Hygrophoraceae (Agaricales) of the Greater Antilles: Hygrocybe subgenus Pseudohygrocybe section Firmae

Sharon A. CANTRELL and D. Jean LODGE**

Center for Forest Mycology Research, U.S. Department of Agriculture, Forest Service, Forest Products Laboratory, P.O. Box 1377, Luquillo, Puerto Rico 00773, USA.
E-mail: sharonac@coqui.net

Received 11 August 1999; accepted 7 June 2000.

A key to 13 species in the genus Hygrocybe subgenus Pseudohygrocybe section Firmae is provided for the Greater Antilles. Seven new species and one species that is a new report for the Greater Antilles are described. The new species are H. brunneosquamosa, H. cinereofirma, H. flavocampanulata, H. luboyi, H. miniatofirma, H. neofirma and H. olivaceofirma. The new report is H. trinitensis.

INTRODUCTION

Section Firmae of subgenus Pseudohygrocybe within Hygrocybe is characterized by short parallel to subparallel hyphae that make up the lamellar trama. Section Firmae is further defined by the presence of dimorphic basidia and spores on the same basidioles (Heinemann 1963). Several species classified in section Firmae deviate from other members of the subgenus Pseudohygrocybe, however, in having long, tapered lamellar trama hyphae sometimes up to 200-300 µm in length, typical of subgenus Hygrocybe. This section is pantropical, but it is especially speciose in the neotropics (Courtecuisse 1989, Dennis 1953, 1970, Pegler 1983, Pegler & Fiard 1978, Lodge & Pegler 1990). Within the Caribbean basin, species belonging to section Firmae have been reported from French Guiana (Courtecuisse 1989, Heim 1967) Mexico (Singer 1957), Trinidad (Dennis 1953, 1970) and throughout the Lesser Antilles (Pegler 1983, Pegler & Fiard 1978). In the Greater Antilles, species in section Firmae have been reported only from Cuba (H. trinitensis; as Agaricus laccatus determined by Berkley & Curtis, and re-determined by Pegler 1987) and Puerto Rico (Lodge & Pegler 1990). As far as we know, there are no published reports of species in section Firmae from Hispaniola.


Recent collecting in Puerto Rico has revealed seven new species and one new report for section Firmae. Hygrocybe miniatofirma has macro- and microspores with partially overlapping dimensions, but the basidia are distinctly dimorphic. The new species H. olivaceofirma is notable for apparent affinities with several species from the paleotropics such as H. diversicolor and H. purpurea. Two of the new species, H. brunneosquamosa and H. cinereofirma, have dull grey and brown pigments that are unusual for section Firmae. Most members of this section have red, yellow, green, or purple colouration. While most members of section Firmae have a pileus that is broadly convex or depressed, three of the new taxa, H. cinereofirma, H. flavocampanulata, and H. laboyi, have a pileus disc that is umbonate or cuspidate. Hygrocybe brunneosquamosa is the only known member of this section possessing a squamulose pileus surface besides the type species, H. firma and H. anisa from Sri Lanka and a previously undescribed neotropical relative, H. neofirma. While dimorphic basidia and spores are assumed to have arisen only once in the genus, the diverse characters represented by most of the new species described here are more typical of different subsections of section Coccineae. Heinemann (1963) found that macrospores of dimorphic species from Africa had binucleate macrospores and multiple pairs of nuclei in the macrobasidia, and hypothesised that they may be polyploid derivatives of species classified in section Coccineae. Other species in section Firmae suggest other affinities, however. Two of the new species, H. flavocampanulata and H. laboyi, and H. hypohaemacta have long, tapering trama hyphae cells, resembling those in subgenus Hygrocybe. However, only molecular data would resolve whether section Firmae is mono- or polyphylectic.

MATERIALS AND METHODS

The study areas in Puerto Rico are described in Cantrell & Lodge (2000).
In the section on specimens examined that follows each description, the collection information often includes different kinds of numbers assigned to the same specimen. Numbers with the prefix CFMR-PR refer to the unique database number at the Center for Forest Mycology Research in Puerto Rico that are being used for the Basidiomycetes of the Greater Antilles project. Collector’s ledger numbers are also provided, if assigned. All recent collections have been deposited in the recognized herbaria noted (CFMR, DUKE, F, IJ, K, NY, UPRRP).

