm 11
11. Stromata ca. 1 mm diam, the base extending beyond the ascoma-enclosing part. Ascus ring J+, cylindrical 3 x 2.2 μm . Ascospores 7.5-9 x 3.5-4.5 μm .....**Group 9**
11. Stromata ca. 1 mm diam, not extending beyond ascoma-enclosing part. Ascus ring J+, broader than high, 0.75 x 1.5-2.5 μm . Ascospores 7.5-9(-10) x 4.5-5(-6) μm .....**Group 10**

Collecting Sites for Hawaiian Island *Xylariaceae*

Hawaii—HA

Hāmākua Coast
Hilo
Hu Ranch---Hualālai Ranch
Keokea ---Keokea Beach County Park
Kipuka Ki ---Kipuka Ki, Volcanoes National Park
Kipuka Puauulu ---Kipuka Puauulu, Bird Park,
Volcanoes National Park
Kolekole—Kolekole Beach Park
Kona
Kopaka Park
Lava Tree--Lava Tree State Monument
MacK---Hilo MacKenzie State Recreation Area
Manuka---Manuka Natural Area Reserve
Mauna Kea
Opihikao
Onomea---Onomea Botanical Garden
Pahala
Pu’Hu---Pu’u Huluhulu vicinity
Pu’uL--Pu’u La’au
Pu’uwa’---Pu’uwa’awa’a
Saddle Road
Scout Camp---Honoka’a Scout Camp
Stainback Hwy---Stainback Highway
Tree Molds
Univ. Farm---University Farm
Waipi’o---Waipi’o Valley

Kauai—KA

Anahola Tr—Anahola Trail
Hanalei---Hanalei Valley
Kalalau---Kalalau Valley
Kaneha Reservoir
Keahua Arboretum
Kealia
Kilohana
Koke’e---Koke’e State Park
Kukui---Kukui o Lono Park
Natl Trop Bot Garden---National Tropical
Botanical Garden
Waimanu---Waimanu area
Waimea---Waimea Canyon State Park

Lanai—LA

Kapano Gulch
Maunalei Gulch

Maui—MA

Haleakalā---Haleakala National Park
Hana Hwy---Hana Highway
Kailua Stream

Maluhia SC---Maluhia Boy Scout Camp
Ohe’o Gulch
Seven Sacred Pools
Waihou Spr Tr---Waihou Spring Trail Nature
Walk
Waikamoi Ridge Tr---Waikamoi Ridge Trail

Molokai—MO

Kamakou Preserve
Pālā’au St Pk--- Pālā’au State Park
Phallic Rock
Waikolu Valley

Oahu—OA

‘Aiea Tr---‘Aiea Ridge Trail
Castle Tr---Castle Trail
Dupont Tr---Dupont Trail
Honolulu
HSPA Arboretum, Manoa
Judd Tr---Judd Trail, Pali Highway
Kahana Bay
Kailua St Pk---Kailua State Park
Kipapa Gulch---Waipi’o, Kipapa Gulch
Kawai Iki Ditch Trail
Lyon Arboretum
Makaha Valley
Manoa Cliff Tr---Manoa Cliff Trail
Manoa Falls Tr---Manoa Falls Trail
Manoa Valley
Nature Center
Pu’Ōhi’a Tr ---Pu’u Ōhi’a Trail, Pali Highway
(trail from Tantalus)
Tantalus---Tantalus neighborhood
Wa’ahila Ridge Rec Area---Wa’ahila Ridge State
Recreation Area
Waianae Mts---Waianae Mts, summit Mount
Ka’ala
Waipi’o

Hawaiian Species Data

Nemania

Nemania abortiva J. D. Rogers, Y.-M. Ju & Hemmes

Notes: *Nemania abortiva* is the only described *Nemania* species with consistently fewer than 8 ascospores per ascus.

Host or Substrate: decayed wood

Distribution: HA: Kipuka Puauulu

Reference: Rogers et al., 2006.

Nemania aenea (Nitschke) Pouzar var.
aureolutea (L. E. Petrini & J. D. Rogers) Y.-M.
Ju & J. D. Rogers

Notes: This taxon has the longest ascospores among species of *Nemania* described from Hawaii. The ascospore germination slit is short, broad and ill-defined. The ascus apical ring stains in Melzer's iodine reagent lightly or not at all.

Host or Substrate: *Myoporum sandwicense*

Distribution: HA: Mauna Kea

Reference: Petrini & Rogers, 1986.

Nemania albocincta (Ellis & Everh.) Pouzar

Notes: This fungus had formerly been known only from the USA mainland. It is only slightly different from *N. diffusa* and, in fact, might be conspecific with it.

Host or Substrate: decayed wood

Distribution: MA: Maluhia SC

Reference: Ju & Rogers, 2002.

Nemania bipapillata (Berk. & M. A. Curtis)

Pouzar

Notes: The nomenclatural history of this taxon is complex. It has been widely known as

Hypoxylon subannulatum Henn. & E. Nyman.

Host or Substrate: decayed wood, *Alnus nepalensis*, *Fraxinus uhdei*

Distribution: HA: Kipuka Puauulu, Kolekole, Kopaka, Waipi'o

Reference: Ju & Rogers, 1996; Ju & Rogers, 2002.

Nemania caries (Schwein.) Y.-M. Ju & J. D.

Rogers

Notes: This taxon has been considered to be a synonym of *N. serpens*. It has not been previously reported from Hawaii.

Host or Substrate: *Acacia koa*

Distribution: HA: Kipuka Puauulu

Reference: Ju & Rogers, 2002.

Nemania chrysoconia (Berk. & Broome) Y.-

M. Ju & J. D. Rogers

Notes: *Nemania chrysoconia* is distinctive in having a yellow to orange coat on the maturing stroma and prominent perithecial mounds.

Host or Substrate: *Eucalyptus robusta*, *Eugenia cumini*

Distribution: HA: Kipuka Puauulu

Reference: Miller, 1961; Ju & Rogers, 2002.

Nemania diffusa (Sowerby) S. F. Gray

Figs. 25 and 26

Notes: This fungus was discussed by Petrini and Rogers as *Hypoxylon bipapillatum*. Its taxonomy and nomenclature is complicated.

Host or Substrate: Angiosperm wood, decayed wood, *Metrosideros polymorpha*, *Sapindus saponaria*

Distribution: HA: Kipuka Puauulu; KA: Waimea;

OA: Dupont Trail

Reference: Petrini & Rogers, 1986.

Nemania effusa (Nitschke) Pouzar

Notes: This species is easily recognized because of its small ascospores.

Host or Substrate: *Psidium cattleianum*

Distribution: HA: Scout Camp

Reference: Rogers & Ju, 2002.

Nemania immersidiscus Van der Gucht, Y.-

M. Ju & J. D. Rogers

Figs. 3 and 6

Notes: This is the only species with sunken ostiolar discs recorded from Hawaii.

Host or Substrate: *Casuarina equisetifolia*, *Eucalyptus* sp., *Psidium* sp.

Distribution: HA: Scout Camp

Reference: Ju & Rogers, 2002.

Nemania kauaiensis J. D. Rogers & F. O. Hay

Figs. 28 and 29

Notes: This species is much like *N. macrocarpa*, differing primarily in its larger ascospores, smaller perithecia, and the easy separation of the perithecium from the stroma. It also differs in producing a red pigment in culture. It is known only from the type location in Hawaii.

Host or Substrate: *Sequoia sempervirens*

Distribution: KA: Koke'e

Reference: J. D. Rogers et al., 2008.

Nemania macrocarpa Y.-M. Ju & J. D.

Rogers

Notes: This species is distinguished primarily by its large perithecia compared with other *Nemania* species. It is known only from Hawaii.

Host or Substrate: decayed wood, *Hibiscadelphus giffardianus*, *Sapindus saponaria*

Distribution: HA: Kipuka Puauulu, MacK

Reference: Ju & Rogers, 2002.

Nemania maritima Y.-M. Ju & J. D. Rogers

Notes: This fungus is unusual among *Nemania* species in its maritime habitat and lack of an asexual state in culture.

Host or Substrate: *Casuarina equisetifolia*

Distribution: HA: MacK

Reference: Ju & Rogers, 2002.

Nemania pouzarii J. D. Rogers & Y.-M. Ju

Notes: This species has been found only once at the type location on highly decayed bleached wood. Stromata contain one or a few perithecia in discrete stromata that, themselves, resemble large perithecia.

Host or Substrate: decayed wood

Distribution: OA: Judd Tr

Reference: Rogers & Ju, 2002.

Nemania serpens (Pers.:Fr.) S. F. Gray

Notes: This is a nomenclaturally and taxonomically complex species with a worldwide distribution. Most *Nemania* species have, at one time or another, been called *N. serpens*.

Host or Substrate: decayed wood

Distribution: KA: Koke'e

Reference: Ju & Rogers, 2002.

Biscogniauxia

Biscogniauxia capnodes (Berk.) Y.-M. Ju & J. D. Rogers Figs. 1 and 2

Notes: This is perhaps the most commonly encountered xylariaceous fungus in the Hawaiian Islands. It is found on many hosts and in many locations. The hosts and locations cited are examples, but are not complete.

