short stem. The pileus is relatively much broader than the stem and is often exceedingly rough-scabrous on the surface, especially in dry weather. It seems distributed over the northeastern portion of the United States, but is not often collected. The stem is often spotted with darker spots.

60. Lactarius scrobiculatus Fr. (Poisonous)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 971.
Gillet, Champignons de France, No. 392.
Patouillard, Tab. Analyt., No. 409.
Michael, Führer f. Pilzfreunde, Vol. II, No. 53.
Hard, Mushrooms, Fig. 133, p. 169, 1908.
Ricken, Blätterpilze, Pl. 9, Fig. 2.

PILEUS 7-17 cm. broad, convex-depressed, at length infundibuliform, varying azonate to markedly zonate, *viscid when moist,* often covered by a thin, hairy tomentum, *straw-yellow to dark ochraceus,* becoming subferruginous and areately cracked when dry, *margin* at first involute and *tomentose-hairy or densely fringed.* FLESH compact, firm, white, changing to yellowish from the milk. GILLS adnate, subdecurrent, narrow, crowded, sometimes forked or anastomosing on stem, whitish or yellowish, darker where wounded. STEM 3-6 cm. long, 2.5-3 mm. thick, *stout,* short, equal, stuffed then hollow, glabrous, concolor or paler than pileus, *with depressed, roundish spots of a brighter color.* SPORES subglobose-elliptical, "minutely echinulate, 6.5-7x8-10 micr., white." (Burl.) MILK white, *changing quickly to sulphur-yellow, acrid. Poisonous.*

Gregarious. On the ground in moist woods, or along mossy margins of swamps, mostly in coniferous regions. Bay View, Huron Mountains, New Richmond. July-August. Infrequent.

The well-marked depressed spots on the stem and the tomentose-hairy margin distinguish it. The margin finally becomes spreading or elevated and the tomentosity gradually disappears. The zones of the pileus may be very obscure or quite distinct; in one large specimen I counted seventeen zones. It is a magnificent mushroom when in full luxuriance, but is not often found.

61. Lactarius torminosus Fr. (Poisonous)

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 28.
Cooke, Ill., Pl. 972.
Gillet, Champignons de France, No. 395.
Michael, Führer f. Pilzfreunde, Vol. I, No. 38.
Hard, Mushrooms, Fig. 127, p. 165, 1908.
Atkinson, Mushrooms, Fig. 118, p. 119, 1900.
Ricken, Blätterpilze, Pl. 9, Fig. 3.

PILEUS 4-10 cm. broad, convex, depressed to subinfundibuliform, viscid when young or moist, ochraceus-buff *tinged with rosy-flesh color,* spotted-zoned, sometimes paler and azonate, *margin* at first involute and *persistently tomentose-hairy or fringed,* disk glabrous. FLESH rather soft, thick, white or tinged incarnate. GILLS decurrent, narrow, thin, close, some forked at base, whitish to creamy, *at length incarnate or reddish-yellow.* STEM 3-6 cm. long, 1.5-2 cm. thick, short, equal or tapering downwards, glabrous or pruinose, even, stuffed then hollow, flesh-color, paler below, sometimes spotted. SPORES "elliptical, echinulate, 8-10x6-8 micr., white." (Burl.) MILK white, *unchanging, very acrid. Poisonous.*

Gregarious. On the ground in mixed forests of birch and hemlock, etc., and in frondose woods of oak, maple, elm, etc.

Throughout the state, from the southern limits to Isle Royale. July-September. Frequent.

Known by the tomentose-fringed margin of the pileus, the zones on the surface, the white, acrid milk which remains unchanged, and the pinkish-yellow or ochraceus color. It must be carefully distinguished from the edible species like *L. deliciosus.* It is usually much paler than the latter, but occasionally approaches it in its colors, and *L. deliciosus* has colored milk and the margin of pileus is naked. *L. torminosus* is poisonous, yet the Russian peasants are said to preserve it and eat it seasoned with oil and vinegar.

62. Lactarius cilicioides Fr. (Poisonous)

Syst. Myc., 1821.

Illustration: Cooke, Ill., Pl. 973.

"PILEUS 4-10 cm. broad, broadly convex or nearly plane, umbili-

cate or centrally depressed, occasionally subinfundibuliform, *covered with long matted hairs or tomentum,* the center sometimes naked with age, *azonate,* viscid when moist, white, reddish, buff or dingy incarnate. FLESH soft. GILLS adnate or slightly decurrent, thin, rather narrow, close, some forked, white or tinged with yellow or incarnate. STEM 2-3 cm. long, 6-12 mm. thick, *short,* equal or tapering downward, pruinose, stuffed then hollow, *not spotted,* white or whitish. SPORES globose-elliptical, 6-8 micr., white. MILK white, sparse, slowly changing to pale yellow, *acrid.*

"In pine woods. September-October."

The description is adapted from Peck (N. Y. Mus. Rep. 38) who remarks that it is distinguished from all others by its conspicuously woolly pileus. The hairs or fibrils are long and intricately matted, and very viscid in wet weather. The milk is said to be very sparse, and in a white variety, sometimes wanting. I have not yet found it in the state, but as it is said to be *poisonous* like the preceding, to which it is closely related, it seemed desirable to include it. The white variety might be mistaken for a Russula.

63. Lactarius vellerius Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 980.
Bresadola, Fungh. Mang. e. Vel., Pl. 67.
Gillet, Champignons de France, No. 400.
Ricken, Blätterpilze, Pl. 10, Fig. 2.
Hussey, Illust. Brit. Myc. I, Pl. 63.
White, Conn. Geol. Nat. Hist. Surv., Bull. 15, Pl. 13.

PILEUS 6-12 cm. broad, subrigid, convex-umbilicate, at length expanded and concave-depressed, *dry, white or whitish, entirely minutely tomentose,* velvety to the touch, margin at first involute then spreading or elevated. FLESH compact, thick white or *stained* from the milk. GILLS adnate-subdecurrent, *subdistant to distant,* moderately broad, somewhat forked, whitish to creamy-yellow becoming brownish-stained. STEM 1.5 cm. long, 1.5-3 cm. thick, equal or tapering downward, *short, stout, pruinose-pubescent,* white, rigid, solid. SPORES subglobose to broadly elliptical, *nearly smooth,* 7-9 micr., white. MILK white, unchanging or temporarily cream-colored, sometimes lacking, *acrid. Poisonous.*

Gregarious. On the ground in mixed and frondose woods, often very abundant.

Throughout the state from the southern limits to Lake Superior. July-September. Rather frequent locally.

This differs from *L. piperatus* in the velvety-tomentose pileus and rather distant gills. *L. deceptivus* has a thick, cottony tomentum on the involute margin, but is almost glabrous elsewhere. Sometimes the milk of *L. vellerius* seems to be lacking, when it might be mistaken for *Russula delica;* the latter, however, lacks the tomentosity of the pileus as a rule, and often has a greenish tinge on the apex of the stem and the edge of the gills. Its edibilty is questioned, but McIlvaine ate it for years. Others also consider it edible since it loses its acridity when cooked. Without doubt it can be eaten by some, but like *Lepiota morgani,* causes bad effects in others. The nature of its harmful principle should be investigated.

64. Lactarius deceptivus Pk. (Edible)

N. Y. State Mus. Rep. 38, 1885.

Illustrations: Peck, N. Y. State Mus. Rep. 54, Pl. 70, Fig. 7-I, 1901.
White, Conn. Geol. & Nat. Hist. Surv., Bull. 3, Pl. 8, op. p. 30.
Hard, Mushrooms, Fig. 129, p. 167 (poor).

PILEUS 7-15 cm. broad, firm, convex-umbilicate, then expanded-depressed or subinfundibuliform, dry, glabrous or nearly so except the margin, *white or whitish,* often with dingy rusty stains, *margin* at first involute and *densely cottony-tomentose,* then spreading or elevated and fibrillose. FLESH compact, thick, white. GILLS adnate-subdecurrent, *rather broad,* subdistant, some forked, white or cream-yellow. STEM 3-7 cm. long, 1-4 cm. thick, stout, short, *solid,* equal or tapering downward, pruinose-pubescent, white. SPORES subglobose to broadly elliptical, 9-12 micr., echinulate, white. MILK white, unchanging, *acrid. Edible.*

Gregarious. On the ground, especially in coniferous woods, occasionally in frondose woods.

Isle Royale, Huron Mountains, Marquette, Houghton, Detroit; throughout the state. July-September. Sometimes very abundant in the north.

Easily confused with *L. vellerius,* from which it differs in the thick, cottony inrolled margin of the pileus and its glabrous surface elsewhere. It has also large spores as compared with *L. vellerius.* It has been eaten in quantity by Peck who pronounces it of fair quality, since the acrid taste disappears in cooking; with us it is far

more abundant in the Northern Peninsula, apparently prefering the colder latitude or altitude. It is said to be most abundant in the mountainous regions in the eastern United States.

65. Lactarius controversus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 29.
Bresadola, Fungh. mang. e. vel., Pl. 61.
Gillet, Champignons de France, No. 381.
Cooke, Ill., Pl. 1003 (extreme form).

PILEUS 8-20 cm. broad, firm, convex and broadly umbilicate or depressed, at length infundibuliform, *viscid* when moist, appressed subtomentose or flocculose, *white at first,* at length tinged incarnate and *stained with brownish flesh colored spots, obscurely* zoned toward margin which is at first involute but soon spreading and elevated or reflexed. FLESH white or at length slightly incarnate. GILLS attenuate behind, at length ascending-decurrent, abrupt, *narrow, crowded,* whitish at first *then strongly incarnate* to pink-incarnate, thin, rather easily separable from pileus. STEM 3-4 cm. long, 1-3 cm. thick, *often eccentric,* equal or narrowed downward, *solid,* firm or spongy, subflocculose, glabrescent, even, not spotted, white within and without. SPORES subglobose, echinulate, 5-7 micr., white or slightly incarnate-tinged. MILK white, unchanging, *slowly acrid,* often rather scanty.

Gregarious. On the ground in low, moist, frondose woods. Ann Arbor, Jackson, Detroit, etc. August-September. Frequent in the southeastern part of the state.

This interesting species I have seen frequently and it appeared to be undescribed. A comparison of figures and descriptions has convinced me that it is an American form of *L. controversus.* The spots on the cap do not become so deeply colored as described for the European plant, but otherwise there is very little discrepancy. When young the plants are white and are easily mistaken for *L. piperatus,* but soon the gills, etc., take on the characteristic flesh-color. The color of the gills is often bright incarnate while that of the cap, flesh and stem is slightly so only in age. The stem is sometimes somewhat proemorsely rooted. The European plant is said to be edible. A form occurs which has a hollow stem but otherwise not very distinct; this may be *L. pubescens* Fr. The latter is said to be much smaller.

Section II. Pileus glabrous, *dry;* taste acrid.

66. Lactarius piperatus Fr. (EDIBLE)

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 27.
Cooke, Ill., Pl. 979.
Patouillard, Tab. Analyt., No. 119.
Michael, Führer f. Pilzfreunde, Vol. I, No. 37.
Ricken, Blätterpilze, Pl. 10, Fig. 3.
Marshall, Mushroom Book, Pl. 36, p. 92, 1905.
Atkinson, Mushrooms, Fig. 119, p. 120, 1900.
Hard, Mushrooms, Fig. 128, p. 166, 1908.
White, Conn. Geol. & Nat. Hist. Surv., Bull. 3, Pl. 9, op. p. 30.
Plate IX of this Report.

PILEUS 4-12 cm. broad, firm, convex-umbilicate, then expanded-depressed, at length infundibuliform, *dry, glabrous,* azonate, *white,* even, *margin* at first involute and *naked,* at length spreading or elevated. FLESH white, compact, thick. GILLS attenuate-subdecurrent, *narrow, very crowded,* dichotomously *forked,* white then cream-yellow. STEM 2-6 cm. long, 1-2 cm. thick, equal or tapering downward, dry, firm, *solid,* glabrous or pruinose, white. SPORES subglobose, nearly smooth, 6-7.5 micr., white. MILK white, unchanging, *very acrid,* copious. *Edible.*

Gregarious or scattered. On the ground in frondose woods of maple, oak, etc.

Throughout the Southern Peninsula, less frequent northward. July-September. Common.

This has the most intensely biting taste of all Lactarii. The acridity disappears in cooking and it can then be eaten with impunity. McIlvaine advises its use in gravy. This species is distinguished from its near relatives by its naked margin and very crowded and dichotomously forked gills which become dingy pale yellowish in age. The photograph of Marshall and the figure of Michael show extreme forms if they refer to this plant. *L. pergamenus* Fr. is said to differ in its longer and stuffed stem, and the pileus is thinner and wrinkled, and is not umbilicate at first; some consider it only a variety. A form occurred near Marquette with merely close gills, and in which the milk changed to pale sulphur-yellow; it had a pleasant odor and is var. *fragrans* Burl. (See Torr. Bot. Club Bull. 14, p. 20, 1908.)

67. **Lactarius pyrogalus** Fr. (Poisonous)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 390.
Ricken, Blätterpilze, Pl. 11, Fig. 2.
Patouillard, Tab. Analyt., No. 121.

PILEUS 4-6 cm. broad, convex then plane and depressed, *gray to livid-gray or brownish-gray,* darker in the center, *zoned* toward margin, moist in wet weather but *not viscid,* glabrous, margin at first involute then spreading. FLESH white, compact, thick. GILLS adnate-subdecurrent, *subdistant to distant,* firm, thin, moderately broad, *yellowish.* STEM 3-5 cm. long, 6-10 mm. thick, equal or tapering downwards, glabrous, becoming hollow, concolor or paler, white-mycelioid at base. SPORES subglobose, echinulate, 6-8 micr., pale ochraceous. CYSTIDIA abundant, subcylindrical, 67-70x9 micr. MILK white, *very acrid,* abundant, persisting as coagulated yellowish globules on the edge of the gills. *Poisonous.*

On the ground in woods. Bay View, Marquette, Ann Arbor. July-August. Infrequent.

Known by its distant gills which become yellowish, the subzonate gray pileus and the milk. The milk often remains as coagulated drops on the gills.

68. **Lactarius chrysorheus** Fr. (Poisonous)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 984.
Gillet, Champignons de France, No. 379.
Ricken, Blätterpilze, Pl. 13, Fig. 4.
Atkinson, Mushrooms, Fig. 123, 1900.