Microstructures were studied using hand-cut sections mounted in aqueous 3% KOH or Melzer’s reagent after rehydration in 70% alcohol. Capitalised colour names are as reproduced by Smithe (1975). Munsell colour code notations have been added in brackets. The spore dimensions are based upon 10-20 spores; length of the spores includes the hilar appendage. Descriptions are based on a single collection unless otherwise noted; deviations from the description among other collections are noted under comments. For the most part, we used Boertmann’s (1995) concepts of subgenera and sections within subgenus Pseudo-hygrocybe and Heinemann’s (1963) definition of section Firmae.

**TAXONOMY**

**Hygrocybe** (Fr.) Kummer 1871

**Subgenus Pseudo-hygrocybe** section Firmae


Description: Lodge & Pegler (1990)


**Hygrocybe brunneosquamosa** Lodge & S. A. Cantrell, sp. nov.

**Etym.**: brunneus, brown; squamosus, scaly, covered with coarse brown scales.

Pileus 22 mm diam, broadly convex, in centre parum depressus, revolutus, in centro atrogriseobrunneus, cinnamomeobrunneus, tomentososquamosus, recurvato-squamosus vel squarrosus, siccos. Lamellae late adnatosubdecurrentes vel arcuatae, cinnamomeobrunneae, subadnata, ad acim sinuato usque crenato, concolorae, lamellulis aequilongis. Stipes centralis, 33 × 7 mm cylindricus, compressus, fuscos, apicaliter floccosus. Spora dimorphae, hyalinae levels, parietibus tenuibus; macrosporae 15-20.8 × 6.6-9.4 µm, Q = 1.8-2.75 (media 2.08), late ellipsoideae, guttulatae refractae; microsporae 3.8-8.3 × 3.5 µm, Q = 1.4-2.18 (media 1.66), subglobosae vel ellipsoideae. Basidia dimorpha, 4-spora, clavata; macrobasidia 32-56 × 12.8-16.8 µm, in KOH parum bruneola; microbasidia 24-28 × 4.8-8 µm. Margo lamaris fertile. Pleurocystidia et chalocystidia nulla. Trama hymenophoria regularis vel subregularis; ex hyphis 2.5-4 µm diametro dense intertextis compositum; hyphae latiferae sparsae 2.5-4 µm diametro. Pileipellis ex hyphis 47.2-52.5 × 11.6-15 µm, trichodermium formantibus, pigmento bruneo et in iodi ope porphyreo impletis. Contentum pilei hyphis laticiferis 4-5.6 µm diametro et hyphis regularibus 9-27 µm diametro intertextis. Hyphis tramae pilei usque 48 µm tumidis fibulis abundantibus. Stipitipellis trichodermium est; hyphae 17-41 × 7.8 µm, elementis terminalibus strangulatis, colore parum bruneo.


Pileus 22 mm diam, broadly convex, slightly depressed in Centre, with inrolled margin; surface Dark Greyish Brown (6.0 R 2.5/1.0) at Centre, Cinnamon Brown (7.0 YR 4.0/4.0) near margin, tomentose, squamulose, recurved-squamulose to squarrosate, dry. Lamellae slightly arcuate, broadly adnate with a decurrent tooth to sinuate, Cinnamon Brown (7.0 YR 4.0/4.0) to Ground Cinnamon (8.7 YR 5.2/3.6), subdistant (1-2 per mm), with lamellulae of one length; edge wavy to crenate, concolorous. Stipe central, 33 × 7 mm, compressed; surface Fuscous (5.0 YR 3.5/1.3), granular, floccose at the apex. Spores dimorphous, hyaline, smooth, thin-walled; macrosperae 15.20-8 × 6.6-9.4 µm, Q = 1.8-2.75 (mean 2.08), broadly ellipsoidal, with refractive guttules; microsperae 5.8-8.3 × 3.5 µm, Q = 1.4-2.18 (mean 1.66), subglobosae to ellipsoid. Basidia dimorphous, 4-spermatae; macrobasidia 32-56 × 12.8-16.8 µm, clavate-stipitate, slightly brownish in KOH; microbasidia 24-28 × 4.8-8 µm, clavate. Lamella-edge fertile. Pleurocystidia et chalocystidia none. Hymenophoral trama regular to subregular, hyphae 28-132 × 8.8-48 µm; central strand stained slightly vinaceous in Melzer’s reagent; subhymenium of densely interwoven hyphae 2.5-4 µm wide; laticiferous hyphae sparse, 2.5-4 µm wide. Pileipellis a trichodermium, with swollen end cells filled with reddish-brown contents in KOH and Melzer’s reagent, 47.2-52.5 × 11.6-15 µm. Pileus context with interwoven laticiferous hyphae 4.5-6 µm wide, and regular hyphae 9-27 µm wide, inflated up to 48 µm, with abundant clamp-connections. Stipitipellis a trichodermium, hyphae 17-41 × 7.8 µm, terminal elements strangugelae, with a slight brown intracellular tint.