Hosts and Substrates: *Acacia koa*, *Casuarina* sp., decayed wood, *Eucalyptus robusta*, *Macadamia* sp., *Metrosideros polymorpha*, *Sapindus saponaria*

Distribution: HA: Hilo; Kipuka Ki, Kipuka Puauulu, Pu'Hu, Pu'uwa', Scout Camp; KA: Koke'e; MA: Kailua Stream; MO: Kamakou Preserve, Phallic Rock; OA: Honolulu, Kailua St Pk, Manoa Valley, Pu'Ōhi'a Tr, Tantalus

Reference: Ju et al., 1998.

Biscogniauxia citrifomis (Whalley, Hammelev & Taligoola) Van der Gucht & Whalley

Notes: This fungus is easily identified on its highly inequilateral ascospores that are often nearly "c" shaped. The perithecial hamathecium contains allophyses which make the contents sticky, as seen also in *B. viscosicentra* (see elsewhere herein).

Hosts and Substrates: *Casuarina equisetifolia*, decayed wood, *Eucalyptus robusta*, *Pisonia sandwichensis*, *Psidium cattleianum*

Distribution: HA: Kipuka Puauulu, MacK, KA:

Kukui; MO: Kamakou Preserve, Phallic Rock;

OA: Wa'ahila Ridge Rec Area

Reference: Ju et al., 1998

Biscogniauxia plumbea (Y.-M. Ju & J. D. Rogers

Notes: This fungus has a lead grey stromatal surface at maturity. Ascospores bear a hyaline cellular appendage. It is known only from the type location.

Hosts and Substrates: *Acacia koa*, *Psidium cattleianum*

Distribution: MA: Maluhia SC

Reference: Ju et al., 1998.

Biscogniauxia uniapiculata (Penz. & Sacc.)

Whalley & Laessøe Figs. 4 and 5

Notes: This is a common *Biscogniauxia* with ascospores bearing a cellular appendage. It has a wide Asian distribution and is widely distributed in the Hawaiian Islands.

Hosts and Substrates: *Acacia koa*, *Aleurites moluccana*, *Eucalyptus robusta*, *Eucalyptus* sp., *Metrosideros polymorpha*, *Psidium cattleianum*, *Psidium guajava*, *Schinus terebinthifolia*

Distribution: HA: Manuka, Scout Camp; KA: Koke'e; MA: Kailua, Maluhia SC; MO: Kamakou Preserve; OA: HSPA Arboretum, Manoa

Reference: Ju et al., 1998.

Biscogniauxia viscosicentra J. D. Rogers, San Martín & Y.-M. Ju var. ***macrospora*** J. D. Rogers & F. O. Hay

Notes: This fungus differs from the typical variety in its larger ascospores. Like the typical variety the hamathecium includes allophyses which make the perithecial contents sticky. Variety *macrospora* is known only from the Hawaiian type location. The typical variety is known only from Venezuela.

Hosts or Substrates: angiosperm wood

Distribution: KA: Koke'e

References: Rogers et al., 2000; Rogers et al., 2008.

Kretzschmaria

Kretzschmaria clavus (Fr.:Fr.) Sacc.

Notes: This fungus is common throughout the American tropics and elsewhere. It appears to be saprobic or weakly parasitic.

Hosts or Substrates: *Albizia* sp., *Casuarina equisetifolia*, decayed wood, *Eucalyptus robusta*, *Mangifera indica*, *Trema orientalis*

Distribution: HA: Hilo, Scout Camp; KA: Hanalei; MA: Hana Hwy; MO: Kamakou Preserve, Phallic Rock; OA: Judd Tr, Manoa Valley

Reference: Rogers & Ju, 1998.

Kretzschmaria micropus (Fr.:Fr.) Sacc.

Notes: This species has small stromata bearing one or more spines on the surface. The taxonomy is complicated (see reference).

Hosts or Substrates: decayed wood

Distribution: HA: sine loco; OA: Judd Tr

Reference: Rogers & Ju, 1998.

Kretzschmaria* cf. *neocaledonica (Har. & Pat.) J. D. Rogers & Y.-M. Ju

Notes: A single collection possibly represents this species. It is an Asian taxon and probably was introduced to Hawaii.

Hosts and Substrates: *Mangifera indica*

Distribution: OA: Pu'Ōhi'a Tr

Reference: Rogers & Ju, 1998.

Kretzschmaria pavimentosa (Ces.) P.

Martin Figs. 10 and 11

Notes: This species is noteworthy in its ascospores with acute apices. It has a wide global distribution.

Hosts and Substrates: *Alnus nepalensis*, *Cocos nucifera*, *Eucalyptus robusta*

Distribution: HA: Hilo, Waipi'o; MA: Maluhia SC; OA: Manoa Valley

Reference: Rogers & Ju, 1998.

Kretzschmaria sandvicensis (Reichert) J. D. Rogers & Y.-M. Ju

Notes: This is a fairly early taxon first described from Hawaii by Reichert. It is probably an "original" inhabitant in that it was known in the Islands before the mass floral (and fungal) introductions of the 20th century.

Hosts and Substrates: *Metrosideros polymorpha*

Distribution: HA: Hilo

Reference: Reichert, 1877; Rogers & Ju; 1998.

Annulohypoxyton

Annulohypoxyton archeri (Berk.) Y.-M. Ju, J. D. Rogers & Hsieh

Notes: This fungus was described from Australia and apparently is not often collected (or at least cited in the literature).

Hosts or Substrates: *Metrosideros polymorpha*

Distribution: HA: Manuka

References: Ju & Rogers, 1996; Hsieh et al., 2005.

Annulohypoxyton atroroseum (J. D.

Rogers) Y.-M. Ju, J. D. Rogers & H.-M. Hsieh

Notes: This fungus was described from Gabon and has been collected in Taiwan.

Hosts and Substrates: *Albizia* sp.

Distribution: HA: Lava Tree

References: Ju & Rogers, 1996; Hsieh et al., 2005

Annulohypoxyton bovei (Speg.) Y.M. Ju, J. D. Rogers & H.-M. Hsieh

Notes: This fungus seems highly associated with *Nothofagus*. It was surprising to find it in the Hawaiian Islands.

Hosts or Substrates: *Eucalyptus* sp.

Distribution: MO: Kamakou Preserve

References: Ju & Rogers, 1996; Hsieh et al., 2005.

Annulohypoxyton moriforme (Henn.) Y.-M. Ju, J. D. Rogers & H.-M. Hsieh

Figs. 13 and 14

Notes: This species is common in both Asian and American tropics. It is commonly encountered in the Hawaiian Islands.

Hosts and Substrates: *Acacia koa*, *Casuarina equisetifolia*, decayed wood, *Eucalyptus* sp., *Sapindus saponaria*

Distribution: HA: Kipuka Ki, Kipuka Puauulu, MacK; KA: Koke'e;

MO: Kamakou Preserve

References: Ju & Rogers, 1996; Hsieh et al., 2005.

Annulohypoxyton nitens (Ces.) Y.-M. Ju, J. D. Rogers & H.-M. Hsieh

Notes: This species is common in the Asian tropics. It is likewise common in the Hawaiian Islands.

Hosts and Substrates: *Acacia koa*, *Casuarina equisetifolia*, *Pisonia* sp., *Psidium cattleianum*

Distribution: HA: Kipuka Puauulu, MacK, MA: Maluhia SC; MO: Pālā'au St Pk, Phallic Rock; OA: Honolulu

References: Ju & Rogers, 1996; Hsieh et al., 2005.

Annulohypoxyton stygium (Lév.) Y.-M. Ju, J. D. Rogers & H.-M. Hsieh

Fig. 24

Notes: This fungus is found throughout the tropics of the world. It is among the most

common xylariaceous fungi in the Hawaiian Islands.

Hosts and substrates: *Albizia* sp., decayed wood; *Eucalyptus robusta*, *Eucalyptus* sp., *Mangifera indica*, *Melaleuca quinquenervia*, *Toona ciliata*

Distribution: HA: Keokea, Kolekole, Stainback Hwy; KA: Hanalei;

MA: Waikamoi Tr; OA: 'Aiea Tr, Nature Center, Pu'Ōhi'a Tr

References: Ju & Rogers, 1996; Hsieh et al., 2005.

Hypoxylon

***Hypoxylon* species lacking pigment in KOH**

Hypoxylon dieckmannii Theiss.

Notes: This fungus has been collected in the American tropics and subtropics.

Hosts and Substrates: *Myoporum sandwicense*

Distribution: HA: Pu'uL

Reference: Ju & Rogers, 1996.

Hypoxylon monticulosum Mont.

Notes: This taxon is widely distributed in the temperate and tropical regions of the world. It is perhaps the most commonly encountered *Hypoxylon* in the Hawaiian Islands.