PILEUS 4-10 cm. broad, convex and broadly umbilicate, then expanded-depressed to subinfundibuliform, *dry or subviscid,* glabrous, color variable, *whitish to yellowish tinged incarnate, zoned with dull orange or yellow,* sometimes almost fulvous, spotted, margin at first involute then pruinose-tomentose, then elevated. FLESH whitish then yellowish from the milk, medium thick. GILLS adnate-decurrent, *crowded,* less so in age, *narrow,* some forked at base, thin, white at first, soon dingy yellowish, stained darker in age. STEM 4-6 cm. long, 1-1.5 cm. thick, equal or subequal, pruinose, glabrescent, even, stuffed then hollow, white, changing to color of pileus with age, sometimes spotted. SPORES subglobose, echinulate, 7-8 micr., white. MILK white, *changing to sulphur-yellow,* copious, very acrid. *Poisonous.*

Subcaespitose or gregarious. On the ground in frondose woods. Ann Arbor, Detroit, Marquette, etc., throughout the state. August-September.

Closely related to *L. theiogalus.* The latter has a more truly viscid pileus which is usually not zoned, and an odor which is well-marked and disagreeable. *L. chrysorheus* is sometimes frequent locally but I have so far not happened upon it in many localities. It may be that it is quite strongly restricted to certain seasons. Fries, Ricken and other European authors describe the pileus as always dry but in the United States it is often subviscid in moist weather. The milk sometimes turns slowly and the taste is occasionally bitter-acrid.

69. **Lactarius theiogalus** Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 396.
Ricken, Blätterpilze, Pl. 13, Fig. 5.
Burlingham, Torr. Bot. Club Mem. 14, Fig. 12, p. 70, 1908.

PILEUS 3-8 cm. broad, convex then expanded, *umbonate, obtuse or depressed,* dry or subviscid, even or wrinkled-uneven, glabrous, *incarnate-isabelline to pale tawny-reddish or fulvous,* obscurely zonate to azonate, margin at first involute soon spreading. FLESH medium thick, compact, white then yellowish from the milk. GILLS adnate-subdecurrent, close, rather narrow, some forked near base, pallid to yellowish-flesh color, reddish-brown where bruised or in age. STEM 3-7 cm. long, 6-12 mm. thick, subequal, firm, *undulate-uneven,* stuffed then hollow, glabrous, concolor or paler, substrigose at base. SPORES "subglobose to broadly elliptical, minutely echinulate, 8-9x6-7 micr., whitish." (Burl.) MILK white, *changing to sulphur-yellow,* tardily but very acrid. ODOR *strong,* pungent, disagreeable. *Suspected.*

Gregarious. On the ground in coniferous woods, sometimes in swampy places. Marquette, Huron Mountains, Houghton, Bay View, New Richmond. July-October. Frequent locally.

This species differs as a rule from the preceding by its umbonate or obtuse pileus, but this is not always reliable. It is necessary to

take into account the odor of the fresh plant, the undulate surface of the stem and the color of the pileus. Usually it lacks the zones which are marked in *L. chrysorheus,* but I have specimens from a sphagnum swamp which show the zones quite well. Miss Burlingham states that it is more zonate in wet places. *L. brevis* Pk. and *L. brevipes* Longyear, are considered by Miss Burlingham as ecological forms of this species. Ricken refers this to the group with pruinose gills; it is, however, too close to the preceding to be placed so far away. Its taste is sometimes bitter at first.

Section III. Pileus glabrous, *viscid;* taste *acrid.*

70. Lactarius insulsus Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 975.
Bresadola, Fungh. mang. e. vel., Pl. 62.
Gillet, Champignons de France, No. 386.
Hard, Mushrooms, Fig. 135, p. 171, 1908.
Ibid, Fig. 132, p. 168 (as *L. regalis* Pk.).
Plate X of this Report.

PILEUS 5-10 cm. broad, rigid, convex-umbilicate, then expanded-depressed to infundibuliform, *coppery-orange,* with alternate *zones* of deeper or lighter tones, sometimes paler throughout, *viscid,* glabrous, somewhat uneven, margin at first involute then elevated and arched, naked. FLESH scarcely compact, thick, white. GILLS adnate then decurrent, thin, *narrow,* some forked at base, white then pallid. STEM 2-5 cm. long, 8-15 mm. thick, equal or tapering downward, glabrous, stuffed then hollow, paler than pileus. SPORES globose, strongly echinulate, 7-9.5 micr., pale yellowish. MILK white, unchanging, *very acrid.*

Gregarious to caespitose. On the ground in open frondose woods. Ann Arbor. July-October. Frequent.

This species does not yet seem to be clearly understood. Ricken describes a plant which is scarcely zoned except on the margin and which has very large spores—12-15x10-12 micr. The spore-measurements of Bresadola and Saccardo, on the other hand, agree with ours. Peck's description (N. Y. State Mus. Rep. 38, p. 122) is that of the paler form and has been copied by McIlvaine. Our plants are mostly of the dark yellow to orange type as described by Miss Burlingham, but paler forms also occur. Specimens of the dark form

were sent to Peck who referred them to *L. regalis* Pk. and Dr. Fischer's photograph of it is so named in Hard's book. It is possible that some of our forms represent *L. zonarius* Fr. which is said to have a solid stem, pale orange to yellow-gilvus pileus with a thinner margin. According to Fries (Monographia) *L. insulsus* has the habit and size of *L. deliciosus,* differing in paler colors, acrid taste and white unchangeable milk. Cooke's figure represents our plants well except that they may become darker with age. *L. regalis* is referred by Peck to a variety of *L. resimus* Fr., and is said to be an almost entirely white plant with scarcely noticeable zones, not at all related to *L. insulsus;* its milk changes to sulphur-yellow. The gills of our form of *L. insulsus* sometimes become dingy yellowish in age or where bruised, but the milk is unchangeable. The plants referred to *L. insulsus* by McIlvaine were edible.

71. Lactarius affinis Pk.

N. Y. State Mus. Rep. 23, 1872.
Ibid, (as *L. platyphyllus* Pk.).

PILEUS 6-15 cm. broad, firm, convex-umbilicate then expanded-depressed, *pale yellowish to yellowish-incarnate* or ochraceous-yellow, *azonate, viscid,* glabrous, even, margin involute at first spreading and arched. FLESH white, moderately thick. GILLS adnate-subdecurrent, *broad* or moderately broad, close to subdistant, forked toward base, *creamy-yellowish.* STEM 5-10 cm. long, 1-2 cm. thick, equal, glabrous, stuffed *then hollow,* yellowish to whitish, often spotted. SPORES globose to broadly elliptical, 9-11 micr., echinulate, whitish. MILK white, unchanging, *acrid.*

Gregarious. On the ground in mixed or frondose woods. Marquette, Ishpeming, South Haven, New Richmond, Detroit. July-September. Rather rare.

Often a very large plant, whose pale yellow, zoneless cap and broad subdistant gills set it apart from others. The whole plant has a tendency to be unicolorous, sometimes dark, sometimes paler. Miss Burlingham states that the milk sometimes dries to a pale dull green shade on the gills. Whether it is edible is unknown.

72. Lactarius hysginus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 169, Fig. 2.
Cooke, Ill., Pl. 989.
Ricken, Blätterpilze, Pl. 12, Fig. 4.

"PILEUS 5-7.5 cm. broad, rigid, convex, then plane, umbilicate or slightly depressed, even, *viscid,* obscurely zonate or azonate, *reddish-incarnate, tan-color or brownish-red,* becoming paler with age, the thin margin involute, GILLS adnate-subdecurrent, close, whitish, becoming yellowish or cream-colored. STEM 2-5 cm. long, 6-15 mm. thick, equal, glabrous, stuffed or hollow, colored like the pileus or a little paler, sometimes spotted. SPORES subglobose, whitish or yellowish, 9-10 micr. MILK white, acrid."

On the ground, mixed woods. Houghton. July.

This was found only in the locality mentioned. The description is that of Peck, with which the fresh plants agreed, except that the gills were almost subdistant. The pileus was obscurely zonate. It was found several times, always solitary.

73. Lactarius trivialis Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 976.
Hard, Mushrooms, Fig. 134, p. 170, 1908.

PILEUS 5-15 cm. broad, convex, soon nearly plane and depressed, glabrous, *viscid, azonate,* color varable, *livid-gray to smoky-gray* or with a lilac-purplish tint, lead-colored or pinkish-brown, margin soon arched, at first pruinose, thin. FLESH thickish, rigid-fragile, pallid. GILLS adnate-subdecurrent, close, thin, moderately broad or rather narrow, some forked, cream-yellowish, *becoming dingy-greenish stained when bruised or in age.* STEM 4-12 cm. long, 1-2 cm. thick, equal, or irregularly undulate, glabrous, even, not spotted, stuffed then *hollow,* firm, concolor or paler than pileus, often pallid. SPORES elliptical, echinulate, 8-10 micr., *yellowish.* MILK white or creamy-white, unchangeable, *acrid. Suspected.*

Gregarious, subcaespitose or scattered. On the ground in frondose and coniferous woods.

Throughout the state, from the southern limits to Isle Royale. July-October. Common.

This is one of our commonest Lactarii during some seasons, usually among the first to appear, especially in the frondose regions. It is found in pine, hemlock, mixed, or oak and maple woods throughout the state. The northern form varies somewhat and needs further study; a variety also occurs in the north whose milk turns sordid green after exposure to the air, with broader and more distant gills and a spotted stem. This may be called var. *viridilactis* var. nov. Peck has described var. *maculatus* with zonate pileus and spotted stem, and var. *gracilis* which is quite a small and slender plant. The common form is a rather large plant; the pileus is sometimes up to 18 cm. broad with a dark livid or lurid, indescribable color, and white or creamy-yellowish, acrid milk. When old or faded the pileus becomes much paler and is often pale leather-colored or incarnate-tan. The flesh of the pileus though rigid is rather fragile and the stem is firm but soon hollow or cavernous.

74. Lactarius uvidus Fr. (Poisonous)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 991.
Gillet, Champignons de France, No. 399.
Ricken, Blätterpilze, Pl. 11, Fig. 4.
Patouillard, Tab. Analyt., No. 209.
Hard, Mushrooms, Fig. 144, p. 180, 1908.

PILEUS 3-7 cm. broad, convex then plane and depressed, rather firm, often subumbonate, *viscid,* obscurely or not at all zonate, sometimes spotted, *cinereus with lilac tinge or livid brownish-gray,* margin at first involute and subpruinose, thin and spreading. FLESH whitish, *becoming lilac or violet when cut,* usually rather soft when moist. GILLS adnate-subdecurrent, thin, close, rather narrow, white or yellowish, *quickly becoming violet or lilac when bruised.* STEM 4-7 cm. long, 6-12 mm. thick, subequal, glabrous, uneven-undulate, viscid, white or dingy yellowish, stuffed then hollow or cavernous. SPORES subglobose or broadly elliptical, 8-10 micr., echinulate, white. MILK white, *changing quickly when in contact with the flesh to lilac-violet,* bitterish-acrid.

Gregarious. On the ground in low, mossy places in swamps, thickets, etc. Bay View, Houghton, Marquette. August-September. Infrequent.

Known by the flesh changing to lilac or violet when cut or bruised. It is found in rather wet places, sometimes attached to moss and

sphagnum and then the base of the stem is white-tomentose. It seems to be most frequent in the Northern Peninsula. Its edibility is uncertain; it is considered poisonous in Europe.

75. Lactarius maculatus Pk. (Suspected)

N. Y. State Mus. Rep. 41, 1888.

PILEUS 8-12.5 cm. broad, convex-umbilicate, then expanded-depressed to infundibuliform, grayish-buff to grayish-lilac, *distinctly zoned with concentric darker spots,* viscid when moist, glabrous, margin at first involute, naked, then spreading and substriate. FLESH grayish, *becoming lilac where bruised,* rather compact. GILLS adnate-subdecurrent, close, broadest in the middle, attenuate behind, whitish to cream-color, *lilac-vinaceous where wounded.* STEM 3-7 cm. long, 1.5-3 cm. thick, subequal, ventricose or tapering, hollow, sometimes compressed, *spotted-variegated,* concolor, glabrous. SPORES "subglobose, echinulate, 10-12.5 micr." (Peck.) MILK at first white to cream color, unchanged or becoming lilac on the flesh, *acrid.*

On sandy ground, oak and maple hillside along Lake Superior, Marquette. August. Rare.

This is closely related to *L. uvidus,* differing from it in its distinctly zonate pileus, larger size and spotted stem. The milk in our specimens remained unchanged. It is likely that the milk in both *L. uvidus* and *L. maculatus* sometimes turns lilac-vinaceous, that at other times it remains unchanged except to cause the broken flesh where it is touched by the milk to assume a lilac-vinaceous color.

Section IV. Pileus glabrous, viscid; taste *mild; milk bright-colored from the first.*

76. Lactarius subpurpureus Pk. (Edible)

N. Y. State Mus. Rep. 29, 1878.

Illustrations: Peck, Ibid, 54, Pl. 70, Fig. 1-6.
Burlingham, Torr. Bot. Club Mem. 14, Fig. 8, p. 61, 1908.

PILEUS convex-umbilicate, then expanded-depressed to subinfundibuliform, *dark red,* pink-zoned, with a grayish lustre, spotted with emerald-green, subviscid when moist, glabrous, margin at first

involute, pruinose, then spreading. FLESH whitish to pinkish, *becoming red when broken especially* next to the gills. GILLS adnate-subdecurrent, close to subdistant, broadest in middle, medium broad, *dark-red,* fading and *greenish with age.* STEM 3-7 cm. long, 6-15 mm. thick, equal or tapering upwards, glabrous, sometimes pruinose, stuffed then hollow, *dark red, spotted more deeply,* floccose-hairy at base. SPORES "broadly elliptical, echinulate, 8-10x7-8 micr., yellowish." (Burl.) MILK *dark red,* mild. *Edible.*

Gregarious. Low moist woods of hemlock or mixed with hemlock. Bay View, Huron Mountains. August-September. Infrequent.

Easily distinguished by its dark red milk which stains the flesh of the broken plant; later the stains assume a greenish hue. Dried specimens do not show this character well, since they become much paler.

