

NOVA SCOTIAN AMANITAS. I.

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In this first paper in a series, 5 taxa of *Amanita* Pers. ex Hook. occurring in Nova Scotia are considered. *A. flavorubens* Berk. & Mont. var. *gracilis* is described as a new variety, and *A. wellsii* (Murr.) Sacc. is reported for the first time from the province.

Dans ce premier d'une série d'articles, on considère 5 taxons d'*Amanita* Pers. ex Hook. rencontrées en Nouvelle-Écosse. On décrit une nouvelle variété, *A. flavorubens* Berk. & Mont. var. *gracilis*, et on signale pour la première fois la présence dans la province d'*A. wellsii* (Murr.) Sacc.

Introduction

This is our first paper in a series on the amanitas occurring in Nova Scotia. The genus *Amanita* Pers. ex Hook. contains some of the most beautiful, edible, poisonous, and conspicuous mushrooms in the province.

Somers (1881; 1890) compiled 6 lists of Nova Scotian fungi between 1880 and 1890 where he reported 6 species of *Amanita*. Additional reports by Mackay (1908; 1913) and Wehmeyer (1950) increased to 22 the number of species collected in the province. Stewart and Grund (1974) described 2 new species and recognized 25 species and 7 varieties.

In this first paper we consider 5 taxa, of which *A. wellsii* (Murr.) Sacc. and *A. flavorubens* Berkley & Montagne var. *gracilis* var. nov. are reported for the first time from the province. Species complexes and other new taxa will be treated in future papers.

Color references are taken from 3 sources, namely: *Reinhold Color Atlas* (Kornerup & Wanscher 1962), designated thus, 6A7 - light brown, etc.; *Color Standards and Color Nomenclature* (Ridgway 1912), designated thus, "Vinaceous-Buff", etc.; and the National Bureau of Standards color charts (Kelly & Judd 1976), designated thus, ISCC-67 - vivid reddish, etc. Color terms taken from the 3 above-mentioned references are enclosed in parentheses; all other color terms mentioned are ours.

Several macrochemical reactions are useful tests on certain taxa of agarics and boleti. Singer (1962, p 77) presents a general history of these tests. Grund and Harrison (1976, p 16) list the chemical reagents and their formulation. An asterisk after a collection number indicates that all camera lucida drawings were based on that collection. All scale markers for microscopic structures are 10 μm . Collections are deposited in the E.C. Smith Herbarium (ACAD), located at Acadia University. Symbols used in the figures are as follows: A = annular terminal cells; C = pseudocystidia or marginal cells at the edge of the lamellae; V = cells of the volva, B = basidioles and basidia; S = spores.

***Amanita umbonata* Pomerleau**

Flore def. Champignon au Québec, pp. 516-518. 1980.

Amanita caesarea (Fr.) Schw. var. *americana* Gilbert in Bres. Icon. Myc. 27: 235. 1941.

Figure 1

Basidiocarp: Pileus 8.0-13 cm broad; shape irregularly conic when young, expanding to subplane, center umbonate, umbo usually low, broadly round, and prominent; margins broadly rounded, sometimes uplifting in old age, striate; surface glabrous; color scarlet red (9B8 - lobster red) immediately upon emergence from universal veil fading to reddish orange (7A8 - reddish orange; ISCC-34 - vivid reddish orange) when young, at maturity fading to yellow (4A7 - sunflower yellow; ISCC-67 - brilliant orange yellow) with a reddish orange umbo (7A8), at maturity and in old age the margins sometimes fading to nearly white; context soft, pallid to pale yellow, thin at margins; odor not distinctive, taste pleasant to lacking. Chemicals on section of pileus: formaldehyde - color of cutis oozes out; guaiac - slowly greenish on edges of lamellae; FeSO_4 - cutis brownish; guaiacol - context slowly pink; aniline - orange color oozes from cutis; phenol aniline - cutis blackens slowly; 14% NH_4 - oozes yellowish color from cutis; KOH - bleaches cutis to yellow; phenol - cutis purple extending into context. Chemicals on pileal surface: conc. NH_4OH - cutis yellow; KOH - pale yellow. Lamellae free, close, tapering slowly from margin to apex of stipe; yellow (3A3 - pale yellow; ISCC-89 pale yellow). Stipe 11-15 cm long, 0.8-1.3 cm thick, expanding to subbulbous basally; surface glabrous, subviscid, fibrils raising when handled; finely tomentose above annulus; color pale orange apically (5A4 - light orange; ISCC-70 - light orange yellow) becoming pale orange or pale yellowish, (ISCC-89 - pale yellow) at base; annulus membranous, pendant, superior, orange (5A7 - chrome yellow; ISCC-66 - vivid orange yellow) fading to yellow (4A4 - pale yellow, ISCC-89 - pale yellow); volva thick, soft, pliable, membranous, white, sheathing lower quarter to third of stipe; context of stipe pale yellow, stuffed when young, hollowing at maturity.