Hosts and Substrates: *Albizia falcata*, *Albizia* sp., *Casuarina equisetifolia*, decayed wood, *Eugenia cumini*, *Fraxinus uhdei*, *Hibiscus tiliaceus*, *Macaranga* sp., *Trema orientalis*

Distribution: HA: Hilo, Kolekole, Kopaka Park, Lava Tree, MacK, Scout Camp;

MA: Hana Hwy; MO: Pālā'au St Pk; OA: Lyon Arboretum, Manoa Valley, Nature Center

Reference: Ju & Rogers, 1996

Hypoxylon munkii Whalley, Hammelev & Taligoola

Notes: This taxon is unique in having white stromatal granules and germination slit on the concave side of the ascospore.

Hosts and Substrates: *Macaranga* sp., *Metrosideros polymorpha*

Distribution: HA: Hu Ranch, Scout Camp

Reference: Ju & Rogers, 1996.

Hypoxylon ravidoroseum Ju, Van der Gucht & Rogers Figs. 22 and 23

Notes: The holotype of this taxon is from the Hawaiian Islands.

Hosts and Substrates: *Casuarina equisetifolia*,

decayed wood, *Eucalyptus* sp.

Distribution: HA: MacK; KA: Koke'e; MO:

Kamakou Preserve, Phallic Rock

Reference: Ju & Rogers, 1996.

Hypoxylon submonticulosum Y.-M. Ju & J. D. Rogers

Notes: This fungus is widespread in continental United States. It is much like *H. monticulosum* and can be confused with it. In the Hawaiian Islands it seems host-specific in the Mamane-Naio vegetation zone of Hawaii.

Hosts and Substrates: *Myoporum sandwicense*

Distribution: HA: Mauna Kea, Pu'Hu, Pu'uL

References: Gilbertson et al., 2001; Ju & Rogers, 1996.

***Hypoxylon* species with orange pigment in KOH**

Hypoxylon* cf. *cinnabarinum Y.-M. Ju & J. D. Rogers Fig. 15

Notes: This species was found only once. It can be difficult to separate from *H. crocopeplum*.

Generally, the ascospores of *H. cinnabarinum* are more or less equilateral and their perispores are usually indehiscent in KOH.

Hosts and Substrates: *Coprosma montana*

Distribution: HA: Kipuka Puauulu

Reference: Ju & Rogers, 1996.

Hypoxylon crocopeplum Berk. & M. A. Curtis

Notes: This fungus is widely distributed among tropical, subtropical and temperate areas of the world. The great length range of ascospores indicates that it might be a species complex.

Hosts and Substrates: *Casuarina equisetifolia*, *Coprosma Montana*, *Fraxinus uhdei*, *Myoporum sandwicense*

Distribution: HA: Mauna Kea, Pu'Hu; KA:

Koke'e; MA: Waihou Spr Tr;

MO: Pālā'au St Pk

References: Gilbertson et al., 2001; Ju & Rogers, 1996.

Hypoxylon diatrypoides Rehm

Notes: This fungus has previously been known from Brazil and New Zealand.

Hosts and Substrates: *Myoporum sandwicense*

Distribution: HA: Hu Ranch

References: Gilbertson et al., 2001; Ju & Rogers, 1996.

Hypoxylon erythrostroma J. H. Miller

Notes: This fungus is found in the American tropics and subtropics and occasionally elsewhere.

Hosts and Substrates: decayed wood, *Schinus terebinthifolia*, *Toona ciliata*

Distribution: HA: Manuka Park, Pu'uL, Stainback Hwy

References: Ju & Rogers, 1996.

Hypoxylon fendleri Berk. Ex Cooke Fig. 18

Notes: This fungus is common in the Asian and American tropics.

Hosts and Substrates: *Myoporum sandwicense*

Distribution: HA: Pu'uL

References: Gilbertson et al., 2001; Ju & Rogers, 1996.

Hypoxylon haematostroma Mont.

Notes: This species is widespread in the world tropics. It is distinguished by its long tubular perithecia and large ascospores.

Hosts and Substrates: *Metrosideros polymorpha*

Distribution: HA: Pu'uL

References: Gilbertson et al., 2001; Ju & Rogers, 1996.

Hypoxylon jecorinum Berk. & Ravenel

Notes: This fungus is found in the American tropics and subtropics. It is separable from several similar species on its conidial state and cultural characteristics.

Hosts and Substrates: decayed wood

Distribution: HA: Hilo

Reference: Ju & Rogers, 1996.

Hypoxylon peleae J. D. Rogers & Y.-M. Ju

Figs. 19 and 20

Notes: This is easily identified by its rough surface that reminds one of pele lava. It is known only from the type location in Hawaii.

Hosts and Substrates: decayed wood

Distribution: HA: Kipuka Puauulu

Reference: Rogers et al., 2007.

Hypoxylon rubiginosum (Pers.:Fr.) Fr.

Notes: Almost every reddish or vinaceous *Hypoxylon* has been called *H. rubiginosum* at one time or another. In the present restricted sense it seems most common in temperate regions of the northern hemisphere.

Hosts and Substrates: *Fraxinus uhdei*, *Mycoporum sandwicense*

Distribution: HA: Mauna Kea; MA: Waihou Spr Tr

References: Gilbertson et al., 2001; Ju & Rogers, 1996.

Hypoxylon samuelsii Y.-M. Ju & J. D. Rogers

Notes: This fungus has been collected in Australia, Indonesia and South America. It seems closely allied to *H. rubiginosum*.

Hosts and Substrates: *Acacia mearnsii*

Distribution: KA: Koke'e

Reference: Ju & Rogers, 1996.

Hypoxylon subdisciforme J. D. Rogers, Y.-

M. Ju & Hemmes Figs. 9 and 12

Notes: This taxon is known only from its type location in Hawaii.

Hosts and Substrates: decayed wood

Distribution: HA: Kipuka Puauulu

Reference: Rogers et al., 2006.

Hypoxylon subgilvum Berk. & Broome

Notes: This taxon is found in tropical and subtropical regions throughout the world. It is widespread in the Hawaiian Islands on a variety of hosts.

Hosts and Substrates: decayed wood, *Eucalyptus robusta*, *Fraxinus uhdei*, *Pithecellobium saman*, *Psidium guajava*, *Trema orientalis*

Distribution: HA: Hilo, Kopaka Pk, Waipi'o; KA: Koke'e, sine loco; MA: Maluhia SC, Seven Sacred Pools; OA: Manoa Cliff Tr

Reference: Ju & Rogers, 1996.

Hypoxylon* species with greenish pigment in KOH**Hypoxylon anthochroum*** Berk. & Broome

Notes: This species is found throughout the world in various climatic zones. It was formerly considered a synonym of *H. rubiginosum*.

Hosts and Substrates: *Cassia* sp.

Distribution: OA: Honolulu

Reference: Ju & Rogers, 1996.

Hypoxylon brevisporum Y.-M. Ju & J. D. Rogers

Notes: This species has been reported from Brazil and Taiwan. It is among *Hypoxylon* species with notably short ascospores.

Hosts and Substrates: *Casuarina equisetifolia*, decayed wood

Distribution: HA: MacK; KA: Hanalei

Reference: Ju & Rogers, 1996.

Hypoxylon fuscopurpureum (Schwein.:Fr.)

M. A. Curtis

Notes: This fungus is found in temperate regions of continental United States.

Hosts and Substrates: *Pisonia* sp.

Distribution: HA: Kipuka Puauulu

Reference: Ju & Rogers, 1996.

Hypoxylon fuscum (Pers.:Fr.) Fr.Notes: This fungus in the classical sense is a frequent inhabitant of *Alnus* spp. in the northern temperate zone. In the current sense, it is an inhabitant of a variety of hosts in many locations. It is almost certainly a species complex.Hosts and Substrates: *Calophyllum inophyllum*

Distribution: MO: sine loco

Reference: Ju & Rogers, 1996.

Hypoxylon investiens (Schwein.) M. A. CurtisNotes: This fungus is found in various climatic zones, worldwide. It is among the *Hypoxylon* species with notably small ascospores.Hosts and Substrates: *Psidium cattleianum*

Distribution: MA: Maluhia SC

Reference: Ju & Rogers, 1996.

Hypoxylon perforatum (Schwein.:Fr.) Fr.

Notes: This fungus is found throughout the temperate zones of the world on a variety of angiospermous hosts.

Hosts and Substrates: *Acacia mearnsii*, *Casuarina equisetifolia*, *Metrosideros polymorpha*, *Sapindus saponaria*

Distribution: HA: Kipuka Puauulu, MacK; KA: Koke'e, sine loco

Reference: Ju & Rogers, 1996.

Hypoxylon placentiforme Berk. & M. A. CurtisNotes: This is a species with a large ascospore length range. When the stroma is hemispherical it resembles a *Daldinia*, but lacks internal rings. Molecular evidence indicates that it is a *Daldinia*.Hosts and Substrates: *Casuarina equisetifolia*, *Sapindus* sp.

Distribution: HA: Kipuka Ki, Kipuka Puauulu; KA: Koke'e

References: Hsieh et al., 2005; Ju & Rogers, 1996.

Hypoxylon subrutileum Starb.

Notes: This species has large ascospores. It has a wide distribution in the world's tropics and subtropics.