77. Lactarius deliciosus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 6.
Gillet, Champignons de France, No. 382.
Cooke, Ill., Pl. 982.
Bresadola, Fungh. manger. e. vel., Pl. 64.
Peck, N. Y. State Mus. Rep. 48, Pl. 29, 1896.
Atkinson, Mushrooms, Pl. 35, Fig. 1, 1900.
Gibson, Edible Toadstools, Pl. 18, p. 169, 1903.
Michael, Führer f. Pilzfreunde, Vol. I, No. 37.
Swanton, Fungi, Pl. 15, Fig. 6-7.
Plate XI of this Report.

PILEUS 5-10 cm. broad, convex-umbilicate, then expanded-depressed to subinfundibuliform, viscid when moist, glabrous, *orange or grayish-orange,* fading to grayish in age, *zoned,* zones or spots brighter-colored, involute at first then arched-spreading. FLESH white soon stained orange when broken, then greenish, especially at junction of gills and pileus. GILLS adnate-decurrent, close, rather narrow, intervenose and more or less forked, *bright orange with yellowish sheen,* becoming greenish in age or where bruised. STEM 3-8 cm. long, 8-15 mm. thick, *equal,* even, stuffed then hollow, pruinose, glabrescent, *orange-yellow, orange-spotted or at length greenish-variegated.* SPORES subglobose, echinulate, 8-10x7-8 micr., yellowish. MILK *orange* or *saffron-yellow, mild.*

Gregarious-subcaespitose. On the ground in moist mossy woods in coniferous regions, under hemlock, balsam-fir, spruce, cedar, birch, etc. Isle Royale, Huron Mountains, Marquette, Munising, Houghton, Bay View. July-September. Frequent locally.

The most desirable perhaps of all the Lactarii for the table, but not very common in southern Michigan at least. Its orange milk and the beautiful zones of the cap have frequently attracted the artist, and it has often been illustrated. Its range with us seems to be mostly northward. This statement is based on seven years of collecting in southern Michigan, but does not exclude the possibility of the appearance of *L. deliciosus* when least expected and perhaps in quantity. Such sporadic fruiting is not infrequent in other mushrooms after they seem to be absent from a region. Peck says it occurs in all kinds of woods, but so far it has been found in quantity only in the northern part of the state. Michael says that because of its strong aromatic taste it is not so desirable as food when served alone but as an addition to other dishes it is excellent.

78. **Lactarius indigo** Schw. (Edible)

Syn. Fung. Carol. Super., 1818.
(Fries, Epicrisis, 1838).

Illustrations: Atkinson, Mushrooms, Pl. 35, Fig. 3, 1900.
McIlvaine, Thousand Amer. Fungi, Pl. 41, Fig. 2.

PILEUS 5-12 cm. broad, convex-subumbilicate, then expanded-depressed to infundibuliform, *indigo-blue or paler,* fading when dry, with a silvery-gray lustre, *zonate,* glabrous. FLESH blue, greenish in age. GILLS adnate-decurrent, close, rather broad, *indigo-blue or paler,* at length pale greenish. STEM 2-5 cm. long, 1-2 cm. thick, equal or tapering downward, glabrous, even, stuffed then hollow, *indigo-blue,* often paler and *spotted.* SPORES "globose to broadly elliptical, echinulate, 7 micr., yellowish." MILK *dark blue, mild. Edible.*

Gregarious. On the ground in oak and maple woods, and sandy pine forests. Ann Arbor, Huron Mountains. Evidently throughout the state. August. Rather rare.

No one can mistake this mushroom as it has no double. It occurs sparingly, but is widely distributed. Schweinitz should be given full credit for naming this striking plant. It seems to be exclusively North American.

RUSSULARIA: Gills becoming darker in age, and then pruinose.

Section V. Pileus minutely scaly, tomentose, pruinose-velvety, dry; taste slowly or slightly acrid.

79. **Lactarius fuliginosus** Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 996.
Gillet, Champignons de France, No. 384.
Patouillard, Tab. Analyt., No. 322.
Ricken, Blätterpilze, Pl. 12, Fig. 5.
Atkinson, Mushrooms, Fig. 117, p. 119, 1900.

PILEUS 2-6 cm. broad, convex, soon expanded-plane or obtuse, sometimes depressed, *dry, even,* minutely velvety-tomentose or glabrous, *azonate,* isabelline or grayish-brown, *clouded with a smoky shade,* margin at length crenate-wavy. FLESH thin on margin, whitish, *becoming tinted with flesh-pink to salmon-color when broken.* GILLS adnate, at length subdecurrent, distinct, close to subdistant, moderately broad, *pruinose,* pallid then pale ochraceus, *becoming pinkish or salmon when bruised.* STEM 2-6 cm. long, *often short,* 3-10 mm. thick, subequal or tapering downwards, stuffed then hollow, minutely pruinose-velvety or glabrous, pallid-grayish-isabelline or smoky-clouded, pinkish-stained where bruised. SPORES globose, echinulate, 7-9 micr. with long sterigmata, *pale ochraceous-yellow.* MILK white at first, then *changing slowly to flesh-pink or salmon* where in contact with the flesh, *slowly acrid.*

Gregarious. On the ground in frondose woods of oak and maple. Ann Arbor. August. Infrequent.

In Europe it is said to occur also in pine woods. It is known by its smoky-clouded often "snuff-brown" pileus, and the tendency of the flesh to assume a flesh-pink or pale salmon color where bruised. Dry weather plants often respond slowly to bruising. The margin of the pileus in age is apt to be wavy or scalloped. *L. gerardii* Pk. is considered by Atkinson as probably a variety.

80. Lactarius lignyotus Fr. (Poisonous)

Monographia, 1863.

Illustrations: Fries, Icones, Pl. 171, Fig. 1.
Michael, Führer f. Pilzfreunde, Vol. II, No. 58.
Atkinson, Mushrooms, Fig. 116, p. 117, 1900.
Hard, Mushrooms, Pl. 21, Fig. 236, p. 172, 1908.
Peck, N. Y. State Mus. Bull. 150, Pl. 123, 1911.

PILEUS 3-7 cm. broad, convex, soon almost plane, *umbonate,* sometimes slightly depressed and then obsoletely umbonate, *dry,* azonate, *pruinose-velvety,* even or *mostly uneven-rugulose* toward *the center,* chocolate or seal-brown to sooty, margin wavy or subplicate in age. FLESH white, *slowly pinkish or reddish where wounded.* GILLS adnate-subdecurrent, close to subdistant, moderately broad, *at first pure white,* then ochraceus, reddish or pinkish where bruised. STEM 4-8 cm. long, 4-12 mm. thick, equal or *abruptly plicate at apex,* pruinose-velvety, sometimes scarcely velvety, *sooty-brown,* spongy-stuffed. SPORES globose, 8-9 micr., echinulate, yellowish, sterigmata long. MILK white, changing slowly to reddish-pink where in contact with flesh, *mild* or subacrid. *Poisonous.*

Gregarious. On the ground in woods, especially in coniferous regions. Marquette, Huron Mountains, Bay View, Ann Arbor. July-September. Infrequent.

Differs from the preceding in the darker color, the rugose pileus and longer and more velvety stem. Efforts which I made to differentiate the two by microscopical characters remained abortive. Both possess slender, cylindrical, aculeate sterile cells on the edge of the gills, about 4 micr. in diameter. The trama of the gills in the specimens examined was more filamentous in *L. lignyotus* and had a floccose structure of spherical cells in *L. fuliginosa.* The two species, however, appear to run into each other at times.

81. Lactarius helvus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 994.
Bresadola, Fung. Trid., Pl. 127 and 39.
Ricken, Blätterpilze, Pl. 13, Fig. 2.

PILEUS 4-12 cm. broad, *fragile,* convex then plane and depressed

with decurved margin, with or without an obscure umbo, azonate, *dry, floccose-scaly, tawny-isabelline,* fading, margin at first involute then spreading. FLESH somewhat watery. GILLS subdecurrent, thickish, close to subdistant, rather narrow, broadest behind, whitish then ochraceous tinged incarnate, pruinose. STEM 5-8 cm. long, (up to 15 cm. long on sphagnum), 5-15 mm. thick, subrigid-fragile, subequal, *pruinose-pubescent,* stuffed then cavernous, concolor, white-mycelioid at base. SPORES globose, 7-9 micr., echinulate. MILK *watery,* rarely white, sparse, mild or scarcely acrid. ODOR *fragrant,* like that of *L. camphoratus.*

Gregarious or scattered. On the ground or on moss in low swampy woods, or on sphagnum in peat-bogs, sometimes among moss along exposed borders of lakes, etc. Ann Arbor and elsewhere in the lake regions of the interior. July-Sept. Frequent locally.

This is for the most part included under var. *aquifluus* by Peck but the watery character of the milk is apparently merely a result of the moist habitat.

82. Lactarius rufus Fr. (Poisonous)

Epicrisis, 1836-38.

Illustrations: Fries, Sverig. Svamp., Pl. 11.
Cooke, Ill., Pl. 985.
Gillet, Champignons de France, No. 391.
Ricken, Blätterpilze, Pl. 13, Fig. 3.
Michael, Führer f. Pilzfreunde, Vol. I, No. 36.
Swanton, Fungi, Pl. 7, Fig. 3-4.

PILEUS 4-10 cm. broad, convex then expanded-depressed to infundibuliform, *umbonate,* flocculose-silky, *glabrescent,* azonate, dry, *bay-red to rufous,* not fading, subshining, margin at first involute. FLESH rather thin, rather soft when moist. GILLS adnate-decurrent, close, at length pruinose, narrow, *ochraceous then rufous.* STEM 5-8 cm. long, (longer in moss), 6-12 mm. thick, equal, dry, glabrous, sometimes pruinose, stuffed then hollow, firm, *rufous or paler,* often strigose-hairy at base. SPORES sub-globose, 7-8 micr., slightly echinulate, white. MILK white, unchanging, *very acrid.* ODOR *none. Poisonous.*

On the ground in hemlock and pine woods. New Richmond. September. Infrequent or local.

Known by its red-brown color, umbonate pileus, very acrid taste

and rather large size as compared with others of the same color. Peck has segregated a species on the lack of the umbo, the hollow stem and scanty milk; it is edible. This he named *L. boughtoni* Pk. (see N. Y. State Mus. Bull. 150, p. 32, and Pl. 6, Fig. 1-7). It seems to be an extreme form of *L. rufus* and may be referred to as var. *boughtoni* Pk. Longyear has reported *L. rufus* from a swamp near Lansing where it occurred in large numbers. I have seen it only in the Adirondack Mountains, New York.

83. Lactarius griseus Pk.

N. Y. State Cab. Rep. 23, 1872.

Illustrations: Burlingham, Torr. Bot. Club, Mem. 14, Fig. 14, p. 18, 1908.
Hard, Mushrooms, Fig. 138, p. 174, 1908.

PILEUS 1-4 cm. broad, soon flaccid, convex then depressed to infundibuliform, *papillate, dry,* azonate, *minutely tomentose,* becoming floccose, *grayish* or brownish-gray, variegated smoky-gray, margin at first incurved. FLESH white, *thin.* GILLS adnate-decurrent, close to subdistant, pruinose, broader than the thickness of the pileus, white *then cream-colored to honey-yellow.* STEM 1-5 cm. long, 2-5 mm. thick, equal, dry, glabrous, stuffed then hollow, whitish to grayish. SPORES broadly elliptical to subglobose, 8-9x6-7 micr., echinulate, white. MILK white, unchanging, *slowly acrid.*

Gregarious or scattered. On the ground or on much decayed logs in woods of the coniferous regions of the state. Marquette, Houghton, Huron Mountains, Sault Ste. Marie, Bay View, New Richmond.

Distinguished by its small size, gray color and tomentose-flocculose cap. It differs from *L. cinereus* in its dry, non-glabrous pileus and in the gills becoming cream-yellow in color. It seems to be limited to regions with conifer trees, although it is also found in frondose woods of such regions.

Section VI. Pileus glabrous, *viscid;* taste *acrid.*

84. Lactarius cinereus Pk.

N. Y. State Mus. Rep. 24, 1872.

Illustrations: Burlingham, Torr. Bot. Club, Bull. 14, Fig. 11, p. 67, 1908.
Hard, Mushrooms, Fig. 137, p. 173, 1908.

PILEUS 1-5 cm. broad, lax, convex-umbilicate, soon expanded-depressed to subinfundibuliform, *viscid* when moist, azonate or subzonate, *glabrous,* even, *cinereous,* margin involute at first then spreading. Thin. FLESH white. GILLS adnate, close, narrow, *white,* not yellowish in age, often pruinose. STEM 2-6 cm. long, 6-12 mm. thick, subequal or tapering slightly upwards, stuffed-spongy then hollow, glabrous, *cinereus,* tomentose at base. SPORES subglobose, echinulate, 6-7.5 micr., *white.* MILK white, unchanging, *acrid.*

Gregarious. On the ground in coniferous and mixed woods of the hemlock regions of the state. Isle Royale, Huron Mountains, Marquette, Houghton, New Richmond. July-September. Infrequent.

Miss Burlingham distinguishes a distinct species which is named *L. mucidus* Burl., which differs from *L. cinereus* in its putty-colored cap with sepia center, and in that the milk stains the flesh and gills blue-grayish-gray. It is said to occur under hemlock but according to this author the true *L. cinereus* is said to be restricted to beech woods. Our plants grew under hemlock, birch, maple and pine. I have no record concerning beech. It is probable that our plants are to be referred to *L. mucidus;* in that case I have no record of *L. cinereus* to which I have always referred these collections. My notes are not sufficient to settle the matter.

85. Lactarius vietus Fr.

Syst. Myc., 1821.

Illustrations: Fries, Icones, Pl. 170, Fig. 1.
Cooke, Ill., Pl. 1009.
Gillet, Champignons de France, No. 401.
Michael, Führer f. Pilzfreunde, Vol. III, No. 71.
Ricken, Blätterpilze, Pl. 14, Fig. 1.

PILEUS 3-6 cm. broad, convex then depressed or subinfundibuliform, *viscid* when moist, *azonate,* minutely silky-tomentose when dry, *drab-colored or lilac-grayish,* margin involute at first then elevated and arched. FLESH whitish. GILLS adnate-decurrent, close, narrow, *pruinose,* cream color then drab or dingy yellowish, *stained grayish when bruised.* STEM 3-7 cm. long, 5-10 mm. thick, equal or tapering upwards, stuffed then hollow, glabrous or glaucous, rivulose-wrinkled, concolor, tinged drab within. SPORES, globose, echinulate, 6-8 micr., cream-buff in mass. MILK white, unchanged, *very slowly acrid.*

Gregarious on the ground, mixed hemlock, beech and maple woods. New Richmond. Infrequent.