Spores 8-10 x (6)7-9 μm , white, smooth, ellipsoid, ovoid, to subglobose, nonamyloid, apiculus prominent. Basidia 30-37 x 9-10 μm , clavate, thin-walled, 2- or 4-spored, hyaline in water. Pseudocystidia on edges of lamellae 25-40 x 14-22 μm , clavate or subbulbous, thin-walled, hyaline in water (possibly of annular origin, Bas 1969, p 322). Pileipellis consisting of a layer of gelatinous interwoven hyphae, about 350 μm thick. Pileal context consisting of interwoven thin-walled hyphae 5-15 (20) μm broad. Lamellar trama composed of a bilateral mediostratum consisting of thin-walled hyphae 15-25 μm broad, and a subhymenium of oval, globose, or ellipsoid cells 8-10 μm in diameter. Context of stipe covered by a caulopellis of tightly interwoven hyphae 5-8 μm thick, and the center stuffed with thin-walled hyphae 20-30 μm thick. Annulus of loosely interwoven hyphae with clavate to subclavate terminal cells 20-70 x 12-18 μm , many identical with those found on the lamellar edges. Volva consisting of interwoven hyphae 5-7 μm thick, interspersed with large, collapsed, thin-walled cells.

Habit and Habitat: Gregarious under deciduous trees (poplar, oak, with understory of honeysuckle).

Material Examined: ACAD 13035*, Agriculture Centre, Kentville, Kings Co., Harrison, 31 July 1979; ACAD 11562, Agriculture Centre, Kentville, Harrison, 21

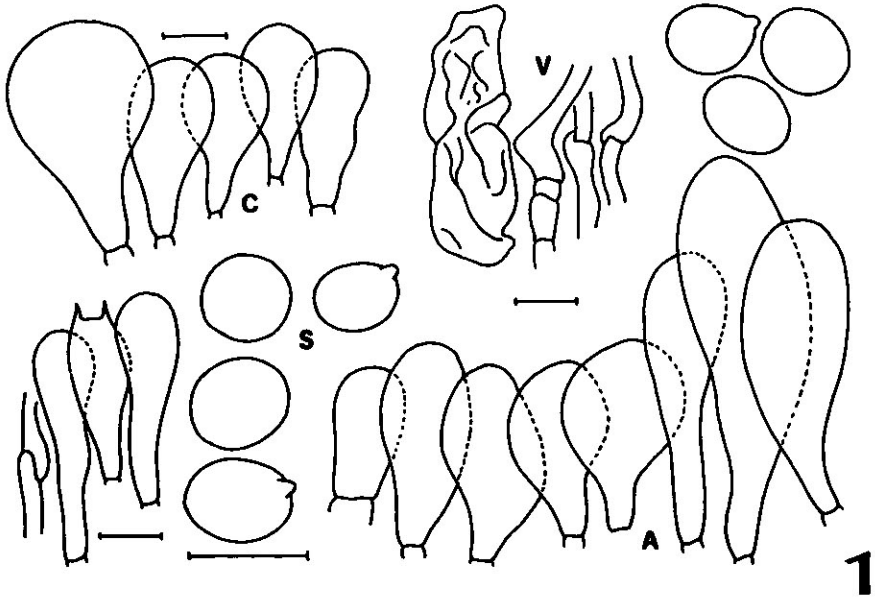
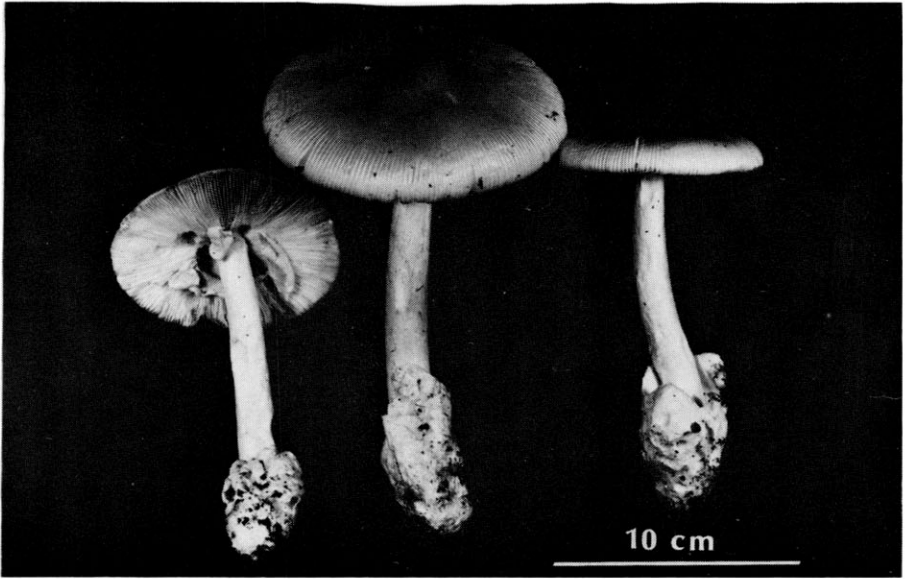
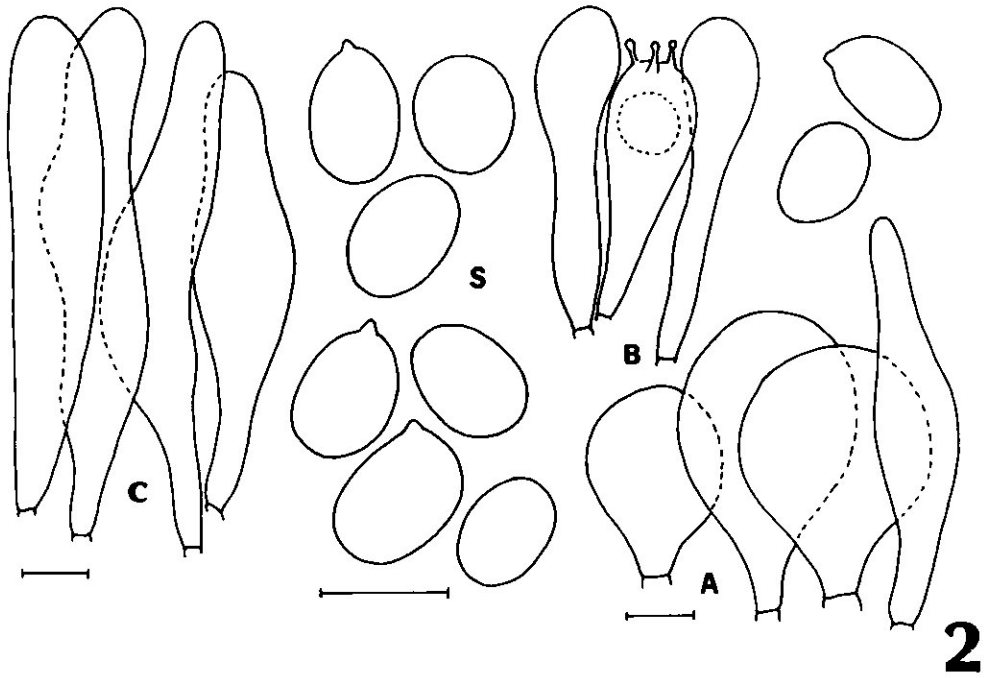
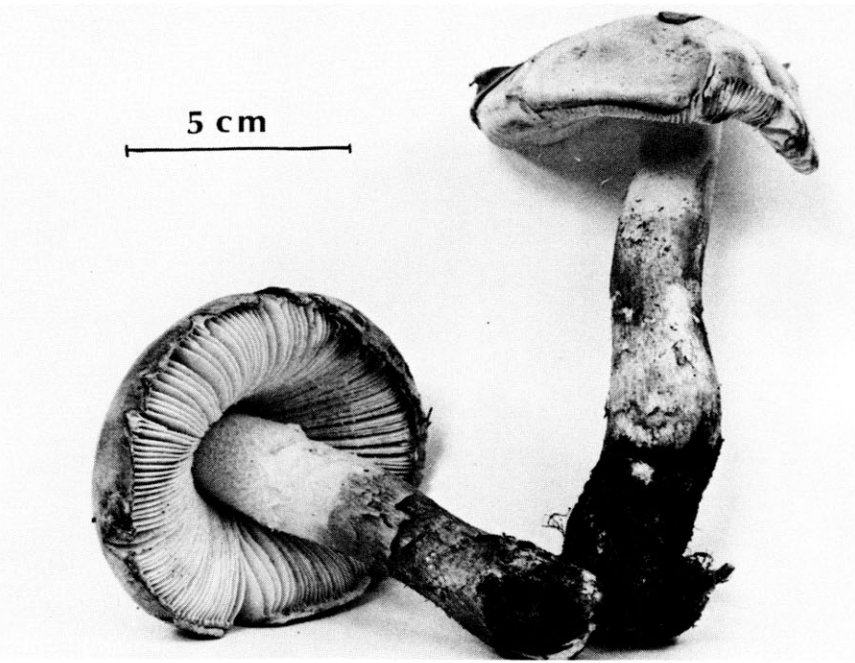