Hosts and Substrates: *Acacia koa*, *Acacia mearnsii*

Distribution: HA: Kipuka Puauulu; KA: Koke'e

Reference: Ju & Rogers, 1996.

Hypoxylon tortisporum Y.-M. Ju & J. D. Rogers

Notes: This species has ascospores that are highly variable in shape and feature germination slits that are much shorter than the spore.

Hosts and Substrates: decayed wood, *Eucalyptus* sp.

Distribution: MA: Hana Hwy; OA: Honolulu

Reference: Ju & Rogers, 1996.

Hypoxylon* species with yellowish, brownish or purple pigment in KOH**Hypoxylon begae*** Y.-M. Ju & J. D. Rogers

Notes: this fungus is known only from the type location. It is distinguished by its long tubular perithecia and very large ascospores.

Hosts and Substrates: decayed wood

Distribution: HA: sine loco

Reference: Ju & Rogers, 1996.

Hypoxylon gilbertsonii Y.-M. Ju & J. D. Rogers

Rogers

Notes: This small-spored species is known only from the type location.

Hosts and Substrates: *Calophyllum inophyllum*

Distribution: HA: Opihikao

Reference: Ju & Rogers, 1996.

Hypoxylon lienhwacheense Y.-M. Ju & J. D. Rogers

Rogers

Notes: This fungus was described from Taiwan and is named for a Taiwan location.

Hosts and Substrates: decayed wood

Distribution: KA: Koke'e

Reference: Ju & Rogers, 1996.

Hypoxylon notatum Berk. & M. A. Curtis

Fig. 21

Notes: This fungus is similar to *H. perforatum*, but lacks its white ostioles, has larger ascospores and features asci with highly reduced or absent apical rings.Hosts and Substrates: *Acacia mearnsii*, *Osmanthus sandwicensis*

Distribution: HA: Manuka; MO: Kamakou Preserve

Reference: Ju & Rogers, 1996.

Hypoxylon parksianum Y.-M. Ju & J. D.

Rogers

Notes: This fungus was previously known from Taiwan and Tonga. In some respects it resembles *H. rubiginosoareolatum*

Hosts and Substrates: (?) *Pisonia* sp.

Distribution: HA: Kipuka Puauulu

Reference: Ju & Rogers, 1996.

Hypoxylon trugodes Berk. & Broome

Notes: This fungus is close to *H. fuscum*; *H. trugodes* is largely tropical and subtropical and *H. fuscum* is largely temperate.

Hosts and Substrates: Decayed wood

Distribution: HA: Waipi'o; MO: Phallic Rock

Reference: Ju & Rogers, 1996.

Hypoxylon vandervekenii Van der Gucht,

Y.-M. Ju & J. D. Rogers

Notes: This fungus features an olivaceous surface and purple pigment in KOH, a unique combination of characteristics.

Hosts and Substrates: *Trema orientalis*

Distribution: KA: Koke'e

Reference: Van der Gucht, et al., 1997

Penzigioid *Xylaria* Taxa

Xylaria alboareolata Y.-M. Ju & J. D. Rogers, sp. nom. nov., MB800271

Hypoxylon areolatum Berk. & M. A. Curtis, J. Linn. Soc. Bot. 10: 384. 1869, non. Starb., 1905.

Penzigia areolata (Berk. & M. A. Curtis) J. H. Miller, Monog. of the world species of *Hypoxylon*. p. 132. 1961.

Notes: This is a *Xylaria* that lacks the upright habit. The type is from Cuba. However, the name *Xylaria areolata* (Berk. & M. A. Curtis) Y.-M. Ju & J. D. Rogers is illegitimate because it is a later homonym of *X. areolata* (Lév.) Sacc. Thus, a new name is provided here so that the present fungus can be accommodated in *Xylaria*.

Hosts and Substrates: *Metrosideros polymorpha*, *Psychotria* sp., *Toona ciliata*

Distribution: HA: Pahala, sine loco, Stainback Hwy.

Reference: Ju & Rogers, 1999.

Xylaria atosphaerica (Cooke & Massee)

Callan & J. D. Rogers

Notes: This penzigioid species was shown by culturing, etc. to be a *Xylaria*.

Hosts and Substrates: decayed wood;

Eucalyptus robusta

Distribution: KA: Koke'e; MO: Pālā'au St Pk

Xylaria berterii (Mont.) Cooke Figs. 34 and 35

Notes: "*Penzigia*" *enteroleuca* (Speg.) P. Martin, "*P.*" *placenta* Petch, and "*P.*" *poroniaeformis* Petch are probable synonyms. This fungus has been reported throughout the tropics of both hemispheres as "*Penzigia*" *berterii* (Mont.) J. H. Miller.

Hosts and Substrates: *Acacia koa*; *Albizia* sp., decayed wood; *Eucalyptus robusta*, *Macadamia* sp., *Metrosideros polymorpha*, *Psidium* sp., *Spathodea campanulata*

Distribution: HA: Kipuka Puauulu, Kopaka Park, Lava Tree; KA: Kilohana, Koke'e; MO:

Kamakou Preserve; OA: Judd Tr, Manoa Valley, Nature Center.

References: Callan & Rogers, 1990; Miller, 1961.

"*Penzigia*" cf. *cadigensis* Yates

Notes: This species is almost certainly a *Xylaria* that lacks the upright habit (see ref. below).

Hosts and Substrates: *Sapindus* sp.

Distribution: HA: Kipuka Puauulu

Reference: Rogers et al., 1987.

"*Penzigia*" *cantareirensis* (P. Henn.) J. H. Miller

Notes: This fungus was first described on material from Brazil. It is almost certainly a *Xylaria*.

Hosts and Substrates: decayed wood, *Tithonia diversifolia*

Distribution: OA: Honolulu

Reference: Ju & Rogers, 1996.

Xylaria discolor (Berk. & Broome) Y.-M. Ju, H.-M. Hsieh & J. D. Rogers

Notes: This hypoxylid species is a resupinate *Xylaria*. *Penzigia bermudensis* J. H. Miller, *Hypoxylon citrinum* Shear and *Penzigia eterio* (Berk. & Broome) Cooke are synonyms.

Hosts and Substrates: *Coprosma montana*, *Euphorbia laurifolia*, decayed wood, *Lantana* sp., *Pelea* sp.

Distribution: HA: Kipuka Ki, Kipuka Puauulu, Kona; KA: Anahola Tr, Kealia; OA: Honolulu, Waipi'o

References: Ju & Rogers, 1996; Ju et al., 2012; Miller, 1961.

Large *Xylaria* species (usually greater than 5 mm in diameter)

***Xylaria adscendens* (Fr.) Fr. Figs. 40 and 41**

Notes: This is a distinctive taxon, easily recognized by the brown, usually flattened, stromata with ostiolar papillae in shallow discoid depressions. As they age and blacken and surface sloughing occurs the ostiolar depressions are often obscured.

Hosts and Substrates: decayed wood, *Eucalyptus robusta*, *Sapindus saponaria*

Distribution: HA: Kipuka Puauulu, Scout Camp

Reference: Callan & Rogers, 1990 (and refs. therein).

***Xylaria anisopleura* (Mont.) Fr.**

Figs. 37 and 38

Notes: Stromata are typically fragariform (strawberry shaped) with conspicuous perithecial contours. Less frequently, they are long-stipitate. This is part of the *X. polymorpha* complex and probably involves several species. It is a commonly encountered morphotype.

Hosts and Substrates: *Acacia koa*, *Albizia falcata*, *Albizia* sp., *Aleurites moluccana*, *Bambusa* sp., *Eucalyptus robusta*, *Psychotria* sp., *Sapindus saponaria*, *Spathodea campanulata*, *Trema orientalis*

Distribution: HA: Kipuka Ki, Kipuka Puauulu, Lava Tree, Scout Camp, Onomea, Stainback Hwy, Waimanu; KA: Hanalei; MA: Hana Hwy MO: Kamakou Preserve, Pālā'au St Pk, Phallic Rock; OA: Kailua, Manoa Valley, sine loco

Reference: San Martín G. & Rogers, 1989.

***Xylaria curta* Fr.**

Notes: This fungus was among the first xylariaceous species described from the Hawaiian Islands. It is distinguished by its small ascospores and the white scales on the stromata. These scales are usually lost as stromata become overmature.

Hosts and Substrates: *Acacia koa*; *Albizia falcata*, *Albizia* sp., decayed wood

Distribution: HA: Hilo, Kipuka Puauulu, Lava Tree; OA: Judd Tr, Waianae Mts.

Reference: Rogers, 1983.

***Xylaria* cf. *cuspidata* Lloyd**

Notes: This curious fungus with a conic head on a long stipe resembles the type specimen of *X.*

cuspidata. The type, however, is from Iowa. Its status, and the status of our fungus, is uncertain.

Host and Substrate: *Eucalyptus* sp.

Distribution: OA: Lyon Arboretum

Reference: Lloyd, 1924.

***Xylaria* cf. *feejeensis* (Berk.) Fr.**

Notes: This species is much like *X. curta* in general morphology. It lacks the white stromatal scales of the latter species. Many collections from various parts of the world have been called *X. feejeensis*; the limits of the species are unclear.