Sometimes the whole plant including the gills is pinkish-buff or incarnate. The grayish hue is more marked in age. It is said to be under suspicion.

86. Lactarius croceus Burl.

Torr. Bot. Club, Mem. 14, 1908.

Illustration: Ibid, Fig. 3, p. 38.

PILEUS 5-10 cm. broad, broadly convex-umbilicate then depressed to infundibuliform, *viscid,* azonate or obscurely zonate, micaceous when dry, *orange to saffron-yellow,* glabrous, margin at first involute and pruinose-downy. FLESH rather thin, whitish, *staining yellow or ochraceous where cut.* GILLS adnate-decurrent, close to *subdistant,* moderately broad, rarely forked, pallid to pale yellow or incarnate-tinged, *changing to cadmium-yellow where bruised.* STEM 3-6 cm. long, 1-2 mm. thick, equal, stuffed then hollow, glabrous, pale orange-yellow, spotted. SPORES globose to broadly elliptical, echinulate, 6-8 micr., pale yellow. MILK white, scanty, slowly changing to yellow, acrid or bitter, often slowly acrid.

Gregarious or scattered. On the ground in woods of oak, maple, elm, etc. Detroit. August-September. Local.

This approaches *L. aurantiacus* Fr. if indeed it is not identical. That species is said to be poisonous. The milk, flesh and gills of the European species do not change color like ours. I have found it at different times, always in the same woods near Detroit. Miss Burlingham reports it from Vermont and North Carolina, and identified our specimens as the same.

Section VII. Pileus glabrous, *dry;* taste *acrid or bitter-astringent.*

87. Lactarius colorascens Pk.

N. Y. State Mus. Bull. 94, 1905.

PILEUS 2-6 cm. broad, nearly plane, then depressed, whitish at first, then *reddish-buff to brownish-red,* azonate, dry or subviscid, glabrous. FLESH thin. GILLS adnate, narrow, crowded to close, whitish *soon brownish-red.* STEM 3-6 cm. long, 5-10 mm. thick, glabrous, equal, stuffed, often compressed, even, whitish, *soon concolor.* SPORES "globose, echinulate, 8 micr." (Peck.) MILK white, *changing to sulphur-yellow,* bitter or slightly astringent.

On the Ground in mixed woods. Marquette, New Richmond. August-September. Rare or local.

It has the color of *L. camphoratus* when mature, but the milk turns decidedly sulphur-yellow. Found so far only in coniferous regions.

88. Lactarius isabellinus Burl.

Torr. Bot. Club, Bull. 34, 1907.

Illustration: Ibid, Fig. 15, p. 103.

PILEUS 2-5 cm. broad, convex then expanded-depressed, subumbonate, azonate, *dry,* glabrous, wrinkled on disk, *red-fulvous* when moist, paler on margin, fading, margin at length short-striatulate. FLESH thin, white, *staining yellowish from the milk.* GILLS adnate-subdecurrent, thin, close, narrow, forking toward base, pale yellowish, *soon ochraceous-fulvous.* STEM 2-4 cm. long, 4-6 mm. thick, equal, stuffed then hollow, glabrous, *concolor,* white-tomentose at base. SPORES "slightly echinulate, white, 7-8.5x6-7.5 micr." (Burl.) MILK white or watery, at *length sulphur-yellow on flesh,* abundant, slowly *acrid or astringent.*

On the ground in mixed woods, in coniferous regions. Marquette. August. Rare or local.

Could easily be mistaken for a large form of *L. subdulcis,* but the striations of the pileus, the taste and the changing milk differentiate it. No specimens were retained. In age, the milk seems to be sparse and its change can not then be noticed.

89. Lactarius parvus Pk.

N. Y. State Mus. Rep. 29, 1878.

PILEUS 1-3 cm. broad, broadly convex then expanded, subdepressed, obsoletely papillate, *dry,* azonate, glabrous, *pale lilaceus-umber,* fading, margin at first involute. FLESH thin. GILLS adnate-decurrent, close to crowded, narrow, few forked at base, dingy white or ochraceus-tinged, *becoming obscurely greenish then dingy-brown where bruised.* STEM 2-3 cm. long, 3-5 mm. thick, subequal, glabrous or pruinose above, stuffed then hollow and *often*

compressed, sometimes sulcate, tinged with same color as pileus. SPORES subglobose, slightly echinulate, white, 6.5-8 micr. MILK white, unchanging, sometimes slightly changed on flesh, *acrid.* ODOR none.

Gregarious or scattered. On the ground or much decayed wood in forests of hemlock and pine or in cedar swamps. New Richmond. August-September. Frequent locally.

This is one of our smallest Lactarii. The umber color of cap and stem, and the peculiar dingy-greenish tints assumed by the wounded gills characterize it. It closely approaches *L. varius.*

90. Lactarius varius Pk.

N. Y. State Mus. Rep. 38.

PILEUS 3-6 cm. broad, convex then plane and depressed, *grayish-buff or darker,* with tinge of lilac, *dry, micaceous-shining,* azonate or slightly zonate on margin. Flesh thin, white. GILLS adnate-subdecurrent, close, narrow, subventricose, whitish to cream-colored, *stained dingy greenish-brown where bruised. STEM* 2-5 cm. long, 4-6 mm. thick, equal, glabrous, firm, *spongy-stuffed,* concolor or paler. SPORES globose, white, 7-8 micr. MILK white, unchanging, slowly acrid. ODOR none.

Gregarious. On the ground in mixed woods. Marquette. August.

This species is very close to the preceding. It is known by its pale colors both when fresh and in herbarium specimens. It was found only in the Northern Peninsula.

Section VIII. Pileus glabrous or pruinose velvety, *dry;* taste *mild.*

91. Lactarius volemus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 10.
Cooke, Ill., Pl. 999.
Gillet, Champignons de France, No. 402.
Bresadola, Fungh. mang. e. vel., Pl. 66.
Ricken, Blätterpilze, Pl. 14, Fig. 3.
Patouillard, Tab. Analyt., No. 323.
Peck, N. Y. State Mus. Rep. 48, Pl. 30.
White, Conn. Geol. & Nat. Hist. Surv., Bull. 3, Pl. 10.

Michael, Führer f. Pilzfreunde, Vol. I, No. 35.
Hard, Mushrooms, Fig. 142, p. 179.
Plate XII of this Report.

PILEUS 5-12 cm. broad, firm, convex then expanded-depressed, plane or obtuse, *dry,* azonate, *glabrous,* even or becoming rimose-areolate or rivulose, *unicolorous, orange-fulvous or brownish orange* to tan-brown, often pale, margin at first involute then spreading. FLESH compact, rigid, whitish, sometimes brownish. GILLS adnate-decurrent, close, moderately broad, white or yellowish, darker with age or brownish where bruised, somewhat forked. STEM 3-10 cm. long, 1-2 cm. thick, subequal, glabrous or pruinose, *solid,* rarely cavernous, concolor or paler. SPORES globose, echinulate, 7-10 micr., white. MILK white, unchanging, *mild, abundant.* ODOR slight when fresh, strong on drying. *Edible.*

Gregarious or scattered. On the ground in frondose woods and open places, throughout the southern part of the state. July-September. Common.

Like *L. deliciosus,* this species is very delicious when properly prepared. It can be cut up and dipped in egg and bread crumbs and fried like oysters; it is also excellent when grated and then baked and served on toast. The milk is copious and white. It is not likely to be confused with others except *L. corrugis and L. hygrophoroides,* both of which are similarly colored, but as they are edible no harm results. It must not be confused, however, with *L. rufus* which is considered poisonous. I have been unable to find *L. volemus* in the coniferous regions of the northern and western parts of the state, although it probably occurs there.

92. Lactarius corrugis Pk. (Edible)

N. Y. State Mus. Rep. 32, 1880.

Illustrations: Atkinson, Mushrooms, Fig. 115, p. 115, 1900.
Hard, Mushrooms, Fig. 141, p. 177, 1908.

PILEUS 6-12 cm. broad, firm, convex then depressed-expanded, dry, azonate, *minutely velvety* (spicules!), *corrugate or rugose-reticulate,* dark reddish-brown to rufous-tawny, sometimes paler, margin involute at first then spreading and arched. FLESH compact, white, thick. GILLS adnate-decurrent, close, somewhat narrow, sometimes forking, yellowish-cinnamon, *becoming fulvous-brown where bruised,* provided *with dark-colored spicules* which give them

the brown color. STEM 6-7 cm. long, 1.5-2.5 cm. thick, *stout,* firm, solid, equal, dry, more or less tinged concolor and subvelvety. SPORES globose, echinulate, 9-12 micr., white. MILK white, unchanging, *mild,* copious. ODOR slight.

Gregarious or solitary. On the ground in frondose woods or open places. Detroit, Ann Arbor. August-September. Infrequent.

Closely related to the preceding, of which it might be considered a variety. The rugose or corrugated pileus and the abundance of brown spicules on the gills are the main distinguishing characters.

93. Lactarius hygrophoroides B. & C. (Edible)

Ann. & Mag. Nat. Hist., Vol. III, 1859.
N. Y. State Cab. Rep. 23, 1872 (as *L. distans* Pk.).

Illustrations: Peck, N. Y. State Mus. Mem. 4, Pl. 53, Fig. 7-11, 1900.

PILEUS 3-8 cm. broad, rarely broader, firm, convex then expanded, umbilicate or subdepressed, glabrous or minutely velvety-pubescent, *dry,* sometimes rugose-wrinkled or rimose-areolate, *yellowish-tawny, fulvous or paler,* margin involute then spreading. FLESH somewhat brittle, whitish, thick. GILLS adnate-subdecurrent, *distant,* narrow, often intervenose, whitish to cream-yellowish. STEM 2-4 cm. long, *short,* 8-16 mm. thick, equal or tapering downward, *solid,* glabrous or pruinose, *concolor.* SPORES globose to broadly elliptical, 9-11 micr., minutely echinulate, white. MILK white, unchanging, *mild. Edible.*

Gregarious or scattered. On the ground in frondose woods or open places. Ann Arbor, Lansing, etc., throughout southern Michigan. July-August. Sometimes common.

This species has the color of *L. volemus* but has distant gills, a short stem and is usually smaller in size. It was described as *L. distans* by Peck and it is regrettable that this appropriate name could not be retained, as the distant gills are its most striking characteristic. However, specimens of Curtis' collections are still in existence and show the plant to have been described by Berkely, as *L. hygrophoroides.* It is equally as good to eat as *L. volemus.*

94. Lactarius luteolus Pk.

Torr. Bot. Club, Bull. 23, 1896.

Illustrations: N. Y. State Mus. Bull. 67, Pl. 83, Fig. 7-11, 1903.

PILEUS 3-7 cm. broad, firm, convex or nearly plane, sometimes umbilicately depressed and subpapillate, *minutely pruinose-velvety, dry,* azonate, more or less rugose, yellowish or dingy buff, margin involute at first. FLESH white, *becoming brown when bruised.* GILLS adnate-subdecurrent, close, narrow, whitish, *becoming brown when bruised.* STEM 2.5-5 cm. long, 3-10 mm. thick, subequal, dry, glabrous or pruinose, firm, spongy-stuffed, *whitish or buff.* SPORES globose, echinulate, 7-8 micr., white. MILK white or whitish, *changing to brown on the flesh,* copious, mild. ODOR mild or foetid.

On the ground in mixed woods. Marquette. August. Rare.

To this species evidently belongs *L. foetidus* Pk. (N. Y. State Mus. Bull. 54, p. 949, 1902), which is a form with a foetid odor.

Section IX. Pileus glabrous, dry or subviscid, taste *mild;* milk white, pale or watery.

95. Lactarius subdulcis Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 393.
Cooke, Ill., Pl. 1002.
Michael, Führer f. Pilzfreunde, Vol. II, No. 55.
Murrill, Mycologia, Vol. 3, Pl. 49, Fig. 5.
Hard, Mushrooms, Fig. 140, p. 176.

PILEUS 2-5 cm. broad, firm, convex then depressed or subinfundibuliform, often papillate, *azonate, dry,* glabrous, *brownish-red,* isabelline or reddish-fulvous, sometimes paler, *not fading,* even or subwrinkled. FLESH whitish or tinged fulvous. GILLS adnate-decurrent, close, *pruinose,* sometimes forked, rather narrow, whitish soon pallid yellowish-flesh color, often fulvous-stained. STEM 4-7 cm. long, 2-8 mm. thick, subequal, stuffed then hollow, glabrous or pubescent to tomentose toward base, even or wrinkled-lacunose, *concolor or* paler than pileus. SPORES globose, echinulate, 7-8

micr., white. MILK white or watery-white, unchanging, *mild* or slightly acrid or bitterish in the throat. *Edible.*

On the ground in low woods, fields, copses, swamps and wet places or in mixed or frondose woods. Throughout the state. June-October. Very common.

This species occurs in dry weather when hardly any other mushroom is to be found, and a swamp or bog must be very dry if it does not yield some. In wet weather it is to be found on high ground as well, either in the woods or the bare soil in fields or roadsides, sometimes even on decayed wood. It is very variable and several varieties have been named, e. g. (a) with cinnamon-red pileus; (b) with chestnut-red pileus and spongy stem, and (c) with varnished-shining bay-red cap and hollow stem. Ricken says the European form is best known by the red-strigose base of the stem and the tufted mode of growth. With us it is usually gregarious or scattered. It must not be confused in dry weather with *Clitocybe laccata* when the latter is moist and then similarly colored. That species differs in its distant gills and fading pileus, and never possesses milk.

96. Lactarius oculatus (Pk.) Burl. (Edible)

Torr. Bot. Club, Bull. 34, 1907.

Illustration: Peck, N. Y. State Mus. Bull. 67, Pl. 83, Fig. 20-24 (as *L. subdulcis* var. *oculatus* Pk.).