Fig 1. *Amanita umbonata*.

July 1976; ACAD 11926, Agriculture Centre, Kentville, Harrison, 9 Aug. 1977; ACAD 10216, south edge of Gaspereaux Valley, Kings Co., Grund, 11 Aug. 1973.

Comments: This fungus is a beautiful North American mushroom. These collections differ from the typical form in the prominent broad pileal umbo that remains reddish orange after the margins have faded to yellow. "Caesar's" mushroom is edible and choice, and easily identified. It is uncommon in Nova Scotia. Pomerleau (1966) reports *A. caesarea* var. *americana* from Quebec. Coker (1917, p. 19 & Pl. 110) described and illustrated a taxon without the broad umbo, indicating a different variety than the one described here.



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Fig 2. *Amanita wellsii*.

***Amanita wellsii* (Murr.) Sacc.**

Syll. Fung. 13: 2-3. 1925.

Venenarius wellsii Murr. Mycologia 12: 291 - 292. 1920.*Amanita wellsii* Murr. Mycologia 12: 292. 1920.

Figure 2

Basidiocarp: Pileus 3-5 cm broad, convex, expanding to plane with slightly rounded margins; surface glabrous with minute yellowish remnants of universal veil on disc, at times subviscid; margins glabrous, nonstriate, in age becoming rimose, fragments of pellicle sometimes pendant on margins; color apricot orange ("Ochraceous-Salmon"; ISCC-52 - light orange; to "Pale Ochraceous-Buff"; ISCC-92-yellowish white), uniform; context compact, firm, pale yellow, orange under pellicle, unchanging, taste and odor lacking. Macrochemical reactions of the pileus: phenol-aniline - brown under pellicle; aniline - light purple under cuticle; phenol - brown under cuticle. Lamellae 8-10 mm wide, pale yellow ("Massicot Yellow"; ISCC-89 - pale yellow), lamellulae lacking. Stipe 4-9 cm long, 9-15 mm thick, mostly equal, slightly expanded basally, base sometimes bulbous; surface covered with fine floccose scales, furfuraceous above annulus, becoming nearly glabrous below; color ("Maize Yellow"; ISCC-89 - pale yellow) at apex, becoming ("Tawny-Olive"; ISCC-94 - light olive brown) at base; annulus superior, of loosely woven hyphae that may hang free or adhere to stipe; volva reduced, floccose scales of loosely interwoven hyphae, often sloughing away in age or when picked; caulopellis firm and yellow; context soft and white, stuffed, becoming hollow in age, unchanging.

Spores 12-13 x 7-8 (9) μm , ovoid to ellipsoid, smooth, thin-walled, hyaline in KOH, nonamyloid, apiculus apical to sublateral. Basidia 35-55 x 10-13 μm , clavate, thin-walled, 4-spored. Pseudocystidia marginal cells (Bas 1969, p 322) 70-80 x 13-15 μm , clavate, subventricose, apices rounded, thin-walled, rare. Annulus of loosely interwoven hyphae; terminal cells 30-55(75) x 18-25 μm , clavate, ventricose to subovoid, thin-walled; hyphae 5-16 μm thick, thin-walled; no clamps observed. Pileipellis a thin turf (trichodermium) of non gelatinized hyphae mostly 4-6 μm thick overlaying a subcutis of yellow interwoven hyphae 100-120 μm thick. Pileal context of tightly interwoven hyphae 7-15 μm thick. Lamellar trama slightly bilateral, of thin-walled hyphae 8-10 μm thick; subhymenia not observed.

Habitat: Growing singly in gravel and bare soil along roadside cuts and shoulders.

Material Examined: ACAD 13102, Bay St. Lawrence, Cape Breton I., J. Timpa, 20 Aug. 1979; ACAD 13111, Kentville, Kings Co., Harrison, August 1979.

Comments: This is the first report of this beautiful light-orange mushroom from Nova Scotia; however, Jenkins (1977) provides a description and color illustration for material from New England and North Carolina.

***Amanita rubescens* (Fr.) S.F. Gray**

Nat. Arr. Brit. Pl. 1: 600. 1821.

Agaricus rubescens Fr. Syst. Myc. 1: 18. 1821.*Venenarius rubens* Murr. Mycologia 5: 75. 1913.*Amplariella rubescens* (Fr.) Gilbert. Iconogr. Mycol. Milano 27, Suppl. 1, p 78. 1941.

Figure 3

Basidiocarp: Pileus (3)4.5-10(11) cm broad, convex to ovoid when young, expanding to broadly convex then finally to almost plane with margin broadly rounded, sometimes with a low broad umbo; surface glabrous and sticky (subviscid), with floccose scales that are remnants from the universal veil; margins incurved at all ages, pellicle separable, slightly striate in some specimens; color variable from nearly whitish red to reddish, (9A2 - reddish white; ISCC-7 - pale pink; 9B4 - dull red; ISCC-18 - light grayish red), the disc often darker than margins, warts dingy whitish or stained reddish; context pallid white, changing to reddish upon exposure and injury, soft; odor and taste not distinctive. Lamellae free, close, with 2 series of lamellulae, ivory white, stained reddish or pink. Stipe (8)10-16 cm long, 0.7-1.2 (1.5) cm thick, mostly equal or tapering slightly toward apex, base bulbous, bulb 1.5-2.5 cm broad; surface of apex fibrous and minutely floccose or pruinose, sometimes slightly striate, mostly minutely fibrous or floccose or subglabrous below annulus to bulbous base, annulus superior, moderately thick, soft, delicate, white and sometimes stained pinkish; stipe white with pinkish tints to brownish at apex, becoming mostly pallid toward base, bruising pinkish and reddish overall; volva evanescent, lacking or reduced to a few patches of scales adhering to bulb, remnants staining reddish.

Spores 8-10 x 6-7 μm , white, smooth, amyloid, globose, or subglobose to ellipsoid. Basidia 30-35 x 8-10 μm , clavate, thin-walled, mostly 4-spored, projecting beyond hymenium, hyaline in KOH or water. Pseudocystidia at edges of lamellae 20-30(35) x 12-25 μm , globose, clavate or ovoid, thin-walled. Pileipellis consisting of a viscid pellicle approximately 100-140 μm thick covering a sublayer of interwoven hyphae approximately 80-100 μm thick, hyphae in this layer containing reddish-brown membrane pigment. Pileal context of interwoven irregular hyphae, mostly 20-30 μm thick, interspersed with narrow (5-7 μm) cells; clamps infrequent. Lamellar trama composed of bilateral mediostratum of thin-walled hyphae mostly 12-20 μm thick, and a subhymenium approximately 20-25 μm thick consisting of spherical, oval, or inflated irregular cells mostly 10-25 μm broad. Annulus of interwoven hyphae 3-5 μm thick; occasionally with large, embedded sphaerocyst-like cells resembling the pseudocystidia found in lamellae. Volva of collapsed ovoid cells, thin-walled, 40-100 x 25-40 μm , and thin-walled hyphae mostly 4-5 μm wide; clamps not observed.