Host and Substrate: decayed wood

Distribution: Sine loco

Reference: Dennis, 1956.

***Xylaria kaumanae* J. D. Rogers, Hemmes & Y.-M. Ju**

Fig. 48

Notes: *Xylaria kaumanae* is known only from the type location on Hawaii. It is distinguished by its rotund fertile parts on abruptly narrowed short stipes.

Hosts and Substrates: *Casuarina equisetifolia*

Distribution: HA: Hilo (Kaumana)

Reference: Rogers et al., 2003.

***Xylaria moelleroclavus* J. D. Rogers, Y.-M. Ju & Hemmes**

Figs. 49-53

Notes: This species became separable from some other taxa when its anamorphic state and teleomorphic state were connected in the Hawaiian Islands. The anamorphic stroma features pegs that bear the conidia apparatus. These pegs dehisce as the stroma matures, leaving only inconspicuous pits.

Hosts and Substrates: *Albizia falcata*, *Albizia* sp., *Aleurites moluccana*, *Psidium* sp., *Mangifera indica*, *Schefflera actinophylla*, *Toona ciliata*

Distribution: HA: Hilo, Kolekole, Lava Tree; KA: Hanalei, Sine loco OA: Honolulu, Kawai Iki Ditch Tr, Manoa Falls Tr, Manoa Valley

Reference: Rogers, Ju & Hemmes, 1997.

***Xylaria pannosa* Lloyd**

Notes: This fungus differs from *X. cubensis* (Mont.) Fr. in its solid stromatal flesh. The latter fungus usually becomes hollow at maturity or prior to maturity. Its relationship with *X. cubensis*—a rather common species in continental USA—is unknown. Molecular data on these taxa might elucidate their relationship.

Hosts and Substrates: *Acacia koa*

Distribution: KA: Koke'e

Reference: Lloyd, 1918.

Xylaria polymorpha (Pers.: Fr.) Grev.

Note: This species has been defined primarily on temperate zone material. There are indications that collections from Hawaii differ from USA main land and European material, and might in fact represent another species. Molecular data should eventually clarify this problem.

Host and Substrate: *Metrosideros polymorpha*

Distribution: HA: Pahala

Reference: Rogers & Callan, 1986

Xylaria schweinitzii Berk. & M. A. Curtis

Notes: This species is much like *X. polymorpha*, differing primarily in having ascospores with an oblique or somewhat spiral slit. These two taxa are often difficult to separate from one another. *X. schweinitzii* seems more common in subtropical and tropical regions than *X. polymorpha*.

Hosts and Substrates: angiosperm wood,

Aleurites moluccana, *Sapindus* sp.

Distribution: HA: Hilo, Kipuka Puauulu; MA: Maluhia SC

Reference: Rogers & Callan, 1986.

Xylaria* cf. *scruposa (Fr.: Fr.) Fr.

Note: Apparently, no type material exists for this taxon. This identification is tentative and follows Dennis (see in ref. cited below). It is close to *X. moelleroclavus* and some of our specimens might represent that species.

Hosts and Substrates: *Metrosideros*

polymorpha, *Psychotria* sp.

Distribution: HA: Pahala, Stainback Hwy.

Reference: Rogers & Callan, 1986.

Xylaria* cf. *tuberosides Rehm Fig. 45

Notes: The identification of this species is tentative. Type material has not been examined. The fertile head is clavate, ca. 8 mm broad, very smooth, black, hollow and carbonaceous, on short concolorous stipe.

Hosts and Substrates: *Acacia koa*, *Aleurites moluccana*, *Mangifera indica*

Distribution: HA: Scout Camp; OA: Kawai Iki Ditch Tr, Tantalus

Reference: Rehm, 1901.

***Xylaria* species on seeds, fruits, and leaves**

Xylaria* cf. *delicatula Starb.

Notes: This tiny fungus was found in only one location. It highly resembles the type collection of *X. delicatula*, but has secondary appendages

on the ascospores. However, very few ascospores of type material were available for scrutiny.

Hosts and Substrates: Decayed leaves, probably of *Eugenia cumini*

Distribution: KA: Kalalau

Reference: Starback, 1901.

Xylaria pisoniae D.Scott, J. D. Rogers & Y.-M. Ju

Notes: This fungus produces stromata on dead leaves that remain hanging on the host tree. It is believed that ascospores and/or conidia infect living leaves and persist as endophytes until the leaves senesce.

Hosts and Substrates: *Pisonia brunoniana* leaves

Distribution: HA: Kipuka Puauulu

Reference: Rogers et al., 2001.

Xylaria psidii J. D. Rogers & Hemmes

Notes: This fungus is known only from the type location.

Hosts and Substrates: *Psidium guajava* seeds

Distribution: HA: Hilo

Reference: Rogers et al., 1992.

***Xylaria* sp. (nov.?)**

Notes: This tiny *Xylaria* has a hair-shaped stroma with clusters of perithecia at intervals. The leaf-inhabiting *Xylaria* spp. is a taxonomically difficult group and, thus, it seems premature to formally name it.

Hosts and Substrates: Leaves of *Mangifera indica*, *Melastoma* sp., *Melochia umbellata*, *Tibouchina semidecandra*

Distribution: HA: Hilo

Small *Xylaria* species on wood (fertile part usually less than 5 mm diameter)

Xylaria apiculata Cooke Figs. 43 and 44

Notes: This small fungus is probably a member of the complex that includes *X. arbuscula*, *X. bambusicola* and *X. partita*; these taxa are discussed elsewhere herein. They are separated primarily on ascospore size and, in the case of *X. bambusicola*, on host.

Hosts and Substrates: *Pipturus hawaiiensis*, *Sapindus saponaria*

Distribution: HA: Kipuka Puauulu; OA: Castle Tr.

Reference: Dennis, 1956.

***Xylaria arbuscula* Sacc.** Fig. 39

Notes: This and *X. multiplex* are the most frequently collected small *Xylaria* spp. in the Hawaiian Islands. Both are recorded on a large variety of hosts. *Xylaria arbuscula* has a global distribution and probably includes several taxa. Hosts and Substrates: *Albizia falcataria*, *Cecropia* sp., *Cocos nucifera*, *Eucalyptus robusta*, *Eugenia jambos*, *Eugenia malaccensis*, *Hibiscus tiliaceus*, *Macadamia* sp., *Sapindus saponaria*, *Spathodea campanulata*; *Trema orientalis*

Distribution: HA: Hilo, Kipuka Puaulu, Kolekole, Lava Tree, Onomea, Pahala, Stainback Hwy; MA: Haleakalā, Hana Hwy, Seven Sacred Pools; MO: Kamakou Preserve, Phallic Rock; OA: Kawai Iki Ditch Tr, Manoa Valley
Reference: Dennis, 1956.

***Xylaria bambusicola* Y.-M. Ju & J. D. Rogers** Fig. 42

Notes: This species apparently occurs only on bamboo or closely related taxa. The formal description is based on collections from Taiwan. Hosts and Substrates: *Bambusa vulgaris*, *Phyllostachys nigra*
Distributions: HA: Hilo; KA: Hanalei; MA: Hana Hwy.
Reference: Ju & Rogers, 1999.

***Xylaria multiplex* (Kunze) Fr.** Fig. 54

Notes: This species is generally separable from the other small *Xylarias* herein by its average smaller ascospores and its smooth stromatal surface. It is close to *X. caespitulosus* Ces., or perhaps conspecific with it. Hosts and Substrates: *Acacia koa*, *Albizia falcataria*, *Albizia* sp., *Aleurites* sp., angiosperm wood, *Casuarina equisetifolia*, decayed wood; *Hibiscus tileaceus*
Distribution: HA: Kipuka Puaulu, Kolekole, Lava Tree; KA: Hanalei, Kaneha Reservoir; MA: sine loco; MO: Phallic Rock; OA: Honolulu, Kahana Bay, Lyon Arboretum, Manoa Valley
Reference: Dennis, 1956.

***Xylaria partita* C. G. Lloyd**

Notes: This fungus resembles *X. juniperus*, particularly var. *asperulata* Starb. The ascospores of our fungus, however, are nearer the size of the typical variety.
Hosts and Substrates: *Eucalyptus robusta*,

Sophora chrysophylla*, *Vaccinium reticulatum

Distribution: HA: Kipuka Puaulu, Scout Camp
Reference: Lloyd, 1917; Starback, 1901.

Rosellinia* species and morphological Groups**Rosellinia bunodes* (Berk. & Broome) Sacc., sp. 1**

Notes: This distinctive species, readily identified by its large ascospores with long attenuated ends, has been reported from various tropical regions of the world.

Hosts and Substrates: *Spathodea campanulata*

Distribution: HA: Onomea

Reference: Saccas, 1956.

***Rosellinia corticium* (Schwein.:Fr.) Sacc., sp. 2** Fig. 30

Notes: This is a large-spored species with an appendage on one end of the ascospore and with the stroma embedded in a reddish brown subiculum. It is frequently reported from temperate regions.