PILEUS 1-2 cm. broad, convex-expanded, *abruptly papillate-umbonate,* viscid when moist, glabrous, *fulvous,* fading to pinkish, umbo-darker and scarcely fading, margin at first involute then spreading. FLESH whitish, thin. GILLS subdecurrent, medium close, *broad,* pruinose, pallid then yellowish. STEM 2-4 cm. long, 2-5 mm. thick, equal, glabrous, stuffed, *concolor* or paler. SPORES globose to broadly elliptical, echinulate, 7-9.5 micr., white. MILK white, sparse, unchanging, *mild.*

On the ground in moist places in woods, or on moss. Ann Arbor. July-September. Infrequent.

Related to the preceding, but often with a distinct viscidity on the expallent pileus. Its definite and persistent papilla has been called the "eye spot" of the cap, since its darker color, especially after the rest of the pileus is faded, makes it appear prominent.

97. Lactarius camphoratus Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1013.
Ricken, Blätterpilze, Pl. 14, Fig. 7.
Plate XIII of this Report.

PILEUS 1-4 cm. broad, firm, rigid-fragile, convex, often umbonate, at length depressed, *fulvous to dark brownish-red,* azonate, dry, glabrous, often wrinkled-uneven, *opaque,* margin arched-decurved. FLESH concolor or paler, rather thin. GILLS adnate-subdecurrent, close, rather narrow, pruinose, dull yellowish to reddish-brown. STEM 1-3 cm. long, 3-8 mm. thick, subequal, glabrous or pruinose, sometimes compressed-wrinkled, spongy-stuffed, *concolor.* SPORES globose, echinulate, 6-7.5 micr., white. MILK white, unchanging, either copious or in dry weather often watery white and scanty, *mild.* ODOR *aromatic, agreeable,* usually very distinct. *Edible.*

On the ground in wet places, swamps, very rotten wood in mixed or frondose woods. Throughout the state. July-August. Common.

Known by its peculiar rigid-fragile consistency, its aromatic odor and dark reddish-brown color. Distinguished from *L. rufus* which grows in similar situations, by its smaller size, odor and non-acrid taste; from *L. subdulcis* by darker color and odor. The odor is not of camphor as the name would indicate; it has been variously characterized as like that of dried melilot, slippery-elm bark, or chicory, or similar to that of *L. helvus.* Like *L. subdulcis,* it is often to be found when other mushrooms are absent.

98. Lactarius rimosellus Pk.

N. Y. State Mus. Bull. 105, 1906.

Illustration: Ibid, Pl. 95, Fig. 7-11.

"PILEUS 3-6.5 cm. broad, rather firm, convex umbonate, then depressed, *brownish terra-cotta,* fading somewhat, azonate, dry, glabrous, rugose from the center, *at length minutely rimose-areolate.* FLESH thin, isabelline then concolor. GILLS decurrent, close, medium broad, few forking, whitish then somewhat ochraceous. STEM 2-6 cm. long, 5-10 mm. thick, equal or tapering upwards, stuffed then hollow, pruinose above, *tomentose to strigose downwards,* concolor. SPORES broadly elliptical, echinulate, 7-8 micr.,

white. MILK *watery or watery-white,* unchanged, mild or slightly woody. ODOR faint, somewhat like that of *C. camphoratus.*"

On the ground in open places or in wet places in woods. Ann Arbor. August. Rare.

Differs from *L. camphoratus* in that the pileus becomes rimose-areolate and fades somewhat in age, and in its more tomentose stem.

Russula Fr.

(From the Latin, *russula,* reddish.)

Veil none; the trama composed of *vesiculose* tissue, *without a milky juice;* gills rigid, fragile, acute on edge; stem central, confluent with the pileus; spores globose or subglobose, usually echinulate or verrucose, white cream-color, yellow or ochraceous.

Fleshy, putrescent, rigid-brittle mushrooms, mostly terrestrial, a few on much decayed wood, on sphagnum or on other mosses. A very distinct genus, most closely related to Lactarius, from which it differs by its lack of a milky juice. Hygrophorus differs in the thicker and more waxy nature of the gills although here there are evident certain signs of relationship with species of Russula. Almost all of the species are *edible* after careful cooking since even the peppery forms then lose their sharp taste; in any case the mild species are perfectly safe when fresh, young and clean.

The PILEUS may be red, purple, violet, bluish, yellow, green or white, except in the Compactae, a differentiated pellicle is present on the surface of the cap. This pellicle is often composed of more or less gelatinous hyphae and becomes viscid in wet weather, or it may remain dry and become pruinose or velvety. The pellicle is somewhat separable along the margin of the pileus and in many of the Fragiles can be peeled easily on the whole surface. The margin of the pileus is often striate at least in age. In the species with a thin cap, the lines of attachment of the gills to the cap show through as raised ridges which are often tuberculate because of the presence of the interspacial veins beneath and these striae may extend far toward the center of the pileus. In the species with firm and thick caps, the striations are not as marked or are obscurely developed on the margin only when the plant becomes old. Still, this character is so variable that it must be used with caution as a diagnostic character. The surface is usually glabrous or merely pruinose to velvety; the latter appearance is due to cystidia-like erect hyphae closely covering the pellicle. The GILLS of the different species are of all shades between shining white and egg-yellow, and this fact alone separates them from any one of the spore-color groups of the Agaricaceae. Some authors consider the forking of the gills as well as the veining in the interspaces of the gills important diagnostic characters. These two characters are intimately related and forking is for the most part merely a pronounced development of veining. In fact such a large number of species have been observed with veined interspaces and some forked gills that this character loses most of its value. In *R. variata* the forking is dichotomous or mostly so and reaches its highest development. The different lengths of the gills are, on the contrary, much more important characteristics. They may be alternately long and short as in the Compactae, or they may be all of one length with rarely any secondary or shorter gills. Intermediate cases occur in the Subrigidae, but even here the short gills are not numerous. Their shape and width are also of value, since the anterior and posterior ends have a characteristic width which accompanies other characters of the given subgenera. The STEM is usually white, sometimes red or slightly ochraceous, in some species changing to ashy, etc., with age. The reticulations on the surface are obscure and of no diagnostic value. It is usually spongy-stuffed within and may become cavernous in age or hollowed by grubs; in the Compactae, however, it is usually solid. The TRAMA is composed of large bladder-like cells arranged in groups and surrounded by strands of slender hyphae, as in Lactarius. Such a structure is said to be *vesiculose* and accounts for the more or less brittle consistency of the plants. Since the difference in this consistency is accompanied by other good characters, it is made the basis of a division of the genus into its subgenera. The TASTE as in the Lactarius, is sharply acrid in some species, slowly or slightly acrid in others, and entirely mild in a considerable number. This is an important character for the identification of the species and is fairly constant. It is necessary to have fresh plants to be sure in some cases that the acridity is present. Sometimes plants which are apparently mild will be found to have a slight acridity only when very young, or only in the gills and not elsewhere. The ODOR of some species, e. g., *R. foetans, R. foetantula, R. compacta,* etc., is quite characteristic and should never be unconsidered. One must not confuse this test by applying it to plants already in the first stages of decay. SPORE PRINTS are considered by most as the most essential means of settling the identity of closely related species. It has been claimed that the color is constant and with this claim I agree. It is also

known that the spore prints fade or change after a time, and hence old herbarium spore-prints are not reliable unless accompanied by careful notes of the print when fresh.

The genus may be divided into four natural groups which are here considered as subgenera: Compactae, Rigidae, Subrigidae and Fragiles. Of these, the first and last correspond to the tribes of that name in Fries. (Hymen. Europ.) As shown in a former paper, (Kauffman, Mich. Acad. Sci., Rep. 11, p. 60, 1909), the forking of the gills and the striations on the pileus are not very reliable for the characterization of the main groups. It has seemed practicable to establish a new division, viz., the Subrigidae, to include forms with a pruinose or velvety dry pellicle and rather firm consistency, which are out of place elsewhere, and seem to be closely related. Some have divided the genus into two large groups on the basis of the mild and acrid taste (Massee, British Fungus Flora, Vol. III.). Others have used the spore-color (Schroeter, Pilze Schlesiens and Hennings, Engler. u. Prantl Pflanzenfamilien). Earle has raised the five "tribes" to generic rank (Bull. N. Y. Bot. Gard. 5, p. 373, 1909), and finally, Maire has proposed a division of the genus into eight sections based in part on microscopical characters (Soc. Myc. de. France, Bull. 26, p. 120, 1910). The last author appreciates that the groups of Fries are fairly natural and has kept the main features, while emphasizing the presence or absence of cystidia-like spicules on the surface of pileus and stem. These "cystidia" cause the velvety or pruinose character which I have used in the group Subrigidae. Further studies of all young buttons and their development will aid materially in a proper arrangement, especially with reference to the character of the margin of the very young pileus.

The claim of Maire (l. c.) that microchemical tests can be used to advantage, has been given a trial in ten of the following species. This work was done at my request by Dr. W. B. McDougall in our laboratory during the summer of 1912. The results are appended under the corresponding descriptions of the species studied.

The abbreviations of Maire are used as follows: G = Tincture of Guaiac. S V=Sulfovanilline. F S=Sulfoformalin. The last two are prepared as follows:

Sulfovanilline.

Distilled water	2.cc.
Sulfuric acid, pure	2.cc.
Vanilline (c. p.)	25 g.

Sulfoformalin.

Distilled water	25 drops
Sulfuric acid, pure	5.cc.
Formalin (4% sol.)	75 drops

The action of *guaiac* is to turn the flesh blue and should react in one or two minutes. Sometimes only certain parts of the plant react, e. g., in *R. subpunctata,* the gills are unaffected. The *sulfovanilline* turns the parts blue, sometimes at first pink, while the *sulfoformalin* intensifies the brownish color of the cystidia and the lactiferous hyphae in the gills. We did not test the "cystidia" of the surface of the pileus and stem, where the test was effectively used by Maire. In *R. virescens* and *R. crustosa* the last two chemicals had hardly any effect as compared with the quick reaction in other species. Our work has been merely preliminary and covered only a small number of species.

The key includes a few species not yet found in the state. Every season seems to differ in the particular species one finds and a number of forms still remain unidentified, but the following list comprises all the species frequent from year to year, at least in the southern part of the state.

The genus has been largely gone over and revised since the publication of the Monograph (Mich. Acad. Rep. 11, 1909), and several additional species have been included and others more fully described and discussed. The recent critical papers by Maire, Romell, Battaille, Ricken, and others in Europe, have thrown much needed light on a number of species.

Key to the Species

(A) Gills unequal, alternately long and short, flesh thick to the margin of the pileus, which is at first incurved and never has striations. (Compactae).
- (a) Flesh white, unchangeable.
  - (b) Gills subdistant; plant entirely whitish; pileus 8-15 cm. 99. *R. delica* Fr.
  - (bb) Gills close.
    - (c) Pileus whitish then sooty-gray, 5-7 cm. broad. 102. *R. adusta* Fr.
    - (cc) Pileus not becoming sooty in age.
      - (d) Odor strong, alkaline; pileus large, 10-30 cm. broad, whitish then pale rusty-ochraceus. *R. magnifica.* Pk.
      - (dd) Odor none; pileus 4-8 cm. broad, whitish. 99. *R. decila* var. *brevipes* Pk.
- (aa) Flesh changing to reddish or blackish in age or when bruised.
  - (b) Flesh at length incarnate or rusty-reddish; odor disagreeable when drying. 104. *R. compacta* Frost.
  - (bb) Flesh at length blackish.
    - (c) Gills subdistant to distant; flesh at first reddish when bruised, then black. 100. *R. nigricans* Fr.

(cc) Gills close or crowded.
(d) Gills etc. becoming reddish then black; gills crowded. 101. *R. densifolia* Secr.
(dd) Gills etc. becoming bluish-black, not at first red; pileus dry. 103. *R. sordida* Pk.
(AA) Gills mostly equal, sometimes with shorter ones scattered promiscuously.
(a) Gills dichotomously forked throughout; pileus dull pink to purplish when young, later olivaceous, or greenish-umber. 116. *R. variata* Bann.
(aa) Gills forked only at the base, or forking not extensive or lacking.
(b) Spores white in mass.
(*R. aeruginea*, *R. foetentula*, *R. rosacea*, *R. mariae* and *R. subpunctata* have creamy-white spores).
(c) Pileus white.
(d) Taste acrid. 133. *R. albidula* Pk.
(dd) Taste mild.
(e) Pileus viscid, sometimes tinged yellowish; remaining white when dried. 139. *R. albida* Pk.
(ee) Pileus dry, sometimes tinged pink. 133. *R. albella* Pk.
(cc) Pileus some shade of green or dingy greenish-white. [See also (ccc)].
(d) Pileus with a continuous separable pellicle; taste mild. 120. *R. aeruginea* Lindb.
(dd) Pellicle adnate, becoming pulverulent or areolate-cracked; gills close.
(e) Pileus dry, dark green when young, substriate on margin. 105. *R. virescens* Fr.
(ee) Pileus viscid, glabrous on disk, mouldy-white to pale greenish-white, striate on margin. 106. *R. crustosa* Pk.
(ccc) Pileus some shade of red, pink, purple or bluish. [See also (cccc)].
(d) Taste mild.
(e) Gills floccose-crenulate on edge; pileus viscid, shining blood-red; stem tinged red. 141. *R. purpurina* Q. & S.
(ee) Edge of gills not crenulate.
(f) Pileus firm and hard, or compact; pellicle adnate or disappearing in places.
(g) Pileus pruinose-velvety, dark red, or purple-red; stem rosy or dark red; gills at length dingy cream-color. 119. *R. mariae* Pk.
(gg) Pileus not markedly pruinose.
(h) Pileus 5-10 cm. broad.
(i) Pileus pale bluish-purple, at length rosy to white on disk, viscid, stem white. 117. *R. cyanoxantha* Fr. var.
(ii) Pileus pale red, soon dry, unpolished; stem rosy-tinged or white; taste rarely slightly acrid. 108. *R. lepida* Fr.
(hh) Pileus 3-6 cm. broad.
(i) Pileus dull lilac-purplish. *R. lilacea* Quel.
(ii) Pileus incarnate to pale livid pink. 114. *R. vesca* Fr.
(ff) Pileus rather thin, fragile or subfragile.
(g) Pileus usually 2-4 cm. broad, clear pink; in oak woods. 142. *R. uncialis* Pk.
(gg) Pileus 4-6 cm. broad, dark violet-purple or purplish-red, silky-shining, in conifer woods. 143. *R. sericeoniteus* Kauff.
(ggg) Pileus 6-12 cm. broad, bright rose-red with yellowish spots; stem white. 140. *R. subdepallens* Pk.
(dd) Taste very acrid.