Habit and Habitat: Solitary, scattered to gregarious, in coniferous woods or under oaks.

Material Examined: ACAD 10365, Alpena Rd., Inglisville, Annapolis Co., Boyd Gehue, 7 Aug. 1979.

Comments: *Amanita rubescens* is common in Nova Scotia and while it is listed as edible no one in our immediate circle of friends has had the courage to test it. One reason is that it is an extremely variable species as it grows around Kentville with numerous morphological and color variants that indicate an unusually wide genetic make-up. These variants range from forms that are strongly reminiscent

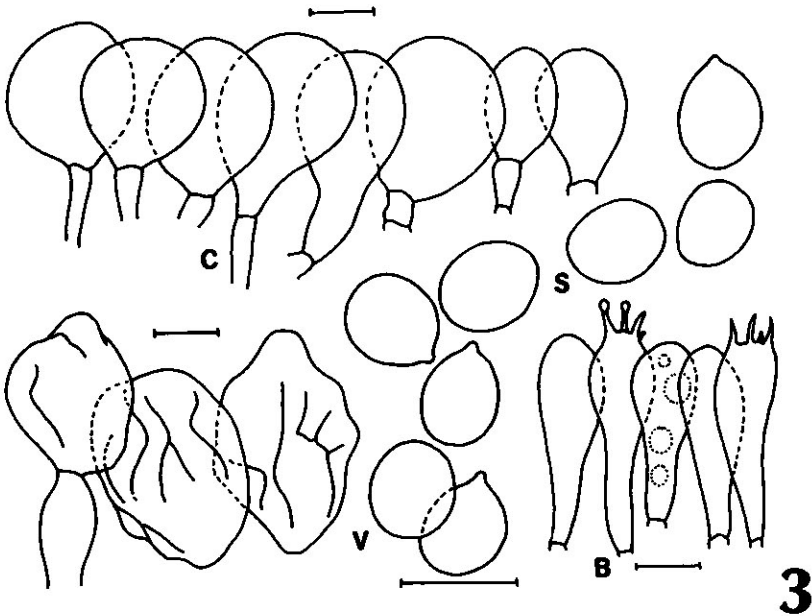


Fig 3. *Amanita rubescens*.

of *A. flavorubens* to others that are almost white with only the faintest blush of reddish colors. This is particularly true on a lawn in Kentville shaded by huge red oaks where there is an abundance of *A. virosa*, *A. bisporigera*, *A. flavorubens*, and *A. flavoconia* growing whenever conditions are favorable. Possibly a chemist can be found to test the numerous variants for poisons.

This is a beautiful and distinctive amanita, particularly as it grows in the spruce and hemlock forests, and it can usually be easily identified. However, this taxon requires additional field data on the numerous forms under oaks before we can be certain that gene exchange is not occurring with other species.