Hosts and Substrates: decayed wood

Distribution: MA: Seven Sacred Pools

Reference: Petrini, 1993.

***Rosellinia*, monocot Group 1**

Notes: Stromata are solitary or fused in small numbers, individuals ca. 0.7 mm diameter.

Ascospores are 10.5 x 5-6 µm.

Hosts and substrates: *Bambusa vulgaris*

Distribution: KA: Hanalei

Reference: Petrini & Petrini, 2005

***Rosellinia*, monocot Group 2**

Notes: Perithecial stromata are hemispherical with a broad base, ca. 1 mm diameter, seated in a white subiculum.

Hosts and Substrates: *Bambusa vulgaris*

Distribution: KA: Hanalei

Reference: Petrini & Petrini, 2005

***Rosellinia*, morphological Group 3**

Notes: This single taxon has large, more or less conical, stromata and lacks a subiculum. The ascus apical ring is 2.2 x 2.2 µm. Ascospores are nearly equilateral, 14.5-16 x 8-9 µm.

Hosts and Substrates: decayed wood

Distribution: HA: Pahala

Reference: Petrini & Petrini, 2005.

Rosellinia, morphological Group 4

Notes: This taxon features hemispherical stromata on a white parchment-like subiculum. The ascus apical ring is $4.5 \times 4.5 \mu\text{m}$. Ascospores are ellipsoid-inequilateral with acute ends, $15\text{--}16 \times 7.5\text{--}9 \mu\text{m}$.

Hosts and Substrates: *Acacia koa*

Distribution: HA: Kipuka Ki

Reference: Petrini & Petrini, 2005.

Rosellinia, morphological Group 5

Notes: These collections are similar, but might not represent the same taxon. J. H. Miller identified material in Bishop Museum as *R. subiculata*. Ascospores are a bit large for that species and one collection came from bamboo, a substrate not considered usual for *R. subiculata*. See *Rosellinia*, Group 8 herein.

Hosts and Substrates: *Aleurites moluccana*, *Bambusa* sp., decayed wood.

Distribution: LA: Kapano Gulch; Maunalei Gulch; OA: Manoa Valley

Reference: Petrini & Petrini, 2005.

Rosellinia, morphological Group 6

Notes: The stroma of this fungus is conic with acute ostiole, ca. 1 mm diam, with base extending beyond the part enclosing the ascoma. The ascus apical ring has an angular rim. Ascospores $15\text{--}15.5 \times 7.5\text{--}9 \mu\text{m}$.

Hosts and Substrates: decayed wood

Distribution: HA: Kipuka Ki

Reference: Petrini & Petrini, 2005.

Rosellinia, morphological Group 7

Notes: Stromata are subglobose to hemispherical, 1-1.2 mm diam. The ascus apical ring is $3 \times 3 \mu\text{m}$. Ascospores are $13\text{--}15 \times 6.5\text{--}9 \mu\text{m}$. J. H. Miller identified collections in Bishop Museum as *R. griseo-cincta* Starb.

Hosts and Substrates: *Erythrina* sp., *Sapindus* sp., decayed wood

Distribution: HA: Hilo, Kipuka Ki; OA: Manoa Valley

Reference: Petrini & Petrini, 2005.

Rosellinia cf. *subiculata*, Group 8 Fig. 27

Notes: This group contains the largest number of collections from the Hawaiian Islands. Stromata vary in diameter from (0.3-)0.5-1 mm and are often on a whitish subiculum or a pale bleached area on the substrate. The ascus apical ring is usually broader than high, $1.5 \times 3 \mu\text{m}$ or as broad as high, $3 \times 3 \mu\text{m}$. Petrini & Petrini give

ascospores as $9\text{--}14 \times 4\text{--}8 \mu\text{m}$. Our collections might include more than a single taxon.

Hosts and Substrates: *Casuarina equisetifolia*, *Cecropia obtusifolia*, *Eucalyptus* sp., *Metrosideros polymorpha*, decayed wood.

Distribution: HA: Hilo, Hu Ranch, Kipuka Ki, Kopaka, MacK; KA: Koke'e; OA: 'Aiea Tr.

Reference: Petrini & Petrini, 2005.

Rosellinia, Group 9

Notes: Stromata are hemispherical with bases wide-spreading beyond the ascoma-enclosing part. Ascus apical ring is higher than broad, $3 \times 2.2 \mu\text{m}$. Ascospores ellipsoid with germ slits less than spore-length, $7.5\text{--}9 \times 3.5\text{--}4.5 \mu\text{m}$. The collections here seem to represent a single taxon.

Hosts and Substrates: *Psidium guajava*, *Psidium* sp., decayed wood.

Distribution: MA: Maluhia SC; OA: Pu'Ōhi'a Tr

Reference: Petrini & Petrini, 2005.

Rosellinia, Group 10

Notes: Stromata are more or less hemispherical, up to 1 mm diam. Ascus apical ring broader than high, $0.75 \times 1.5\text{--}2.2 \mu\text{m}$. Ascospores ellipsoid with spore-length germ slit, $7.5\text{--}9\text{--}(10) \times 4.5\text{--}5\text{--}(6) \mu\text{m}$.

Hosts and Substrates: *Casuarina equisetifolia*, decayed wood

Distribution: HA: MacK; OA: 'Aiea Tr

Reference: Petrini & Petrini, 2005.

Stilbohypoxyton**Stilbohypoxyton quisquiliarum** (Mont.) J.

D. Rogers & Y.-M. Ju Figs. 33 and 36

Notes: This fungus is allied with *Rosellinia*. The stromata often have yellowish scales and warts or spines.

Hosts and Substrates: *Acacia koa*, decayed wood, *Macadamia* sp., *Sapindus saponaria*

Distribution: HA: Kipuka Ki; Kipuka Puauulu; Univ. farm

Reference: Rogers & Ju, 1997.

Daldinia**Daldinia childiae** J. D. Rogers & Y.-M. Ju

Notes: *Daldinia* is closely allied to *Hypoxyton* and some authorities consider them to be congeneric. Many collections of *D. childiae* were formerly considered to be *D. concentrica*.

Daldinia childiae stromata release a yellowish

pigment in KOH, whereas those of *D. concentrica* release a purple pigment in KOH.

Hosts and Substrates: *Acacia mearnsii*, decayed wood.

Distribution: KA: Koke'e

Reference: Ju & Rogers, 1997; Rogers et al., 1999.

Ascovirgaria

Ascovirgaria occulta J. D. Rogers & Y.-M. Ju

Notes: This is a cryptic fungus, found only once. Interestingly, the asexual state, *Virgaria nigra* (Link) Nees, is encountered in various parts of the world. Thus, the question can be posed: is *Ascovirgaria* common, but undiscovered because it is cryptic or is the *Virgaria* state flourishing in the comparative scarcity of its sexual state?

Hosts and Substrates: decayed wood

Distribution: HA: Kipuka Puauulu

Reference: Rogers & Ju, 2002 b.

Jumillera

Jumillera hawaiiensis J. D. Rogers & Y.-M. Ju Figs. 7 and 8

Notes: *Jumillera* is separated from *Biscogniauxia* primarily on its scolecosporous, *Libertella*-like, conidial state. This is the only *Jumillera* species known from the Hawaiian Islands.

Hosts and Substrates: *Acacia koa*

Distribution: KA: Koke'e

Reference: Rogers & Ju, 2002 b; Rogers, Ju & San Martín, 1997

Lopadostoma

Lopadostoma hawaiianum J. D. Rogers & Y.-M. Ju

Notes: This is the only *Lopadostoma* taxon described from the Hawaiian Islands. It is known only from its type location on Hawai'i.

Hosts and Substrates: *Casuarina equisetifolia*

Distribution: HA: MacK

Reference: Rogers & Ju, 2002 b.

Xylotumulus

Xylotumulus gibbisporus J. D. Rogers, Y.-M. Ju & Hemmes Figs. 46 and 47

Notes: This is a monotypic genus known only

from its type location on Hawai'i. It is one of few xylariaceous taxa with a spiraling ascospore germination slit and an ascus apical ring that does not become blue in iodine.

Hosts and Substrates: angiosperm wood

Distribution: HA: Kipuka Puauulu

Reference: Rogers et al., 2006.

Anthostomella

***Anthostomella* spp.**

Notes: This genus is represented in the Hawaiian Islands by a number of species. Single perithecia are embedded in leaves or small stems. A monograph of the genus is extant and the reader is referred to it.

Hosts and Substrates: Various

Distribution: Wide

Reference: Lu & Hyde, 2000.

Camarops

Camarops ustulinoides (P. Henn.) Nannf.

Notes: This genus is not xylariaceous, but belongs to the family Boliniaceae. It is included here because it has a well-developed superficial stroma. Asci are small and the ascus apical ring does not become blue in iodine. Ascospores are small, slightly flattened and have a germination pore on the more acute end.

Hosts and Substrates: *Albizia* sp.

Distribution: HA: Hamakua Coast

Reference: Samuels & Rogers, 1987.