Comments: This unusual species grows on mineral soil in Subtropical Wet Forest. It is superficially reminiscent of a Chroogomphus sp. because of its shape and the colour of the lamellae. However, H. brunneosquamosa belongs in the Hygrophoraceae because of the waxy and oily texture of the lamellae, the presence of hyaline and inamyloid spores, and the size of the basidia (5-7 times as long as the spores). Within section Firmae, brown pigments and squamules are very unusual. Hygrocybe helvolofirma Pegler has similar pigments, but H. brunneosquamosa lacks staining reactions, has a squamose pileus, and has a smaller stature while H. helvolofirma stains greyish blue violet, has a smooth pileus surface and is more robust (Pegler, 1983). Hygrocybe neofirma (see p. 221) has smaller squamules that are concentrated in the centre of the
pileus, and it also differs from *H. brunneosquamosa* in overall colour (yellow to scarlet with blackish staining). Microscopically, *H. neofirma* differs from *H. brunneosquamosa* in having slightly shorter macrospores (13.5-19 µm vs 15-21 µm), slightly longer macrobasidia (50-60 um vs 32-56 µm), and more inflated subhymenial hyphae (15-30 um vs 2.5-4 um wide). Hygrocybe firma (Berk. & Broome) Singer and H. anisa (Berk. & Broome) Pegler from Sri Lanka both have a trichodermal pileipellis, but they are yellow rather than brown and also differ in having a pileipellis with chains of subglobose and some stipitate-capitate elements, narrower macrobasidia (6-12 vs 12.8-16 µm), and macrospores mostly less than 13.5 µm.


**Key to Greater Antillean species of Hygrocybe section Firmae**

Hymenophoral trama regular, composed of long elements, usually with many exceeding 200 µm in length, some hyphae with tapered ends; lamellae always adnexed to free (if basidia and spores are dimorphic, see 2 below)...

**Subgen. Hygrocybe**

Hymenophoral trama regular to subregular, composed of short elements, the longest not exceeding 200 µm in length; usually without tapered ends; lamellae variously attached (adnexed, adnate, decurrent)...

**Subgen. Pseudo-hygrocybe**

1(1) Basidia and spores dimorphous

2(1)  Basidia and spores monomorphous

3(2) Pileus and stipe viscid to glutinous; lamella-edge sometimes gelatinised

3(4) Pileus viscid or dry; stipe dry or slightly lubricous at most; lamella-edge never gelatinised

4(2) Pileus with grey, grey-brown, or olive-brown colours

4(7) Pileus with yellow, orange, red, green or purple colours

5(4) Pileus tomentose, recurved-squamulose to squarrose; lamellae brown

5(7) Pileus radially fibrillose or fibrillose-silky; lamellae not brown

6(5) Pileus plane, but depressed and perforated at the centre, radially fibrillose-silky, translucent-striate, lamellae Flesh Ochre with Lime Green to Citrine near margin

7(6) Pileus broadly conical or umbonate with a stellate split at the centre, radially fibrillose, not translucent-striate; lamellae pale grey

8(7) Pileus and lamellae with purple or green colouration

9(8) Pileus and lamellae without green or purple colouration

10(9) Pileus Yellow Green, sometimes flushed with rufous when dry, translucent-striate at margin; lamellae white or pale green

11(10) Pileus Burnt Lake purple to Mahogany Red with flushes of green, and a chartreuse sterile margin, non-striate; lamellae dark green

12(11) Pileus radial fibrillose or fibrillose-silky

13(12) Pileus radially fibrillose-silky

14(13) Centre of pileus rugulose to rugose and not perforated when mature; surface not blackening; lamellae white

15(14) Pileus perforated at the centre when mature; surface tomentose to squarrose, blackening; lamellae yellow

16(15) Pileus and stipe glutinous. Pileus 10-23 mm diam, convex to plano-convex with age; lamellae adnexed or free, white

17(16) Pileus 10-23 mm diam, convex to plano-convex with age; lamellae adnexed or free, white

18(17) Pileus greater than 10 mm diam, broadly convex or plane, indented and sometimes perforated at the centre, margin even or irregular but not scalloped; chelocystidia present

19(18) Pileus 4-8(10) mm diam, cylindrical or truncate-parabolic, umbilicate, with scalloped yellow margin; chelocystidia absent

20(19) Pileus 4-8(10) mm diam, cylindrical or truncate-parabolic, umbilicate, with scalloped yellow margin; chelocystidia absent