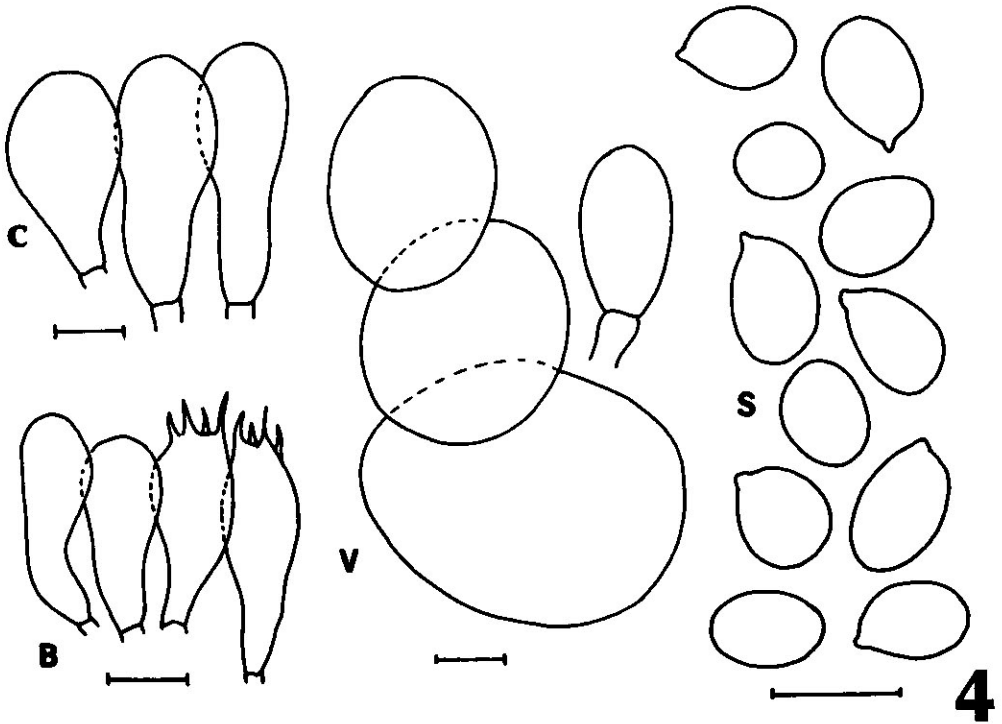
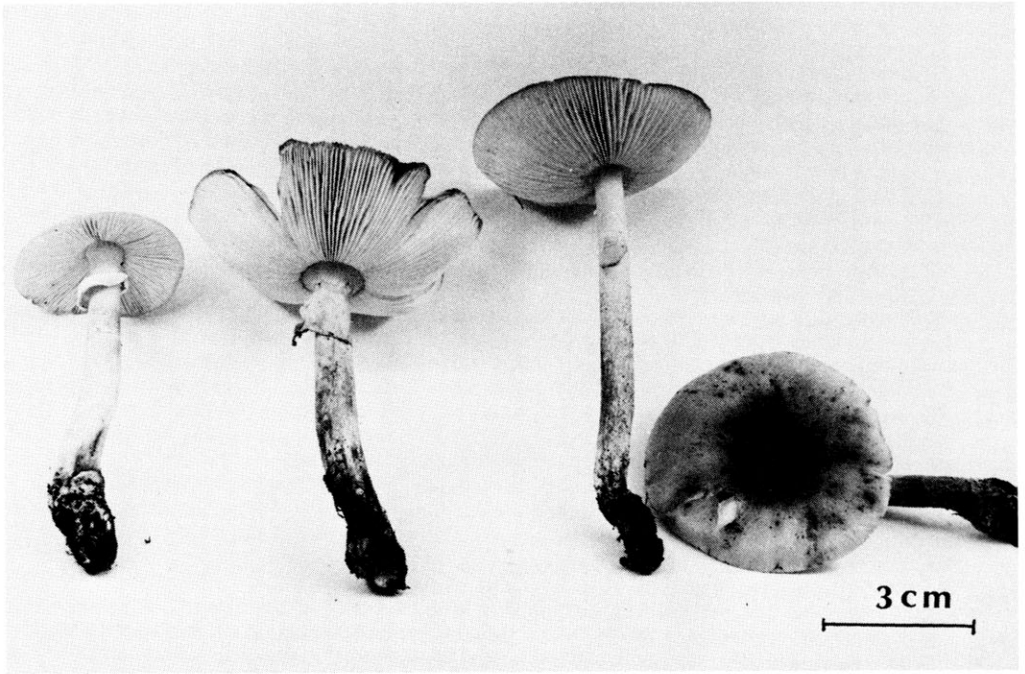


Fig 4. *Amanita flavorubens* var. *gracilis*.

***Amanita flavorubens* Berk. & Mont. in Mont.**

Syl. Gen. Spe. Crypt. Paris 1846

var. *gracilis* var. nov.*A. flavorubescens* Atk. J. Myc. 8: 111. 1902.**Figure 4**

Pileus 3.5 - 6 cm latus, convexus et expansus, melleus, glaber, non striatus; lamellae liberae, confertae; stipes 7 - 9 cm longus, 5 - 8 mm crassus, pruinosis; annulus membranaceus, pallidus; volva evanescent. Sporae 7 - 9(10) x (5)6 - 7 μ m, subgloboseae vel subellipsoideae, amyloideae. Typus in herbario E.C. Smithii, Universitatis Acadiae (ACAD) conservatus.

Basidiocarp: Pileus 3.5 - 6 cm broad, convex becoming depressed on disc at maturity, finally margins uplifting in old age; surface glabrous, sometimes with a few yellowish remnants of universal veil, polished when dry; margins at first entire, splitting radially in age or when dry, nonstriate, somewhat frayed at edges in old age; color light brown (5D5 - clay; ISCC-72 - dark orange yellow) on disc, fading to light brown (5D4 - blond; ISCC-76 - light yellowish brown) at margins, all colors darkening in old age; context white becoming light brownish in age, yellowish under cutis at pileal apex; taste and odor not distinctive, chemicals on flesh negative in all reactions. Lamellae 2.5 cm broad, 3 mm wide; close, free, in 2 series, pallid. Stipe 7-9 cm long, 5-8 mm thick at apex, equal to slightly expanded basally; volva reduced to yellow floccose remnants; annulus white, superior, membranous, collapsing in age, usually adhering to stipe; surface pruinose on apex above annulus, mostly glabrous with thinly overlain fibrils or pruinae resulting from adhesion of veil remnants, often glabrous in age, fibrous when handled, brownish becoming reddish in lower half; context white in center, caulopellis off-white, staining brownish at base, stuffed becoming hollow in old age.