Pachytrype

Pachytrype princeps (Penzig & Sacc.) M. E. Barr Figs. 31 and 32

Notes: This fungus produces stromata that are highly verrucose and of rubbery to horny texture and of greenish internal color. Asci are small and bear small allantoid or unbent ascospores. It is not xylariaceous, but is considered here because the stromata resemble those of the Xylariaceae.

Hosts and Substrates: decayed wood,

Metrosideros polymorpha

Distribution: HA: Kipuka Puauulu, Manuka

Reference: Barr et al., 1993.

NOTES ON HOSTS OF XYLARIACEAE IN HAWAII

Most of the data on hosts are taken from Little & Skolmen (1989) and Sohmer & Gustafson (1996). Most of the hosts have been introduced from elsewhere either purposefully or accidentally. Of these introductions, many are "naturalized", i.e. become accepted as components of the extant flora.

Acacia koa Gray—This is a native species, known only from the Hawaiian Islands.

Acacia mearnsii DeWild.—This is an introduced species, native to Australia.

Albizia falcataria (L.) Fosberg—This species, a native of the Molucca Islands, was introduced to Hawaii in 1917.

Aleurites moluccana (L.) Willd.—This species was probably introduced early in the colonization of the Hawaiian Islands.

Alnus nepalensis D. Don—This species was introduced to the Hawaiian Islands as a forest species for plantations.

Bambusa vulgaris Schrad. Ex Wendl.—This species was probably introduced in the early 19th century.

Calophyllum inophyllum L.—This species was an early introduction to the Hawaiian Islands.

Cassia spp.—There are two common *Cassia* species, both introduced.

Casuarina equisetifolia (L.) ex J. R. & G. Forst.—This is a common introduced species that is native to Asia.

Casuarina glauca Sieber ex Spreng.—This is an introduced species, a native of Australia.

Cecropia obtusifolia Bertol.—This introduced species is native to Mexico, Central and South America.

Cocos nucifera L.—This species was an early introduction to the Hawaiian Islands.

Coprosma montana Hillebr.—This plant is probably to be considered a native.

Dodonaea viscosa Jacq.—This species and ***Sapindus saponaria*** are said to be the only tree taxa native to both Hawaiian Islands and continental United States.

Eucalyptus robusta Sm.—This is the most common of the numerous eucalypts in Hawaiian. It is a native of Australia.

Eugenia cumini (L.) Druce—Introduced and cultivated in the 19th century.

Eugenia jambos L.—This is an introduced species, widely considered a weed.

Eugenia malaccensis L.—This is an introduced cultivated species.

Euphorbia laurifolia Juss. ex Lam.—An introduced species, from South America.

Ficus macrocarpa L.—An introduced species.

Fraxinus uhdei (Wenz.) Lingelsh.—Introduced in late 19th century.

Hibiscadelphus giffardianus Rock—An endemic species, nearly extinct.

Hibiscus tiliaceus L.—Considered a native of Hawaiian Islands.

Lantana cf. ***comara***—Introduced.

Macadamia integrifolia Maiden & Betche—Introduced and cultivated.

Macaranga spp.—Introduced species.

Mangifera indica L.—Introduced prior to 1825.

Melaleuca quinquenervia (Cav.) S. T. Blake—Considered a native of Hawaiian Islands.

Melastoma cf. ***candida***—An introduced species.

Melochia umbellata (Houtt.) Stapf—Introduced ca. 1925.

Metrosideros polymorpha Guad.—Most common and widespread native tree in the Hawaiian Islands.

Morinda citrifolia L.—An early introduction to Hawaiian Islands.

Myoporum sandwicense Gray—Considered a native of Hawaiian Islands.

Osmanthus sandwicensis (Gray) Knobl.—Considered a native of Hawaiian Islands.

Pelea sp.—A number of species are endemic.

Phyllostachys nigra (Lodd. Ex Lindl.) Munro—An introduced species.

Pipturus albidus (Hook. & Arn.) Gray—Considered a native of Hawaiian Islands.

Pipturus hawaiiensis Levl.—A synonym of *P. albidus*.

Pisonia brunoniana Endl.—Native of Hawaiian Islands.

Pisonia sandwicensis Hillebr.—Native of Hawaiian Islands.

Pithecellobium saman (Jacq.) Benth.—Introduced to Hawaiian Islands in 1847.

Psidium cattleianum Sabine—Introduced ca. 1825.

Psidium guajava L.—Introduced in early 19th century.

Psychotria sp., probably ***P. hawaiiensis*** (Gray) Fosberg—Native of Hawaiian Islands.

Sapindus saponaria L.—Native of Hawaiian Islands.

Schefflera actinophylla (Endl.) Harms.—Introduced ca. 1900.

Schinus terebinthifolia Raddi—Introduced prior to 1911.

Sequoia sempervirens (D. Don) Endl.—Introduced.

Sophora chrysophylla (Salisb.) Seem.—Native of Hawaiian Islands.

Spathodea campanulata P. Beauv.—Introduced 1928.

Terminalia catappa L.—Introduced before 1800.

Tibouchina semidecandra Cogn.—Introduced and naturalized; native of Brazil.

Tibouchina urvilleana (DC.) Cogn.—Introduced.

Tithonia diversifolia (Hemsl.) Gray—Introduced.

Toona ciliata M. Roem.—Introduced.

Trema orientalis (L.) Blume-- Introduced.

Vaccinium reticulatum Smith—Introduced.

Host-Fungus Index

Generic abbreviations:

Annulo=Annulohypoxylon; Ascov=Ascovigaria
Bis=Biscogniauxia; Camarops=Camarops;
Daldinia=Daldinia; Hy=Hypoxylon;
Jumillera=Jumillera; Kretz=Kretzschmaria;
Lopado=Lopadostoma; Nem=Nemania;
Pachy=Pachytrype; Penz="Penzigia";
Ros=Rosellinia; Stilbo=Stilbohypoxyton;
Xy=Xylaria; Xylotum=Xylotumulus

Acacia koa—Annulo moriforme; Annulo nitens; Bis capnodes; Bis plumbea; Bis uniapiculata; Hy subrutilum; Jumillera hawaiiensis; Nem caries; Ros group 4; Stilbo quisquilarum; Xy anisopleura; Xy berteri; Xy curta; Xy multiplex; Xy pannosa; Xy? tuberoide

Acacia mearnsii-- Daldinia childiae; Hy notatum; Hy perforatum; Hy samuelsii; Hy subrutilum

Acacia sp.—Hy monticulosum; Xy moelleroclavus

Albizia falcata—Hy monticulosum; Xy anisopleura; Xy arbuscula; Xy curta; Xy moelleroclavus; Xy multiplex

Albizia sp.—Annulo atroroseum; Annulo stygium; Camarops ustulinoides; Hy monticulosum, Kretz clavus; Xy anisopleura; Xy berteri; Xy curta; Xy multiplex

Aleurites moluccana—Bis uniapiculata; Ros group 5; Xy anisopleura; Xy moelleroclavus; Xy multiplex; Xy schweinitzii; Xy? tuberoide

Alnus nepalensis— Kretz pavimentosa; Nem bipapillata

Angiosperm wood—Bis viscosicentra var. macrospora; Nem diffusa; Xy multiplex; Xy schweinitzii; Xylotum gibbisporus

Bambusa sp.—Ros group 5; Xy anisopleura

Bambusa vulgaris—Ros group 1; Ros group 2; Xy bambusicola

Calophyllum inophyllum—Hy fuscum; Hy gilbertsonii

Cassia sp.—Hy anthochroum

Casuarina equisetifolia— Annulo moriforme; Annulo nitens; Bis citrifomis; Hy brevisporum; Hy croceoplum; Hy monticulosum; Hy perforatum; Hy placentiforme; Hy ravidoroseum; Kretz clavus; Lopado hawaiianum; Nem immersidiscus; Nem maritima; Ros group 10; Ros cf. subiculata; Xy kaumanae; Xy multiplex

Casuarina glauca—Hy monticulosum

Casuarina sp.—Bis capnodes

Cecropia obtusifolia—Ros cf. subiculata

Cecropia sp.—Xy arbuscula

Cocos nucifera—Kretz pavimentosa; Xy arbuscula

Coprosma montana—Hy cinnabarinum; Hy croceoplum; Xy discolor

Decayed wood—Ascov occulta; Annulo moriforme; Annulo stygium; Bis capnodes; Bis citrifomis; Daldinia childiae; Hy begae; Hy brevisporum; Hy erythrostroma; Hy jecorinum; Hy lienhwacheense; Hy monticulosum; Hy peleae; Hy ravidoroseum; Hy subdisciforme; Hy subgilvum; Hy tortisporum; Hy trugodes; Kretz clavus; Kretz micropus; Nem abortiva; Nem albocincta; Nem bipapillata; Nem diffusa; Nem macrocarpa; Nem pouzarii; Nem serpens; Pachy princeps; Penz cantareirensis; Ros corticium; Ros group 3; Ros group 5; Ros group 6; Ros group 7; Ros group 9; Ros group 10; Ros cf. subiculata; Stilbo quisquiliarum; Xy adscendens; Xy atosphaerica; Xy berteri; Xy curta; Xy discolor; Xy feejeensis; Xy multiplex