(e) Pileus 2-6 cm. broad.
(f) Spore-mass pure white; stem white, fragile.
(g) Pileus uniform rosy-red; gills close to subdistant. 131. *R. fragilis* Fr.
(gg) Pileus rosy-red on margin, disk olivaceous or purplaces. 132. *R. fallax* Cke.
plish and livid; gills subdistant; usually in mossy
(ff) Spore-mass creamy white; stem white or rosy.
(g) Pileus rigid, not striate, soon dry; cuticle adnate, unpolished, red. 115. *R. subpunctata* sp. nov.
(gg) Pileus subfragile; pellicle separable and striate on margin, viscid, shining rosy-red. 134. *R. rosacea* Fr. *R. sanguinea* Fr.
(ee) Pileus 5-10 cm. broad, rarely larger.
(f) Rigid. Pileus dark red, not fading, cuticle adnate, even on margin. 118. *R. atropurpurea* Maire.
(ff) Fragile; pileus rose-red to scarlet.
(g) Taste tardily acrid. 130. *R. rugulosa* Pk.
(gg) Taste quickly acrid.
(h) On sphagnum; in troops. 129. *R. emetica* var. *gregaria*.
(hh) On debris of very rotten wood and on the ground. 129. *R. emetica* Fr.
(cccc) Pileus some shade of brown, yellowish, etc.
(d) Odor aromatic, becoming foetid; pileus very striate.
(c) Pileus 7-12 cm. broad, sordid yellowish-whitish. 111. *R. foetens* Fr.
(cc) Pileus 3-7 cm. broad, pale livid ochraceous; base of stem with rusty-red stains. 110. *R. foetentula* Pk.
(dd) Odor not aromatic.
(e) Pileus 6-12 cm. broad, straw-color to ochraceous-reddish, rigid, not striate. 107. *R. ochraleucoides* sp. nov.
(ee) Pileus 3-6 cm. broad.
(f) Taste acrid; pileus grayish-brown, substriate. 113. *R. sororia* Fr.
(ff) Taste mild.
(g) Pileus yellow or yellowish, at least when young, not ashy under the cuticle.
(h) Pileus 5-8 cm. broad, scarcely striate in age, chrome yellow; stem yellow. *R. flavida* Frost.
(hh) Pileus 3-5 cm. broad, very tuberculate-striate in age, at first sulphur-yellow then dingy yellowish-brown. 109. *R. Pulverulenta* Pk.
(gg) Pileus pale yellowish-brown, ashy under the cuticle, strongly striate. 112. *R. pectinatoides* Pk.
(bb) Spores and gills some shade of ochraceous, yellowish or creamy-yellowish (spore-print necessary).
(c) Stem whitish, changing to ochraceous-brown where bruised or handled; odor disagreeable in age; color of pileus purplish-red, olivaceous, yellowish, etc., very variable, colors mixed. 121. *R. xerampelina* Fr. 122. *R. squalida* Pk.
(cc) Stem not with this peculiarity.
(d) Pileus some shade of red.
(e) Taste acrid; fragile.
(f) Pileus reddish-buff to purplish; spores pale yellow; in swamps. 137. *R. palustris* Pk.
(ff) Pileus rosy-red to scarlet.
(g) Gills straw yellowish to pale ochraceous; margin of pileus even, rather firm. 135. *R. veternosa* Fr.
(gg) Gills deep ochraceous-yellow; margin of pileus striate, gills and pileus fragile. 136. *R. tenuiceps* Kauff.
(ee) Taste mild.

(f) Stem at length ashy or blackish where bruised.
(g) Wound at first reddish then black; pileus dull red, variegated with yellow etc., firm. 126. *R. rubescens* Beards.
(gg) Wound not at first reddish.
(h) In coniferous regions; stem stout.
(i) Pileus 5-12 cm. broad, orange-red. 123. *R. decolorans* Fr.
(ii) Pileus 5-10 cm. broad, crimson-red. 123. *R. decolorans* var. *rubriceps* Kauff.
(hh) In frondose regions; stem not very stout; pileus dark red to blackish on disk. 125. *R. obscura* Rom.
(ff) Stem not becoming ashy.
(g) Pileus 5-10 cm. broad or more.
(h) Plants usually solitary or scattered.
(i) Pileus firm, large, dingy or dull red to purplish, often faded; gills ochraceous from the first. 128. *R. alutacea* Fr.
(ii) Pileus and stem very fragile; colors of pileus mixed varying pink, incarnate, yellowish; spores bright yellow. 145. *R. amygdaloides* sp. nov.
(iii) Pileus firm, blood-red. 127. *R. borealis* Kauff.
(hh) Closely gregarious, sometimes in troops; fragile.
(i) Pileus dull and variable in color, not bright red; gills white at first, then creamy-yellowish to pale ochraceous. 144. *R. integra* Fr. and forms.
(ii) Pileus dark violet-purple to dark red; rather firm; spores ochraceous-buff. *R. ochrophylla* Pk.
(gg) Pileus 2-5 cm. broad or less.
(h) Spores pale yellow or cream color.
(i) Pileus umbonate, very fragile; on sphagnum. 148. *R. sphagnophila* Kauff.
(ii) Pileus not umbonate; stem and gills translucent, honey-yellowish in age; fragile. 147. *R. puellaris* Fr.
(hh) Spores truly ochraceous in mass.
(i) Stem rosy-dusted; pileus rose-red, fragile. 146. *R. roseipes* (Sec.) Bres.
(ii) Stem white; pileus pinkish red, lilac etc., fading to yellowish. 149. *R. chamaeolentina* Fr. 150. *R. abietina*, etc.
(dd) Pileus some shade of yellow.
(e) Flesh of stem cinereous when old.
(f) Pileus orange-red, fading in age. 123. *R. decolorans* Fr.
(ff) Pileus dull yellow (flavus), color not changing, scarcely viscid. 124. *R. flava* Rom.
(ee) Flesh not becoming ashy.
(f) Edge of gills vivid lemon-yellow. *R. aurata* Fr.
(ff) Edge of gills concolor.
(g) Taste mild; pileus 2-6 cm. broad, gills egg-yellow. 151. *R. lutea* Fr.
(gg) Taste tardily acrid; pileus 5-10 cm. broad; gills pale yellow. 138. *R. aurantialutea* Kauff.

COMPACTAE Fr. Flesh thick, compact and firm. Pileus without a separable pellicle, its margin non-striate and at first involute. With entire and short gills alternating regularly. Spores white in mass.

This group is closely related to the Piperites division of the genus Lactarius. Some of the species, e. g. *R. delica,* are very similar to *L. vellerius, L. deceptivus,* etc., when the latter are dried out by the wind or dry weather and then lack the milky juice. The Compactae are a very natural group, easily distinguishable.

99. Russula delica Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1068.
Gillet, Champignons de France, No. 607.
Bresadola, Fung. Trid., Vol. 2, Pl. 201.
Ibid, Fung. mang. e. vel., Pl. 68.
Ricken, Blätterpilze, Pl. 15, Fig. 1.
Patouillard, Tab. Analyt., No. 514.
Peck, N. Y. State Mus. Rep. 54, Pl. 71, Fig. 1-5 (as *R. brevipes* Pk.).
Ibid, N. Y. State Mus. Rep. 43, Pl. 2, Fig. 5-8 (as *R. brevipes* Pk.).

PILEUS 8-15 cm. broad, firm, convex-umbilicate then depressed to infundibuliform, *dull white,* sometimes with rusty-brown stains, *unpolished,* glabrous, pubescent or obscurely tomentose, even, *dry,* margin at first involute not striate. FLESH compact, white or whitish, not changing where bruised. GILLS subdecurrent, narrowed behind, broader in the middle, *subdistant,* or distant, thickish, short and long alternating, few forked, *white or whitish,* edge often distinctly greenish. STEM 2-5 cm. long, 1.5-2 cm. thick, *short,* stout, *solid,* equal or subequal or tapering down, white becoming dingy, *not turning blackish* when bruised, glabrous or subtomentose above, often with a narrow pale-green zone at apex. SPORES globose, 9-10 (rarely 11 or 12) micr., tuberculate, white in mass. TASTE mild to tardily but weakly acrid. ODOR none.

Gregarious, in sandy soil. In maple, birch, oak and coniferous woods throughout the state; most abundant along the Great Lakes in conifer regions. July-October. Common locally.

Var. *brevipes* Pk. (=*R. brevipes* Pk., N. Y. State Mus. Rep. 43, 1890), has been found at New Richmond. The gills are crowded and the pileus is smaller, 4-6 cm. broad. It was found in hard clay soil, through which it pushed with difficulty. It is apparently an ecological variety conditioned by dry weather and hard soil. It is uncommon.

The typical *R. delica* is usually a large plant, simulating *Lactarius vellerius* in size, color, etc. Fries in the Epicrisis says the cap is "shining." This error was omitted in his Monographia but copied again in Hymenenomycetes Europaei. The error has since been repeated by other authors, including Cooke on his plate in the Illustrations. The Michigan plants are exactly like those growing in Sweden, where in some of the specimens the edge of the gills and the apex of the stem were tinged green, as is the case in ours, especially in the plants of the northern part of the state. *R. lactea* Fr. is said to have very broad, distant, free gills and milk-white cap and stem. I have not seen any plants with the glaucous green gills of *R. chloroides* Bres.

100. Russula nigricans Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1015.
Gillet, Champignons de France, No. 625.
Michael, Führer f. Pilzfreunde, Vol. III, No. 75.
Ricken, Blätterpilze, Pl. 15, Fig. 2.
Peck, N. Y. State Mus. Rep. 54, Pl. 71, Fig. 6-9.
Hard, Mushrooms, Fig. 146, p. 184, 1908.

PILEUS 7-15 cm. broad, subrigid, convex then depressed to subinfundibuliform, margin at first incurved then spreading and elevated, often irregularly wavy, at first whitish and clouded with umber, *soon smoky-umber,* subviscid at first, glabrous, even on margin. FLESH compact, white, *changing to reddish* where bruised, *then blackish.* GILLS narrowed or rounded behind, adnexed, *thick* and firm, *subdistant to distant,* sometimes intervenose, short and long alternating, white becoming grayish, reddish at first when bruised. STEM 2-6 cm. long, 1-3 cm. thick, *solid,* hard, stout, glabrous, even or lacunose-depressed in places, white at first, *at length smoky-umber,* reddish then blackish where bruised. SPORES subglobose, 8-10 micr., echinulate, whitish in mass. TASTE mild, sometimes tardily but slightly acrid. ODOR none.

Gregarious or solitary. On the ground in coniferous or frondose woods. Throughout the state, rarely in the southern part, more plentiful in the north. July-September.

This Russula usually persists in ordinary weather without decaying and is then frequently inhabitated by another mushroom,

Nyctalis asterophora, as shown in the illustration. It is usually a rather large, firm plant, distinguished from the following by the subdistant, thick gills. The flesh of all parts when bruised turns first reddish then blackish, but the red stain may not appear in old plants; this is to be expected because of the drying up of the scanty juice which is supposed to cause this phenomenon where it is exposed to the air. Peck, McIlvaine and others have eaten it and consider it fairly good.

101. Russula densifolia Secr. (Edible)

Mycographie I, 1833.

Illustrations: Cooke, Ill., Pl. 1017.
Gillet, Champignons de France, No. 608.
Patouillard, Tab. Analyt., No. 319.
Hard, Mushrooms, Figs. 157 and 145, 1908.
Kauffman, Mich. Acad. Sci. Rep. 11, Fig. 1, op. p. 90, 1909.

PILEUS 5-12 cm. broad, somewhat firm, convex then depressed to subinfundibuliform, margin at first incurved then elevated, dull whitish at first, *soon clouded with pale smoky-brown,* without a pellicle, usually *subviscid,* even, pruinose when dry. FLESH compact, thick, grayish-white, pale smoky in age, *changing to reddish* when bruised, *then blackish.* GILLS narrowly adnate to subdecurrent, *rather narrow,* thick, *crowded* then close, alternately long and short, few forked, subvenose, whitish soon dingy grayish, reddish when bruised then black. STEM 5-6 cm. long, 1.5-2.5 cm. thick, stout, equal or tapering downward, rigid, spongy-solid, whitish then cinereous, soon dark ashy within, *turning reddish then blackish where bruised,* obscurely wrinkled, glabrous or subpruinose. SPORES globose, coarsely reticulate, 7-9x6-8 micr., white in mass. STERILE CELLS on edge of gills, hyaline, slender, flexuous, acuminate, 60x3-4 micr., abundant. TASTE slowly acrid in fresh plant. ODOR none.

Gregarious, subcaespitose or solitary. On the ground in frondose woods among fallen leaves. Ann Arbor, Detroit, Palmyra. July-September. Usually rare, but abundant in August, 1912, in oak woods at Ann Arbor.

As pointed out by Peck, the American plant is slightly subviscid on the cap but this character is easily overlooked. The viscidity is slight, even after rains. It comes nearest to *R. adusta,* in size,

natural coloring and gills, but differs in the change which the flesh undergoes when bruised. Authors consider *R. adusta* to have a mild taste and if this is true our plant differs also in this respect. The gills are usually markedly crowded and narrow, while those of *R. nigricans* are broad and subdistant. The latter is more common in coniferous regions, while *R. densifolia* has so far been found in Michigan only in frondose woods. Maire (Bull. Soc. Myc. France, 26, p. 87) states that *R. densifolia* lacks the hair-like sterile cells on the edge of the gills; that they are abundant in *R. nigricans* and less numerous in *R. adusta*. In our specimens of *R. densifolia* they were abundant, which would indicate that this is not a very constant character.

102. **Russula adusta** Fr.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1051.
Michael, Führer f. Pilzfreunde, Vol. II, No. 64.
Ricken, Blätterpilze, Pl. 15, Fig. 3.

"PILEUS 5-7 cm. broad, convex then depressed or subinfundibuliform, *white or whitish,* becoming brownish or sooty-gray, glabrous, dry, even. FLESH compact, white, *not changing when bruised.* GILLS adnate to subdecurrent, *thin, close,* short and long alternating, narrow, white becoming sordid. STEM 2-5 cm. long, about 1.5 cm. thick, *short, solid,* equal or subequal, glabrous, even, *white then sooty-gray.* SPORES subglobose, slightly echinulate, 6-9 micr., white in mass. Taste *mild. Odor* slight."