21(20) Pileus 4-8(10) mm diam, cylindrical or truncate-parabolic, umbilicate, with scalloped yellow margin; chelocystidia absent

22(21) Pileus 4-8(10) mm diam, broad, with a blunt margin in cross section

23(22) Pileus 5.6-8 x 3.2-4.8 µm; chelocystidia cylindrical or ventricose, without clamp-connections

24(23) Pileus convex, with a mammillate disc, non-striate; lamellae 5 mm broad, with tapered margin (acicular) in cross section

25(24) Pileus convex, with a mammillate disc, non-striate; lamellae 5 mm broad, with tapered margin (acicular) in cross section
Hygrocybe section Firmae of the Greater Antilles


Pileus 22 mm diam, plano-cuspidate, with a rimose margin; surface Drab (9.0 YR 5/2.5) to Light Drab (0.2 Y 5/8.2/5), radially fibrillose, moist. Lamellae sinuate, pale grey, with lamellulae of two lengths; edge even, white. Stipe central, 50 x 3-5 mm, equal, compressed, hollow; surface Hair Brown (9.1 YR 3.3/2.0), paler at the base, smooth, moist. Spores dimorphous, globose or subglobose, hyaline, smooth, thin-walled, with refractive guttules; macrospores 10.8-17.4 x 10.0-13.3 µm, Q = 1.0-1.4 (mean 1.15); microspores 4.6-7.5 x 4.0-6.6 µm, Q = 1.0-1.45 (mean 1.16). Basidia dimorphous, clavate, 2-4 spored, with many guttules; macrobasidia 44-60 x 16-20 µm; microbasidia 25-40 x 4.9-10.0 µm. Lamella-edge fertile. Pleurocystidia and cheilocystidia none. Hyphomorophal trama regular, of short broad hyphae, 29-66 x 11.6-20.0 µm; laticiferous hyphae present, refractive, 4.0-6.6 µm wide. Piliädii of repent hyphae, some with brown contents, 4.0-20.8 µm wide, clamp-connections present. Pileus context with slender hyphae, 2.7-5.3 µm wide tangled in with chains of short inflated cells 28-160 x 8-44 µm, clamp-connections present. Stipitipellis a cutis of repent hyphae, 21.2-99.7 x 6.6-17.3 µm, with few uplifted hyphal ends, with clamp-connections.

Comments: This species was found on soil in Lower Montane Wet Forest. The dull pigments of the pileus suggest section Caccinea, subsection O vinæ, but the presence of strongly dimorphic basidia and spores place H. cinereofirma within section Firmae. Within this section, H. helvolofirma has similar coloration, but the cuspidate rather than indented and perforated pileus, absence of a pinkish-violet staining reaction in the lamellae, and distinctly globose spores of H. cinereofirma clearly distinguish these species.


Hygrocybe flavocampanulata S. A. Cantrell & Lodge, sp. nov. (Figs 13-19)

Etym.: flavus, yellow; campanulatus, bell; yellow bell-shaped pileus.

Pileus 21 mm diametro, campanulatus vel umbonatus, ad marginem recurvatus, luteus, radialiter fibrillososerosicus, straitus, translucentistibratus, humidos, lubricos. Lamellae adnexae vel subsinuatae, stramineae, 3 mm latae, lamellulis longitudinibus duoab, ad aciæm concolores. Stipes centralis, 45 x 3 mm, cylindricus, aequalis, solidus usque fuscatus, pileo concolor, glabrus, humidos, lubricos. Sporae dimorphæ, subglobosæ vel ovoidæ-ellipsoideæ, hyalinae, laeves, parietibus tenuibus; macrosporae 11.2-16.0 x 7.2-10.4 µm, Q = 1.4-1.9 (media 1.74); microsporae 5.6-8.0 x 3.2-4.8 µm, Q = 1.33-2.0 (media 1.66). Basidia dimorphæ, 4-spora; macrobasidia clavata, 50.4-60.0 x 12-16 µm, guttulis numerosis; microbasidia cylindrica, 36.0-41.6 x 5.6-7.2 µm, Q = 4.34-1.9 (media 1.59). M. argo lamelaris fertilis. Pleurocystidia et cheilocystidia nulla. Trama hymenophorialis regulæs, ex hyphis 29-66 x 11.6-20.0 µm compositis, hyphae lacticiferae refractivaæ 4.0-6.6 µm diametro praesentia. Pileellis ex hyphis 4.0-20.8 µm instructis, cutem fomentibus, fibulis praesentibus. Contextus pilei hyphis gracilibus 2.7-5.3 µm diametro catenis cellularum brevium infiltratis 28-160 x 8-44 um importibus, fibulis praesentibus.
clamp-connections. Pseudocystidia also present at the lamellar edge, numerous, cylindric, ventricose, 97-183 × 8.0-21.3 µm. Hymenophoral trama subregular, not narrowed at the margin, composed of long and broad conductive hyphae, 140-300 × 8-20 µm and thin interwoven hyphae, clamp-connections present. Pileipellis a thin ixocutis, hyphae 2.4-4 µm diam, subgelatinised, overlaying sausage shaped hyphae 47.8-106.0 × 8.0-14.6 µm, laticiferous hyphae and clamp-connections present. Stipitipellis a cutis of repent hyphae, with a thin ixocutis, clamp-connections and laticiferous hyphae present.