Spores 7-9(10) x (5)6-7 μ m, subglobose, oval, subellipsoid to obovoid, amyloid, thin-walled, smooth, colorless in KOH, with medium-sized apiculus. Basidia 27-30 x 10-12 μ m, thin-walled, hyaline in KOH, mostly 4-spored. Cystidioid cells on edges of lamellae (marginal cells) 25-35 x 12-15 μ m, projecting beyond hymenium, mostly clavate, uncommon to rare. Lamellar trama bilateral, composed of inflated thin-walled hyphae mostly 70-90 x 25-40 μ m, elongate, reniform, subfusoid to ellipsoid; subhymenium mostly 10-25 μ m thick, of sub-globose or ovoid cells. Pileal context of interwoven thin-walled hyphae 5-8(10) μ m wide, and large thin-walled, elongate, reniform, or ovoid hyphae mostly 80-100 x 30-40 μ m, many containing gas when mounted in water; clamps not observed. Pileipellis a layer of mostly gelatinized hyphae 80-100 μ m wide, the nongelatinized cells 205 μ m wide. Cells in the volvar remnants 40-70 x 10-35(40) μ m, clavate to mostly ovoid, interspersed with loosely interwoven thin-walled hyphae 3-5 μ m wide.

Habit and Habitat: Solitary to gregarious in grass under red oaks (*Quercus borealis* Michx.).

Material Examined: ACAD 13019 (Type), Kentville, Kings Co., Harrison, 19 July 1979.

Comments: *Amanita flavorubens* is a highly variable taxon. *Amanita flavorubens* var. *gracilis* differs from variety *flavorubens* in its long, slender, deep-rooting stipe that lacks a defined volva, and a glabrous pileal surface. The volva is a mass of yellowish scales and remnants from the universal veil that fall away and

remain in the ground upon picking. *Amanita flavorubens* is uncommon in North America but is abundant under red oaks in Kentville, N.S. This gracile variety is probably the least common and most distinctive of several varietal forms that remain to be described.

***Amanita vaginata* Bull. ex Fr.) Vitt. sensu lato**

Tent. Mycol. s. Ama. Illust. Medi. 1826.

- Vaginata fulva* (Fr.) A.H. Smith. Mushrooms in their Natural Habitats, p 396. 1949.
Amanita vaginata var. *fulva* Gillet. Les Hymenomycetes, p 51. 1874.
Amanita vaginata subsp. *fulva*. Konrad & Maubl. Icon. Sel. Fung. 6: 33. 1924.
Amanita vaginata f. *fulva* Veseley. Atlas Champ. Eur. fasc. 4-5: 49. 1934.
Amanita fulva Secr. Mycogr. Suisse 1: 37. 1833 (invalidated).
Amanitopsis vaginata (Fr.,) Roze, Bull. Soc. Bot. France 23. 1876.
Amanitopsis vaginata var. *fulva* Sacc. Syll. Fung. 5: 21. 1887.
Amanitopsis fulva Fayod. Ann. Sci. Nat. Ser. 7, 9: 317. 1889.

Figure 5

Basidiocarp: Pileus (3)4.5-7.5 cm broad, at first conic becoming convex, then plane, and finally centrally depressed in old age, prominently umbonate; margins deeply striate to sulcate; glabrous slightly viscid (sticky when held to lips); color (5F4 - dark brown; ISCC-78 - dark yellowish brown to 7D8 - burnt sienna; ISCC-72 - dark orange yellow; "Cinnamon") at the margins; context thin, soft to brittle, white, unchanging; taste and odor not distinctive. Chemicals on pileal sections: formalin - pink; guaiac - lamellae green; FeSO_4 - gray; guaiacol - vinaceous purple; phenol aniline - commencing as a vinaceous reaction directly above lamellae, becoming deep reddish brown; phenol - deep reddish brown. Chemical reactions on cutis all negative. Lamellae white or pallid, becoming orange gray when old, close, free, broadest at margin, edges finely irregular. Stipe 8.5-15 cm long, 5-8 mm thick, mostly equal or sometimes tapering apically; surface pruinose, or squamulose to sometimes subfibrillose; color that of the pileal margin, usually a shade of light orange; annulus absent; volva membranous, tightly sheathing, grayish to grayish orange, usually with brown or cinammon stains or spots; context white with firm rind, stuffed becoming hollow, finely floccose on interior walls of rind.

Spores 8-10 μm , globose, smooth, nonamyloid, hyaline in water. Basidia 45-60 x 10-15(18) μm , clavate, thin-walled, 2- or 4-spored. Pileal surface a turf about 250-300 μm thick of interwoven irregular hyphae 6 x 10 μm broad, subgelatinous, with brown intracellular pigment in most hyphae. Pileal context of interwoven, irregular, thin-walled hyphae mostly 15-25 μm wide. Lamellar trama composed of a mediostratum and subhymenium, the bilateral medio-stratum of large subclavate cells about 25-30 μm wide, the subhymenium of spherical, oval, or ellipsoid thin-walled cells mostly 15-20 μm diameter. Volva of interwoven hyphae mostly 4-6(10) μm thick, terminal cells 20-30 x 10-20 μm that are globose or ellipsoid, and sphaerocysts (20)30-40 μm , thin-walled and usually collapsed when mounted in water.

Habit and Habitat: Gregarious in coniferous or mixed forests, often growing in *Sphagnum*.

Material Examined: ACAD 10327*, Port Williams, Kings Co., Harrison, 27 July 1979; ACAD 11779, Auburn, Kings Co., Harrison, 11 Sept. 1976; ACAD 10944, Buckfield, Queens Co., H. Stewart, 20 Aug. 1966; ACAD 10990, Hebb's Cross. Lunenburg Co., H. Stewart, 28 Sept. 1966; ACAD 1088, Aylesford, Kings Co., H. Stewart, 29 July 1967.