Gregarious or solitary. On the ground in mixed woods of northern Michigan. July-September. Infrequent.

The smaller size, unchanging flesh when bruised, and thin close gills characterize it. At first the whole plant is nearly white, but it gradually takes on a grayish or sooty cast. Michael, who gives an excellent figure, says it has a rather strong odor which is almost nauseating. This seems not to have been noticed by others. In Europe, also, it is said to be soon attacked by grubs especially in the stem; as the same insects do not always occur in this country, such facts are only of local interest. It usually hugs the ground closely.

103. **Russula sordida** Pk. (Edible)

N. Y. State Mus. Rep. 26, 1874.

Illustrations: N. Y. State Mus. Bull. 105, Pl. 98, Fig. 1-3, 1905.
Plate XIV of this Report.

PILEUS 5-12 cm. broad, *dry,* convex-depressed, margin at first incurved, glabrous, even, *dingy white becoming smoky with age.* FLESH whitish, compact, *becoming blackish-brown or bluish-black* when bruised, *without first turning reddish.* GILLS adnate to subdecurrent, rather narrow, *close,* long and short alternating, *white becoming blackish in age,* few forked. STEM 3-5 cm. long, 1-2 cm. thick, short, solid, rigid, equal, whitish becoming black when handled. SPORES globose, 7-8 micr., white in mass. TASTE mild or tardily and slightly acrid. ODOR none.

Gregarious or solitary. On the ground in the hemlock regions of the north, rarely in southern Michigan. July-August. Infrequent.

This differs from the European *R. albonigra* (Kromb.) in its dry pileus. A species has been named by Peck with viscid cap, viz., *R. subsordida;* this is probably identical with *R. albonigra.* Our plant has a dry pileus and differs from *R. nigricans* and *R. densifolia* in the lack of the change to red immediately after bruising. In specimens found near Ann Arbor the gills of the young plants were easily separable from the trama of the pileus; whether this is a constant character I cannot say. Peck found the same to be true in specimens of *R. densifolia.* The stems are said to be often infested with grubs.

104. **Russula compacta** Frost & Peck (Edible)

N. Y. State Mus. Rep. 32, 1879.

Illustration: Peck, N. Y. State Mus. Bull. 116, Pl. 109, 1907.

PILEUS 5-10 cm. broad, firm, convex then depressed to subinfundibuliform, margin at first incurved, thin, then elevated, *dry, unpolished,* minutely tomentose in age, even, whitish when young, *at length sordid-pale-reddish or rusty-ochraceous* either wholly or in spots. FLESH thick, compact, rather brittle, white, *changing to reddish in age or when wounded.* GILLS narrowly adnate, close, rather *narrow,* alternately short and long, sometimes much forked toward base, sometimes few forked, white at first, then stained

sordid reddish or reddish-brown. STEM 3-6 cm. long, 1.5-3 cm. thick, *stout,* spongy-stuffed, *rather brittle,* equal or tapering down, uneven, white at first becoming reddish or reddish-brown in age or from handling. SPORES subglobose, echinulate, with large oil-globule, 8-10x7-8 micr., white in mass. TASTE mild or slightly and tardily acrid. ODOR *becoming disagreeable* in age or on drying, like that of *R. squalida* Pk.

Gregarious. On the ground in beech and maple woods. New Richmond. August-September. Rare.

This is a very distinct species. The whole plant becomes diffused with the rusty-reddish color which is at first pale incarnate, but becomes more marked as the plant ages. The stem has the consistency of that of *Boletus castaneus* or *B. cyanescens* but the interior becomes cavernous less readily than in those plants. The scanty juice which causes the color change has the same relation to the flesh as that which causes the reddish and then blackish color in *R. nigricans.* The disagreeable odor of the drying plant is quite marked, and is an aid to its identification. It is probably quite rare; it was found only a few times in New York by Peck but has been reported by Van Hook from Indiana. *R. incarnata* Morgan (Cinn. Soc. Nat. Hist., 1883) is probably identical. The edges of the gills are provided with microscopic, subcylindrical, sterile cells. In age the plant becomes quite fragile. Peck's figure is not at all illustrative of the colors.

RIGIDAE. Flesh compact, rather thick. Pileus rigid, provided with an adnate cuticle which often cracks or disappears in parts of the surface, especially on disk, mostly separable only at the margin. Gills usually somewhat forked, and with shorter ones intermingled.

The subgenus differs from the Compactae in that the gills do not alternate regularly as long and short and by the presence of an adnate pellicle; it differs from the Subridgidae and Fragiles, by the more rigid substance of the pileus, the adnate pellicle, the presence of short gills and usually by the forking of some of the gills especially at or near the stem. Most of the species are mild or very slightly acrid.

Section I. Margin of pileus obtuse, cuticle soon dry, at length pulverulent, granular or rimosely-cracked in places. Gills broader anteriorly.

105. Russula virescens Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1039.
Gillet, Champignons de France, No. 639.
Bresadola, Fungh. mang. e. vel., Pl. 69.
Michael, Führer f. Pilzfreunde, Vol. II, No. 62.
Atkinson, Mushrooms, Pl. 36, Fig. 1, 1900.
Marshall, Mushroom Book, Pl. 18, p. 69 (poor).
Gibson, Edible Toadstools and Mushrooms, Pl. 11, p. 126, 1903.
Peck, N. Y. State Mus. Rep. 48, Pl. 31, 1896.
Hard, Mushrooms, Fig. 150, p. 189, 1908.
McIlvaine, Amer. Fungi., Pl. 44, Fig. 6, p. 184, 1900.

PILEUS 5-12 cm. broad, at the very first globose, soon convex and expanded, often somewhat depressed on disk, firm, *dry,* as if velvety, the surface (especially the disk) broken into many floccose or pulverulent *areas or patches, green* or grayish green, the margin *not striate* or rarely so, cuticle scarcely distinguishable or separable. FLESH white. GILLS *white.* rather close, narrowed toward the stem, almost or entirely free, few shorter or forked. STEM 3-7 cm. long, 1-2 cm. thick, white, firm, equal or subequal, solid or spongy. SPORES white, subglobose, 6-8 micr. CYSTIDIA none. No differentiated subhymenium. TASTE *mild.* ODOR none.

Oak and maple or mixed woods, probably throughout the state. Occasional. July and August.

Under this name was included in this country, for a time, a more common form with viscid striate cap which has been segregated by Peck under the name of *R. crustosa.* The two seem to run into each other at times, but Peck distinguishes the pileus of *R. crustosa* "by its smooth, not warty center, its paler color and usually striate margin." The latter is also distinctly viscid when young but this depends considerably on the weather conditions. *R. virescens* might be confused with green specimens of *R. variata* whose surface is sometimes areolate, but the gills of *R. virescens* are not as pure white, are not decurrent nor much forked, and the taste is mild.

Microchemical tests: G. (Flesh and gills slowly bright blue.) F S. (No effect.) S V. (No effect.)

106. Russula crustosa Pk. (Edible)

N. Y. State Mus. Rep. 39, 1886.

Illustration: N. Y. State Mus. Bull. 67, Pl. 84, Fig. 1-7, 1903.

PILEUS 5-12 cm. broad, firm, convex then expanded and depressed in the center, surface cracked except on disk, the *areas crustlike,* sordid cream-color, dirty brownish or ochraceous, usually tinged with olive or green, *viscid* when young or moist, especially on the disk, *striate on margin* when mature. FLESH white. GILLS *dull white,* becoming somewhat dingy cream color in age, rather broad in front, narrowed toward the stem, adnexed or free, *thick, distinct,* not crowded, rather brittle, few forked, few short. STEM 3-6 cm. long, 1-2.5 cm. thick, short, stout, spongy-stuffed, subequal or ventricose, white. SPORES white, subglobose, 8-10 micr. CYSTIDIA rather numerous, extending clear through the subhymenium. *Subhymenium* sharply separated from gill-trama. TASTE *mild.* ODOR none.

Scattered or gregarious. Oak and maple woods in southern Michigan. July to September. Common.

This is near *R. virescens* and is apparently much more common. It seems to be still referred to *R. virescens* by some authors, although in that case the Friesian description will have to be modified to include it.

Michochemical tests: G. (Flesh and gills become deep blue.) S V. (Gills and flesh very slowly tinged blue.) F S. (Cystidia colored brown.)

107. Russula ochraleucoides sp. nov.

Illustration: Plate XV of this Report.

PILEUS 6-12 cm. broad, *large, rigid,* convex, soon expanded-plane, varying *straw-yellow to pale ochraceous,* usually dull ochre to reddish-ochre toward center, pellicle adnate, soon dry, and *pulverulent* or subrimose, *even* on the *obtuse* margin. FLESH *thick,* compact, white, unchanging or slightly sordid in age. GILLS adnexed or free, *rather narrow,* rounded and slightly broader in front, *white* or whitish, close to subdistant, shorter ones intermingled, often forked in posterior part, intervenose. STEM 4-6 cm. long, 1.5-2 cm. thick, short, *rigid,* equal or tapering slightly downward, *white,* glabrous or subpruinose, spongy-solid, even or obscurely

wrinkled. SPORES globose, very minutely rough, 7-9 micr. (incl. apiculus), *white in mass.* CYSTIDIA very few. BASIDIA about 40x9 micr. TASTE tardily and slightly bitterish-acrid or disagreeably bitter. ODOR faintly aromatic or none.

Gregarious. On the ground in open oak-maple woods. Ann Arbor. August. Rare.

Related to *R. virescens* by its rigidity and the nature of the surface of the pileus. The surface is pulverulent, somewhat rimose in age, soft to the touch and under the microscope is seen to be composed of slender, hyaline, erect cystidia-like hairs. A subhymenium is lacking. It has a short, stout stem and relatively much broader cap. It differs from *R. ochraleuca* in size and in the thick flesh of the cap, in that the flesh of the stem does not become ashy when bruised, as well as in the bitter taste and the unpolished pileus. *R. granulosa* Cke. is said to have a granular stem and pileus, and many cystidia in the hymenium according to Massee. It is far from belonging to the Fragiles where Fries placed *R. ochraleuca. R. granulata* Pk. is said to be tubercular-striate on the margin of the cap and is smaller. The gills are often abundantly forked toward the stem.

108. Russula lepida Fr. (non Bres.) (Edible)

Epicrisis, 1836-38.

Illustrations: Fries, Sverig. Swamp., Pl. 59, form minor.
Cooke, Ill., Pl. 1072.
Gillet, Champignons de France, No. 620.
Ricken, Blätterpilze, Pl. 16, Fig. 4.
Hard, Mushrooms, Fig. 149, Pl. 188, 1908. (Doubtful.)
Gibson, Edible Toadstools, etc., Pl. 12, p. 131, 1903. (Doubtful.)
Atkinson, Mushrooms, Pl. 36, Fig. 3, p. 126, 1900. (Doubtful.)

PILEUS 4-10 cm. broad, *rigid,* convex, then expanded-depressed, cuticle adnate and disappearing on disk, *unpolished, soon dry,* rose-red to pale blood-red, *fading,* disk soon pallid or variegated with paler yellowish-reddish hues, sometimes rimulose-cracked or rugulose on disk, margin obtuse, not striate. FLESH compact, *white* or reddish under the cuticle, thick, abruptly thin on margin. GILLS narrowed behind and narrowly adnate or almost free, close, *rather narrow,* broader and rounded in front, *white then whitish* (albus), few shorter, occasionally forked. STEM 4-7 cm. long, 1-2 cm. thick,

equal or slightly tapering downward, *white or tinged rosy-pink,* spongy-stuffed, rather rigid, obscurely wrinkled. SPORES subglobose, 9-10 x 7-8 (incl. apiculus), with oil-drop, rough or partly smooth, *almost pure white in mass.* ODOR none or very slightly disagreeable. TASTE *mild,* sometimes slightly bitterish-subacrid. CYSTIDIA moderately abundant, subcylindrical, 70-75x10-12 micr.

Gregarious or solitary. On the ground in frondose woods. Ann Arbor, Detroit. July-August. Rather rare.

This plant occurs rather rarely in southern Michigan. It differs from the description given by Bresadola (see translation Mich. Acad. Rep. 11, p. 68, 1909) in that the spore-mass is nearly white, not straw color, and the gills are only slightly thickish. I have found specimens only during a few seasons. Peck also reports it uncommon in New York. The margin of the pileus is sometimes slightly viscid and the cuticle slightly separable on the margin. It must not be confused with *R. mariae* whose cap and stem are less rigid and more deeply colored, and which has creamy-yellowish spores and larger cystidia. Our plant sometimes has an entirely rose-red cap, sometimes, especially when older, approaching the colors of *R. decolorans* but paler and duller, subpruinose when dry and variegated with pinkish, yellowish or pale-orange hues becoming white in spots. It is often rigid for a long time.

Section II. Margin of pileus acute or subacute, at first incurved; cuticle *viscid,* slightly separable only on margin, often disappearing on disk or in spots.

109. Russula pulverulenta Pk.

Torr. Bot. Club, Bull. 29, 1902.

Illustration: Plate XVI of this Report.

PILEUS 3-5 cm. broad, rather rigid at first, *then fragile,* rather thin, broadly convex at first, expanded and depressed to subumbilicate, at first even on the margin, at length *distinctly tuberculate-striate,* cuticle adnate, viscid, separable on margin, in very young stage sulphur-yellow, soon ochraleucous, finally *dingy yellowish brown,* surface *dotted* by small, numerous, *pale yellow, somewhat mealy or flocculent scales or granules,* margin at very first incurved-subinrolled. FLESH white, at first firm and tough, finally soft. GILLS narrowly adnate, close, rather narrow, broader toward front, *white,* unchanging, often bifurcate at stem, intervenose. STEM 3-5

cm. long, 1-1.5 cm. thick, subequal or irregularly enlarged, *rigid-fragile,* surface at the very first covered by a sulphur-yellow pulverulence, *at length dotted by sulphur-yellow granules, especially at base,* white beneath, spongy-stuffed, *becoming cavernous.* SPORES globose, echinulate, 6-8 micr. (incl. apiculus), *white in mass.* CYSTIDIA numerous, subhymenium scarcely differentiated. BASIDIA 45x9 micr., 4-spored. TASTE and ODOR slight or somewhat disagreeable.

Gregarious. On lawns, roadsides, or in frondose woods among grass, etc. July-September. Southern Michigan. Not infrequent during a few seasons.