Comments: This beautiful bright yellow species with a campanulate pileus is unique because of its colour, the shape of the pileus, and microcharacteristics. It is found in Subtropical Wet and Lower Montane Wet Forest types. The most similar, and probably closely related species is H. laboyi, described below. Refer to comments under H. laboyi for characters that distinguish these two taxa. Hygrocybe subflavida is also similar in pileus shape and colour but it lacks dimorphic basidia and spores. The shape and size of the spores and chelocystidia of H. flavocampanulata are similar to those of H. occidentalis var. occidentalis (see Lodge & Pegler 1990), but H. flavocampanulata cannot be confused with that species because of its more slender basidiocarps (pileus 20-22 mm and stipe 3 mm diam vs pileus 10-70 mm diam and stipe 4-20 mm diam, respectively), an umbonate disc instead of a depressed disc that becomes perforated with age, the presence of numerous pseudocystidia, a thick, sterile lamella-edge, and larger macro- and microbasidia.

Dennis (1953) described a collection from Trinidad as Hygrocybe earlei, which Hesler and Smith (1963) and Pegler (1983) classified as H. subflavida. We noted that the basidia and spores are dimorphic in this collection and not monomorphic as described by these authors and it fits our concept of H. flavocampanulata.


**Descriptions:** Lodge & Pegler (1990), Pegler (1983).

**Comments:** This bright red, glutinous species is one of the few species in sect. **Firmae** that occurs in Subtropical Moist Forests, and is the only glutinous species in the section. It also differs from most members of section **Firmae** in having long trama hyphae with tapered ends and adnexed to free lamellae, typical of subgenus **Hygrocybe** rather than subgenus **Pseudohygrocybe**.

Specimens examined: **Jamaica:** Crownland, Trelawny Parish, 18° 15' 39" N, 77° 39' 6" W, 600 m, on humus, 10 Jun. 1999, T. J. Baron, (S. A. Cantrell J-9), (CFMR-JAM 156, IJ); ibid, Bird Cave Rock, on soil, 18 Sept. 1996, D. J. Lodge JAM-16 (IJ). - **US Virgin Islands:**
Hygrocybe laboyi  S. A. Cantrell & Lodge, sp. nov.
(Figs 20-26)

Etym.: Named after Carlos Laboy, one of the collectors.

Pileus 15 mm diam, broadly convex, campanulate, with a mammillate umbo; surface Spectrum Yellow (6.0 Y 8.5/12.0), radially fibrillose-silky, shiny, dry. Lamellae sinuate, Spectrum Yellow (6.0 Y 8.5/12.0), 5 mm broad, distant; edge eroded, very thin, concolorous. Stipe centrally, 5 × 4 mm, flared at apex, hollow; surface Spectrum Yellow (6.0 Y 8.5/12.0), fibrillose-silky, shiny, dry. Spores dimorphous, ellipsoid, elongate, cylindrical, hyaline, smooth, thin-walled, guttulate; macrospores 13.6-16.8 × 7.2-9.6 µm, Q = 1.54-2.1 (mean 1.78); microspores 7.2-8.8 × 4.0-5.6 µm, Q = 1.54-2.1 (mean 1.78). Basidiomata dimorphous, 4-spored, clavate; macrobasidia 50.4-68.0 × 11.2-13.6 µm; microbasidia 35.2-480 × 6.4-8.0 µm. Marginum angustata (in sectione transversali acicularis) ex elementis ducentibus latis 14-40 µm diametro elementis intertextis tenuibus tenuis 4-8 µm diametro immixtis composita, fibulis praesentibus. Pileipellis cutis est ex hyphis repentibus 48-72 × 9.6-14.4 µm composita, hyphis erectis paucis, fibulis praesentibus. Hymenophoral trama fibrillos-sericea, humidus, hygrophanus, lubricus.