Dodonaea viscosa---Hy diatrypeoides

Erythrina sp.—Ros group 7

Eucalyptus robusta—Annulo stygium; Bis capnodes; Bis citrifomis; Bis uniapiculata; Hy subgilvum; Kretz clavus; Kretz pavimentosa; Nem chrysoconia; Xy adscendens; Xy anisopleura; Xy arbuscula; Xy atosphaerica; Xy berteri; Xy partita

Eucalytus sp.—Annulo bovei; Annulo moriformis; Annulo stygium; Bis uniapiculata; Hy ravidoroseum; Hy tortisporum; Nem immersidiscus; Ros cf. subiculata; Xy? cuspidata

Eugenia cumini—Hy monticulosum; Nem chrysoconia; Xy cf. delicatula
Eugenia jambos—Xy arbuscula
Eugenia malaccensis—Xy arbuscula
Euphorbia laurifolia—Xy discolor
Ficus macrocarpa—Kretz clavus
Fraxinus uhdei—Hy crocopleum; Hy monticulosum; Hy rubiginosum; Hy subgilvum; Nem bipapillata
Hibiscadelphus giffardianus—Nem macrocarpa
Hibiscus tiliaceus—Hy monticulosum; Xy arbuscula; Xy multiplex; Xy multiplex
Lantana sp.—Xy discolor
Macadamia sp.—Bis capnodes; Kretz? neocaledonica; Stilbo quisquiliarum; Xy arbuscula; Xy berteri
Macaranga sp.—Hy monticulosum; Hy munkii
Mangifera indica—Annulo stygium; Kretz clavus; Kretz cf. neocaledonica; Xy alboareolata; Xy moelleroclavus; Xy sp. ?nov. (leaves); Xy ?tuberoide
Melaleuca quinquenervia—Annulo stygium
Melastoma sp.—Xy sp. ?nov. (leaves)
Melochia umbellata—Xy sp ?nov. (leaves)
Metrosideros polymorpha—Annulo archeri; Bis capnodes; Bis uniapiculata; Hy haematostroma; Hy munkii; Hy perforatum; Pachy princeps;; Ros cf. subiculata; Xy alboareolata; Xy berteri; Xy polymorpha; Xy ?scruposa
Morinda citrifolia—Nem chrysoconium
Myoporum sandwicense—Hy crocopleum; Hy diatrypoides; Hy dieckmannii; Hy fendleri; Hy rubiginosum; Hy submonticulosum; Nem aenea var. aureolutea
Osmanthus sandwicensis—Hy notatum
Pelea sp.—Xy discolor
Phyllostachys nigra—Xy bambusicola
Pipturus hawaiiensis—Xy apiculata
Pisonia brunoniana—Xy pisoniae (leaves)
Pisonia sandwichensis—Bis citriformis
Pisonia sp.—Annulo nitens; Hy fuscopurpureum
Pithecellobium saman—Hy subgilvum
Psidium cattleianum—Annulo nitens; Bis citriformis; Bis plumbea; Bis uniapiculata; Hy investiens; Nem effusa
Psidium guajava—Bis uniapiculata; Hy subgilvum; Ros group 9; Xy psidii

Psidium sp.—Nem immersidiscus; Ros group 9; Xy berteri; Xy moelleroclavus
Psychotria sp. — Xy alboareolata Xy anisopleura; Xy ?scruposa
Sapindus saponaria—Annulo moriforme; Bis capnodes; Hy perforatum; Nem diffusa; Nem macrocarpa; Stilbo quisquiliarum; Xy adscendens; Xy anisopleura; Xy apiculata; Xy arbuscula
Sapindus sp.—Hy placentiforme; Penz cf. cadigensis; Ros group 7; Xy schweinitzii
Schefflera actinophylla—Xy moelleroclavus
Schinus terebinthifolia—Bis uniapiculata; Hy erythrostroma
Sequoia sempervirens—Nem kauaiensis
Sophora chrysophylla—Xy partita
Spathodea campanulata—Xy anisopleura; Xy arbuscula; Xy berteri; Xy multiplex; Ros bunodes
Terminalia catappa—Xy immature (on fruit)
Tibouchina semidecandra—Xy sp. (nov.?) (leaves)
Tithonia diversifolia—Penz cf. cadigensis
Toona ciliata—Annulo stygium; Hy erythrostroma; Xy alboareolata; Xy moelleroclavus
Trema orientalis—Hy monticulosum; Hy subgilvum; Hy vandervekenii; Kretz clavus; Xy anisopleura; Xy arbuscula
Vaccinium reticulatum—Xy partita

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FIGURE LEGENDS

Figures 1-12. Figs. 1, 2. *Biscogniauxia capnodes*. 1. Shows variety of morphologies. Bar = 20 mm; 2. Natural size. Bar = 10 mm. Figs. 3 and 6. *Nemania immersidiscus*. 3. Habit. Bar = 10 mm; 6. Magnified view of ostiolar areas. Bar = 2 mm. Figs. 4 and 5. *Biscogniauxia uniapiculata*. 4. Bar = 20 mm; 5. Enlarged to show surface. Bar = 5 mm. Figs. 7 and 8. *Jumillera hawaiiensis*. 7. Bar = 20 mm; 8. Bar = 5 mm. Figs. 9, 12. *Hypoxylon subdisciforme*. 9. Bar = 13 mm; 12. Enlarged to show perithecial stromata. Bar = 5 mm. Figs. 10 and 11. *Kretzschmaria pavementosa*. 10. Shows variety of morphologies. Bar = 20 mm; 11. Approximately natural size. Bar = 10 mm.

Figures 13-24. Figs. 13 and 14. *Annulohypoxylon moriforme*. 13. Habit. Bar = 10 mm; 14. Detail of ostiolar areas. Bar = 1 mm. Fig. 15. *Hypoxylon cf. cinnabarina*. Bar = 20 mm. Figs. 16 and 17. *Annulohypoxylon nitens*. 16. Habit. Bar = 10 mm. 17. Detail of ostiolar areas. Bar = 1 mm. Fig. 18. *Hypoxylon fendleri*. Bar = 10 mm. Figs. 19 and 20. *Hypoxylon peleae*. 19. Habit. Bar = 20 mm. 20. Detail of surface. Bar = 5 mm. Fig. 21. *Hypoxylon notatum*. Bar = 10 mm. Figs. 22 and 23. *Hypoxylon ravidoroseum*. 22. Habit. Bar = 20 mm; 23. Surface detail. Bar = 5 mm. 24. *Annulohypoxylon stygium*. Bar = 10 mm.

Figures 25-36. Figs. 25 and 26. *Nemania diffusa*. 25. Habit. Bar = 10 mm; 26. Detail of surface. Bar = 2 mm. Fig. 27. *Rosellinia cf. subiculata*. Detail of perithecial stromata. Bar = 1 mm. Figs. 28 and 29. *Nemania kauaiensis*. 28. Habit. Bar = 10 mm; 29. Detail of stroma. Bar = 1 mm. Fig. 30. *Rosellinia corticium*. Bar = 5 mm. Figs. 31 and 32. *Pachytrype princeps*. 31. Habit. Bar = 10 mm; 32. Stromatal interior. Bar = 0.2 mm. Figs. 33, 36. *Stilbohypoxyton quisquiliarum*. 33. Habit. Bar = 10 mm; 36. Detail of surface with perithecia, some encased in yellow hyphae and some black. Bar = 2 mm. Figs. 34 and 35. *Xylaria berteri*. 34. Habit. Bar = 10 mm; 35. Enlargement of a stroma. Bar = 3 mm.

Figures 37-48. Figs. 37 and 38. *Xylaria anisopleura*. 37. Habit. bar = 10 mm; 38. Enlargement of stromata. Bar = 2.5 mm. Fig. 39. *Xylaria arbuscula*. Bar = 6 mm. Figs. 40 and 41. *Xylaria adscendens*. 40. Variety of morphologies. Bar = 15 mm. 41. Bar = 10 mm. Fig. 42. *Xylaria bambusicola*. Bar = 5 mm. Figs. 43 and 44. *Xylaria apiculata*. 43. Variety of morphologies, about half-size. Bar = 20 mm; 44. Enlarged stromata to show detail. Bar = 5 mm. 45. *Xylaria tuberosides*. Bar = 5 mm. Figs. 46 and 47. *Xylotumulus gibbisporus*. 46. Approximately natural size. Bar = 10 mm. 47. Enlargement of external stroma. Bar = 2 mm. Fig. 48. *Xylaria kamanae*. Bar = 13 mm.

Figures 49-54. Figs. 49-53. *Xylaria moelleroclavus*. 49. Maturing perithecial stromata. Bar = 20 mm. 50. Surface of mature perithecial stroma, showing ostiolar areas. Bar = 2 mm. 51. Anamorphic stromata showing anamorphic branches. Bar = 5 mm. 52. Immature perithecial stromata with remains of anamorphic state. Bar = 20 mm. 53. Enlargement of young perithecia stroma with remains of the anamorph evident. Bar = 5 mm. Fig. 54. *Xylaria multiplex*. Bar = 5 mm.