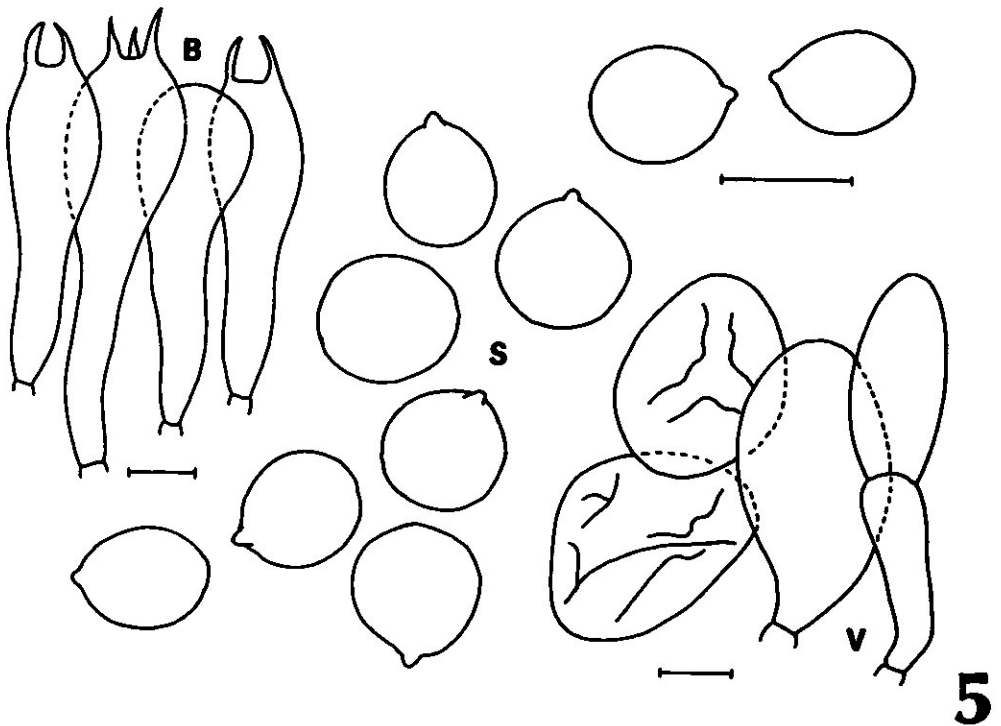
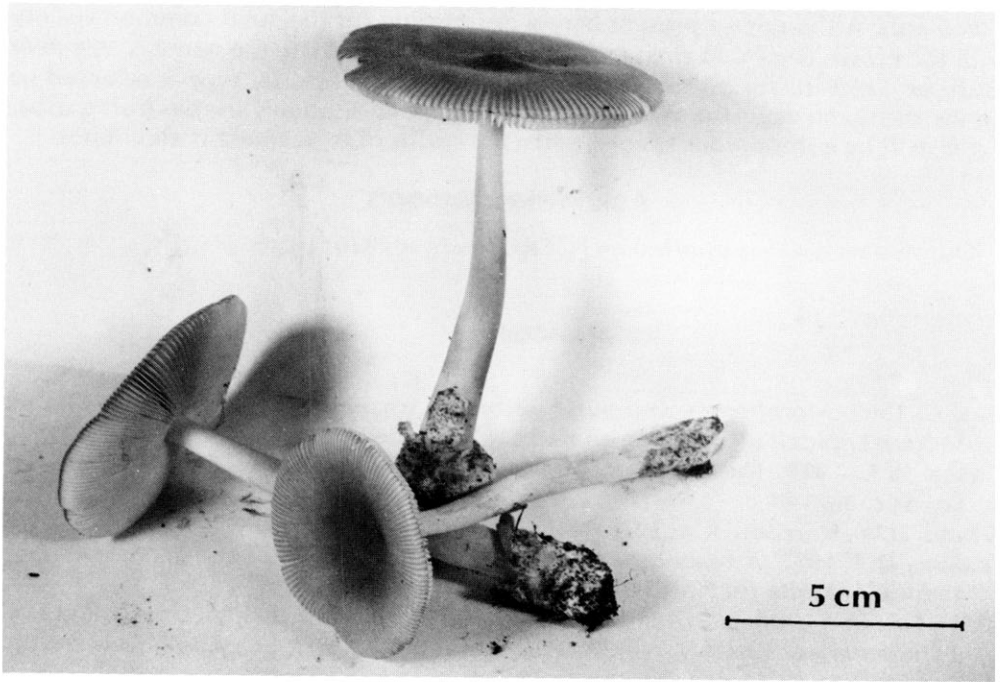


Fig 5. *Amanita vaginata*.

Comments: Although we present here a description for the most common variety with the brown cap (*A. vaginata* var. *fulva*) we choose to use the name *A. vaginata* (Bull. ex. Fr.) Vitt. for all the varieties until a nomenclatorial type is selected to define the taxon *vaginata*. We believe that the Nova Scotian varieties (*fulva*, *alba*, *livida*) will be autonomous species when the status of *A. vaginata* is elucidated.

Acknowledgements

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