Comments: This species was found in Lower Montane Wet Forest. It differs from H. flavacamanulata by having a non-striate instead of a translucent-striate pileus margin, lamellae that are 5 mm broad, pure yellow, and acicular in cross section rather than 2-3 mm broad, straw yellow, and with a blunt edge in cross section, and dry, silky-fibrillose pileus and stipe surfaces instead of moist and lubricous gelatinized surfaces. Microscopically, these two species differ by their cheilocystidia. Hygrocybe laboyi has cylindrical cheilocystidia with distinctive medallion clamp-connections while H. flavacamanulata has cylindrical or ventricose cheilocystidia that lack clamp-connections at their base.

subglobosae vel late ellipsioideae vel ellipsioideae vel elongatae, hyalinae, levies, parietibus tenuibus, guttulatae; macrosporae 12.8-16.0 × 8.0-15.2 µm, Q = 1.05-1.9 (media 1.57), microsporae 8.8-12.0 × 5.6-8.8 µm, Q = 1.1-1.8 (media 1.45). Basidia dimorpha, clavata, 4-sporea; macrobasidia 40-72 × 11.2-17.6 µm, centreo oleso plena; microbasidia 28-48 × 6.8-10.4 µm, gutties olei parvis paucis. Pleurocystidia nulla. Chelocystidia 44-56 × 12-24 µm, late ventricosa vel late fusiformia interdum apice cylindrico-nodulosa, fibrillis nullis. Margo lamellaris fertiles. Trama hymenophoralis sub-regularis ex hypphis libris 12-20 µm diameter et hypis inter-testiculibus fibrillatoribus 3.2-4.0 µm diametro composita. Pililepis cutis est ex hypis repentibus 2.8-13.6 µm diametro, fibrillatis composita. Stipitipilepis cutis est ex hypis repentibus 3.2-12.0 µm diametro fasciculis caulocystidiorum vermiciformium cylindricorum 12-3 × 4.0-6.4 µm composita.


Pileus 15-16 mm diam, broadly convex to plane, slightly depressed in the centre, rarely perforated; surface Scarlet (8.75 R 4.5/16.5). Geranium (7.5 R 4.0/15.0), Orange-Yellow (10.0 YR 8.0/14.0) at the centre, radially fibrillose-silky, moist, hygrophanous; margin Orange-Yellow (10.0 YR 8.0/14.0), translucent-triariate. Lamellae adnate, or sinuate, Scarlet (8.75 R 4.5/16.5). Geranium (7.5 R 4.0/15.0), 2 mm broad, distant, with lamellulae of two lengths; edge concolorous or Orange-Yellow (10.0 YR 8.0/14.0) in some, wavy. Stipe central, 30-55 × 3 mm, equal, hollow; surface Orange Yellow (10.0 YR 8.0/14.0), Spectrum Orange (5.0 YR 6.5/16.0), Chrome Orange (2.5 YR 6.0/16.0), silky-fibrillose, moist, hygrophanous. Spores dimorphous, sub-globose, broadly ellipsoid, ellipsoid or elongate, hyaline, smooth, thin-walled, guttulate; macrospores 12.8-16.0 × 8.0-15.2 µm, Q = 1.05-1.9 (mean 1.57); microspores 8.8-12.0 × 5.6-8.8 µm, Q = 1.1-1.8 (mean 1.45). Basidia distinct dimorphous, clavate, a-spored; macrobasidia 40-72 × 11.2-17.6 µm, filled with oily contents; microbasidia 28-48 × 6.8-10.4 µm, with few small oil drops. Pleurocystidia none. Lamella-edge fertile, composed of basidia mixed with chelocystidia. Chelocystidia 44-56 × 12-24 µm broadly ventricose or broadly fusiform, some are cylindric nodulose at the apex, without clamp-connections. Hymenophoral trama sub-regular, composed of broad hyphae, 12-20 µm wide, and thin interwoven hyphae with clamp-connections: 3.2-4.0 µm wide. Pililepis a cutis of repent hyphae, 2.8-13.6 µm wide with clamp-connections. Stipitipilepis a cutis of repent hyphae, 3.2-12.0 µm wide, with clusters of cylindric, vermiciform caulocystidia, 12-36 × 4.0-6.4 µm.

Comments: This scarlet species of Lower Montane Wet forest resembles a small form of H. occidentalis var. scarletina, but it differs macroscopically from the latter in usually lacking a perforated pileus, and having lamellae that are usually a deeper red and narrower than those of H. occidentalis var. scarletina (2-3 mm vs 4-10 mm broad) (Lodge & Pegler 1990). Microscopically, these two species are similar, although the separation of macro- and microspores is more distinct in H. occidentalis, and both macro- and microspores are clearly broader in H. miniatifiora than in H. occidentalis (8-15 vs 6-10 µm and 5.6-8.8 vs 3-5 µm broad for macro- and microspores, respectively) (Lodge & Pegler 1990).
Lesser Antilles. Hygrocybe neofirma differs macroscopically from the type collection of H. firma from Sri Lanka in the pileus which is orange rather than pure yellow and radially fibrillose with squamules rather than tomentose, and the black staining reaction with bruising and with age and drying. Microscopically, H. neofirma differs from H. firma in the structure of the pileipellis (absence of stipitate-capitate terminal elements between the scales, and a more radial arrangement of the trichodermal elements), macrospores that are larger (9.6-12(-15.7) × 7.2-10.4 µm) rather than 8-10.4(-13.4) × 5.6-8 µm; and macrobasidia that are very stout and much broader than the microbasidia (10.8-15.2 vs. 6.4-8 µm wide).

Pelger’s (1986) description, which incorporated Petch’s concept of H. firma, was apparently based on two different species. Petch’s collections (Petch 2299 and 4078) have a repent cutis with some upturned hyphal ends rather than a trichoderm, and further differs from H. neofirma in having a squamose pileus, and broader macrobasidia that are clavate-stipitate rather than narrowly clavate.


Description: Lodge & Pelger (1990).


Hygrocybe olivaceofirma Lodge, S. A. Cantrell & Nieves-Rivera, sp. nov.

Figs 39-43

Etym.: olivaceus, olive brown; firma, belonging to section Firmae.

Pileus 25 mm diametro planus depressus, perforatus; marginem translucenti-striato, revolutum, undulatum, superficie margine cruda, laevo-nervata, ad centrum et margine marronina gradientes versus marginem citrinae, 4-5 mm latae, distantes (1 per millimetro). Pileusus transparerent, cavus, superficie margine cruda, laevo-nervata, ad centrum olivacea-brunnea hygrophana, usque fumoso-purpureum, 4-5 mm lata, 4-5 mm sparsa, ad centrum et margine marronina gradientes versus marginem citrinae, 4-5 mm latae, distantes (1 per millimetro). Pileusus transparerent, cavus, superficie margine cruda, laevo-nervata, ad centrum olivacea-brunnea hygrophana, usque fumoso-purpureum, 4-5 mm lata, 4-5 mm sparsa, ad centrum et margine marronina gradientes versus marginem citrinae, 4-5 mm latae, distantes (1 per millimetro). Pileusus transparerent, cavus, superficie margine cruda, laevo-nervata, ad centrum olivacea-brunnea hygrophana, usque fumoso-purpureum, 4-5 mm lata, 4-5 mm sparsa, ad centrum et margine marronina gradientes versus marginem citrinae, 4-5 mm latae, distantes (1 per millimetro). Pileusus transparerent, cavus, superficie margine cruda, laevo-nervata, ad centrum olivacea-brunnea hygrophana, usque fumoso-purpureum, 4-5 mm lata, 4-5 mm sparsa, ad centrum et margine marronina gradientes versus marginem citrinae, 4-5 mm latae, distantes (1 per millimetro).
Fig. 43. Figs 39-48. H. olivaceofirma. Fig. 39. Basidiome. Fig. 40. Macrobasidium. Fig. 41. Microbasidium. Fig. 42. Macrospores. Fig. 43. Microspores. Figs 44-48. H. trinitensis. Fig. 44. Basidiomes. Fig. 45. Macrobasidium. Fig. 46. Microbasidium. Fig. 47. Macrospores. Fig. 48. Microspores.

Comments: This species was found only once on clay soil in Subtropical Wet Forest. It is a distinctive species within section Firma because of the combination of colours of the pileus, lamellae, and stipe. Pegler (1983) described H. naranjana from Trinidad but this species differs from H. olivaceofirma in lacking green tints in the pileus (Rose Red to Burnt Lake Purple instead of Olive Brown) and lamellae (Pinkish Vinaceous to Indian Red instead of Flesh Ochre grading to Lime Green). In H. naranjana, the stipe is pinkish vinaceous to buff yellow rather than rufous to orange-yellow and yellow, the stipe apex is smooth (lacking cauleocystidia), the macrobasidia are narrower (7.5-9.5 versus 9.6-13.6 Mm) and the clamp-connections are inconspicuous. Hygrocybe diversicolor from Sri Lanka is somewhat similar to H. olivaceofirma but it differs by having a darker stipe (greenish yellow to purplish grey or purplish black rather than rufous, orange-yellow, and yellow), smaller macrospores (9-11.5 × 5.2-7 µm vs. 10.4-16 × 6.4-10 µm), and larger basidia (Pegler 1986). Another possible relative is H. purpurea (Beeli) Heinem. described from southern Africa. However, H. purpurea differs from H. olivaceofirma in having a blackish red pileus and stipe and larger macro- and microbasidia (50-56 × 14-15 vs. 32-37.5 × 9.6-13.6 µm and 40-50 × 7-9 vs. 22-35 × 4-7 µm, respectively), bean shaped or slightly constricted spores, and less conspicuous clamp-connections (Heinemann 1963). Hygrocybe olivaceofirma could be mistaken for a faded H. prieta, but the shape of the macrobasidia (stout-clavate versus clavate-stipitate), orange-rufous tint in the lamellae, and absence of sterile pileus margin distinguish it from the latter species. Hygrocybe olivaceofirma can be distinguished from faded H. chloochlora by the olive-brown pigments in the pileus, the orange-rufous flush in the lamellae versus green or white, the stout clavate versus clavate-stipitate basidia, and smaller macrospores (10.4-16 × 6.4-10 µm vs. 15-22 × 7.5-12.5 µm) (Lodge & Pegler 1990).


Description: Lodge & Pegler (1990).

Hygrocybe trinitensis (Dennis) Pegler, Kew Bull. 32: 306 (1978). (Figs 44-48)

Pileus 4-8 mm, cylindric or truncate-parabolic, umbilicate, margin scalloped; surface Crimson (6.6 R 3.3/12.3), Poppy Red (5.9 R 3.8/14.3), with Orange-Yellow (10.0 YR 8.0/14.0) sterile margin, translucent-striate, radially fibrillose-silky, shiny, moist. Lamellae adnate with a decurrent tooth or decurrent, Crimson (6.6 R 3.3/12.3) to Peach Red (8.4 R 5.5/10.1), 3-3 mm broad; edge wavy, Orange Yellow (10.0 YR 8.0/14.0) at base, smooth, silky, moist. Spores dimorphous, subglobose or ellipsoid, hyaline, smooth, thin-walled, guttulate; macrospores 8.8-12.0 × 6.4-8.0 µm, Q = 1.2-1.8 (mean 1.35); microspores 6.4-8.8 × 4.4-6.4 µm, Q = 1.2-1.8 (mean 1.4). Basidia dimorphous, clavate; macrobasidia 32-55 × 8.8-12.8 µm, 4-spored, with basal clamp-connection; microbasidia 16.0-31.2 × 5.6-8.8 µm, 2-4-spored, sterigmata up to 7.2 µm long. Chelocystidia and pleurocystidia none. Lamella-edge fertile.

Comments: This small, red species has been reported previously only from the type locality in Trinidad (Dennis 1953) and from Cuba (Pegler 1987). There is also a collection from southern Texas at F. Most of our collections are from high elevations (Lower Montane Wet and Subtropical Rain Forest types) in the Luquillo Mts of Puerto Rico, but it was once collected at a lower elevation (300 m; Subtropical Wet Forest).


NOTE
For colour images of some of these beautiful species see the website: <http://www.cortland.edu/NSF/ga.html>.

ACKNOWLEDGMENTS
The first author was supported by funds from the USDA Forest Service, Washington office and the Forest Products Laboratory for a Postdoctoral fellowship, administered through the National Research Council with additional funding from the National Science Foundation, Biotic Surveys and Inventories Program, grant DEB-95.25902, to the Research Foundation of the State University of New York at Cortland. We thank the USDA Forest Service, International Institute of Tropical Forestry for providing facilities; the Puerto Rican Dept. of Natural Resources for granting collecting permits; D. Kolterman (Department of Biology, University of Puerto Rico) for the Latin descriptions; L. A. Bailey for computer, herbarium and logistical support, T. J. Baroni for loans of specimens and photographs and the following for collections: C. Laboy, V. Cuevas, J. Mercado, E. Terranova, M. Serrano, A. Nieves-Rivera, M. Boyd, L. Fish, N. Legon, L. Baroni, T. Baroni and E. Horak. We thank the curators of the following herbaria CORT, K, NY, NY and T. J. Baroni, E. Horak, and R. Courtecuisse for their valuable comments on drafts of this manuscript.

REFERENCES

Corresponding Editor: T. Lasne