This Russula is closely allied to the preceding section. Its development has been carefully studied. When the caps are 4 mm., or less broad the margin is definitely subinrolled. The texture of the trama is then very firm and tough and the entire surface of both cap and stem is covered, as seen under the microscope, by a differentiated thin layer composed of short, dense, erect yellow hairs or hyphae. These hyphae are continuous at first with the trama but become separated in masses as the pileus and stem enlarge, adhering at length to the surface of the mature pileus and stem as delicate, appressed, pulverulent-flocculose, sulphur-yellow granules. The hymenium contains very numerous cystidia with a dark-brown, granular content, which project into the subhymenium and often connect with similarly colored hyphae which intermingle with the gill-trama. (Lactiferes.) The young cystidia project above the basidia but later are even with them. These brownish cystidia give a brown-dotted appearance to the sides of the gills as seen under low power of the microscope.

Microchemical tests: G. (Flesh and gills become rapidly light blue, then dark blue.) S V. (Gills first turn reddish then slowly blue; flesh scarcely affected.) F S. (Cystidia colored brown.)

This species is easily confused in the old, discolored stage with *R. pectinatoides* and *R. foetentula,* since both have a livid yellowish-brown cap at times when mature, well marked tuberculate striations, and are about the same size. They lack, however, the peculiar yellow granules of *R. pulverulenta.* (For further remarks see Mich. Acad. Rep. 11, p. 77, 1909.)

110. Russula foetentula Pk.

N. Y. State Mus. Bull. 116, 1907.

PILEUS 3-7 cm. broad, soon fragile, at first subhemispherical then convex to plane and depressed, *viscid, livid-ochraceous, russet-tinged,* disk darker and innately granular, long tuberculate-striate. Margin at first incurved. FLESH thin, whitish. GILLS adnexed or nearly free, close, rather narrow, broader in front, thin, whitish, *often spotted or stained reddish.* STEM 2.5-5 cm. long, 6-12 mm. thick, subequal, somewhat firm, spongy-stuffed, soon cavernous, whitish or sordid-white, *stained at the very base by cinnabar-red stains.* SPORES 7-9 x 6-7 micr., echinulate, *creamy-white in mass.* CYSTIDIA moderately abundant. BASIDIA 40-45x9 micr., 4-spored; *subhymenium* scarcely differentiated. OROR none or somewhat like oil of bitter almonds, varying in intensity. TASTE very slightly acrid.

Scattered or gregarious. On the ground in frondose woods. Ann Arbor. Abundant in 1911.

This species has characters intermediate between *R. foetens* and *R. pectinatoides* and is most easily distinguished from both by the reddish stains at the base of the stem; this character was very constant in many individuals during a single season. The odor varies much in intensity and is often lacking. The pileus is sometimes tinged with reddish-yellow but most of our plants had a decided russet color at maturity. Micro-chemical tests as in *R. pulverulenta.*

111. Russula foetens Fr.

Syst. Myc., 1821.

Illustrations: Fries, Svamp. Sverig., Pl. 40.
Cooke, Ill., Pl. 1046.
Gillet, Champignons de France, No. 612.
Michael, Führer f. Pilzfreunde, Vol. I, No. 45.
Ricken, Blätterpilze, Pl. 19, Fig. 4.
Hard, Mushrooms, Fig. 147, p. 185, 1908.
Plate XVII of this Report.

PILEUS 7-12 cm. broad, fleshy, hard then fragile, *subglobose* then expanded and depressed, viscid when moist, thin margin at first incurved, *tuberculate-sulcate* when expanded, yellowish or dingy ochraceous, pellicle adnate. FLESH thin, rigid but fragile, dingy

white. GILLS white, at *first exuding drops of water,* sordid when old or bruised, rather close, adnexed, few forked, interspaces venose, shorter ones present. STEM 4-6 cm. long, 1-2.5 cm. thick, whitish, short, stout, stuffed then cavernous. SPORES *white* in mass, subglobose, 7.5-10 micr. CYSTIDIA numerous; subhymenium narrow, not sharply differentiated. TASTE *acrid.* ODOR *strongly amygdaline, becoming foetid.*

Gregarious. In mixed woods in the north; in oak, maple, etc., in southern Michigan. July, August and September.

The odor of the fresh young plant is like oil of bitter almonds or cherry bark; when old or decaying it becomes quite disagreeable. The margin of the young pileus is strongly incurved. Not edible.

Micro-chemical tests: G. (Flesh and gills quickly light blue, then dark blue.) S V. (Gills slowly deep blue.) F S. (Cystidia colored brown.)

112. Russula pectinatoides Pk.

N. Y. State Mus. Bull. 116, 1907.

Illustrations: Ibid, Pl. 105, Fig. 6-10.

PILEUS 3-7 cm. broad, rather firm, *becoming fragile, thin,* convex, then plano-depressed, viscid when moist, covered by a thin separable pellicle, radiately rugose-striate on the margin, often halfway to the center, or *strongly tubercular-striate,* dingy straw color, brownish, yellowish-brown or umber-brown. FLESH white, thin, becoming fragile, slightly *ashy under the cuticle,* not changing. GILLS whitish, close to subdistant, thin, distinct, equal, moderately broad, broadest in front, narrowed behind, often stained or broken halfway from stem, some forked at base. STEM 2-5 cm. long, .5 to 1 cm. thick, white or dingy, subequal, glabrous, spongy-stuffed *then hollow,* even. SPORES whitish or creamy-white in mass, subglobose, 6-8 micr. diam. TASTE mild or slightly and tardily acrid. ODOR *not noticeable.*

Gregarious. Grassy places, lawns, groves and woods. Throughout the state. July and August.

Cooke's illustrations of *R. pectinata* and *R. consobrina* var. *sororia* remind one very much of this plant. Peck points out that it differs from these by its mild taste, adnate gills and grayish color under the cuticle. It is also close to *R. foetentula,* which sometimes lacks the odor. *R. subfoetens* Smith as known to Romell, also reminded me of this species. The color of *R. pectinatoides,* the

long striations and the medium size are the best recognition marks in the field. It differs, of course, from *R. foetens* by lack of a strong odor. Whether the margin is at first incurved is nowhere noted.

113. Russula sororia Fr.

Epicrisis, 1836-38 (as subspecies of *R. consobrina*).

Illustration: Cooke, Ill., Pl. 1057.

PILEUS 3-6 cm. broad, rather firm, convex then subexpanded, *viscid* when moist, margin substriate when mature, pellicle somewhat separable along margin, *gray,* olivaceous-brown or grayish-brown. FLESH white, unchanged. GILLS narrow, subdistant, distinct, white for a time, then discolored, adnate, shorter ones intermingled, rarely forked, interspaces venose. STEM 2.5-5 cm. long, 1-2 cm. thick, white, not becoming cinereous, short, spongy-stuffed. SPORES *white.* TASTE *acrid.* ODOR none.

Solitary. Woods in southern Michigan. August and September. Rare. This species used to be placed under *R. consobrina.*

114. Russula vesca Fr.-Bres.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1075.
Bresadola, Fungh. mang. e. vel., Pl. 72.
Ibid, Fung. Trid., Pl. 128 (as *R. lilacea* var. *carnicolor*).
Michael, Führer f. Pilzfreunde, Vol. I, No. 41 b.

PILEUS 3-6 cm. broad, fleshy, firm, convex then expanded and depressed in the center, *viscid, soon dry,* more or less rugulose or wrinkled, reddish, *pale livid-pink,* or sordid flesh-red, becoming paler, cuticle thin and disappearing, *not quite reaching the edge of the pileus* so that a narrow white exposed margin results, margin even and spreading. FLESH white. GILLS white, thin, at length *stained* lurid-brownish or rusty, close, moderately narrow, adnate, forked or anastomosing at base. STEM white, obscurely rivulose, *hard* and compact, subequal, solid, 3.5-4.5 cm. long, 1.5 cm. thick, often discolored by yellowish-rusty stains. SPORES *white in mass,* subglobose, minutely echinulate, 7-8 micr. TASTE *mild.* ODOR none. Rare.

Only a few doubtful collections have been made in southern Michigan. The above description is taken from my notes of the Swedish plant as known to Romell, and agrees mostly with that of Bresadola. Most modern mycologists consider the Friesian "rugulose-reticulate" character of the stem as too uncertain to be practicable. The important characters are: the hard consistency, the wrinkled or veined rarely "cutefracta" surface of the cap, the cuticle not reaching to the margin of the cap, and the gills discolored in spots. The cuticle apparently ceases to grow so that the surface of the expanding pileus may become somewhat areolate cracked and the margin naked.

115. Russula subpunctata sp. nov.

PILEUS 2-5 cm. broad, *rigid,* convex then expanded-plane to depressed, cuticle adnate and scarcely separable on margin, subviscid, soon dry, *pale dull red to rosy-red,* often white-spotted where cuticle disappears, minutely rivulose or subgranular, margin even, acute. FLESH compact, firm, rather thick on disk, abruptly thin on margin. GILLS adnate to subdecurrent, thin, slightly attenuate at both ends, not broad, close to subdistant, whitish *then pale cream-colored,* few short or forked at base, pruinose, intervenose. STEM 2-4 cm. long, 4-10 mm. thick, subequal or tapering down, spongy-stuffed, *becoming cavernous,* white or rosy-tinged, unchanging, attached at times to roots and forming mycorhiza. SPORES subglobose, rough-reticulate, 9-11x7-9 micr. (incl. apiculus), *creamy-white in mass.* CYSTIDIA abundant, subcylindrical, rough, with dark brown granular content, 90-110x8-12 micr. BASIDIA about 65x9 micr. *Subhymenium* markedly differentiated. TASTE *quickly and very acrid.* ODOR none.

Gregarious. On the ground in frondose woods. Ann Arbor. July-August. Infrequent.

The appearance of this Russula is well shown in Patouillard's figure of *R. punctata* Gill. (Tab. Analyt., No. 621) with which it agrees except in its very acrid taste. The gills of our plants have only rarely a red edge. The spore print is cream-colored or almost light yellowish. Dr. McDougal found one group of specimens forming mycorhiza on roots of *Tilia americana.*

Micro-chemical tests: G. (Flesh slowly light blue; gills unaffected.) S. V. (Flesh and gills quickly deep blue.) F. S. (Cystidia colored brown.)

116. **Russula variata** Banning—Pk. (EDIBLE)

N. Y. State Mus. Bull. 105, 1906.

Illustrations: Ibid, Pl. 101, Fig. 1-5.
Hard, Mushrooms, Fig. 154, p. 194, 1908 (as *R. furcata*).

PILEUS 5-12 cm. broad, fleshy, firm, convex then depressed to subinfundibuliform, viscid, *not striate,* purplish or *deep rose pink when young,* later variegated with olive or dark umber or sometimes *greenish* with only a trace of *purple,* opaque and reticulate-wrinkled under lens, the thin pellicle slightly separable on the thin margin, with a subsilky or dull luster when dry. FLESH white, firm, cheesy, tinged grayish under pellicle. GILLS shining and *persistently white,* adnato-decurrent, thin, *rather crowded,* narrowed at both ends, not broad, *subdichotomously forked,* interspaces venose. STEM 4-7 cm. long, 1-3 cm. thick, white, firm, solid, equal or subequal, sometimes tapering downward, even. SPORES *white in mass,* subglobose, 7-10 micr. TASTE *mild to tardily acrid* or slightly astringent. CYSTIDIA very few and short. *Subhymenium* not clearly differentiated. ODOR none.

Gregarious. Under conifers at Marquette, in deciduous woods about Ann Arbor. July, August and September. Frequent.

Superficially nearest to the descriptions of *R. furcata* Fr. and *R. virescens* Fr. The former species is rare in Europe, and most authors have consigned it to oblivion or consider it a variety of *R. cyanoxantha.* The plants which used to be referred to *R. furcata* in this country, have found a more appropriate resting place in *R. variata.* The figures of *R. cutefracta* Cke. (Cooke, Ill., Pl. 1024 and 1040) show the color of the young and old plants much better than do Peck's figures, and if Cooke's species had pure white spores and white and dichotomously forked gills, they could be considered identical; however, these points are not clear. Peltereaux thinks *R. cutefracta* Cke. occurs in France and has ochraceous spores and that the cracked margin of the cap is a weather effect; this then could not be our species with white spores. When one finds single old plants with much green, it is quite difficult to distinguish them from *R. virescens;* they are to be separated by their dichotomously forked gills which are slightly decurrent and more persistently white, and by the slight acridity. The cuticle is sometimes cracked toward the margin as in *R. virescens,* but its margin is at first incurved while in *R. virescens* it is straight on the stem. Peck says

it has a good flavor after cooking, which destroys the slight acrid taste.

Micro-chemical tests: G. (Flesh and gills quickly deep blue.) S V. (Gills slowly blue; flesh slightly blue-tinged.) F S. (No effect.)

117. **Russula cyanoxantha** Fr. var. (EDIBLE)

Monographia, 1865.

Illustrations: Michael, Blätterpilze, Vol. II, No. 59.
Gillet, Champignons de France, No. 605.
Cooke, Ill., Pl. 1076 and 1077. (Doubtful.)
Bresadola, Fungh. Mang. e. vel., Pl. 71. (Doubtful.)

PILEUS 5-10 cm. broad, *rigid,* convex then expanded and depressed in the center or subinfundibuliform, *dark bluish-purple or lilac* on margin, *disk dingy white tinged rose-pink,* cuticle thin and adnate, *viscid,* separable on margin, *even,* or substriate only near edge, surface somewhat wrinkled or streaked. FLESH white, compact, purplish or lilac under cuticle. GILLS *white,* a few forked toward base, few shorter, moderately broad, not very distant, narrowed behind, intervenose. STEM 6-9 cm. long, 1-2 cm. thick, *white,* subequal, spongy-stuffed, cortex hard, sometimes cavernous and compressed, glabrous, even or obscurely wrinkled. SPORES *white in mass.* TASTE *mild.* ODOR none.

Scattered or gregarious. Maple and birch, or mixed woods of northern Michigan, oak and maple woods of the southern part. July-August. Not infrequent.

The above description applies to a definite form which occurs in Michigan and is quite constant. It does not agree with the species understood by Romell, Maire and Peltereaux in Europe, whose typical plant has creamy-white gills and spores. Our species approaches *R. azurea* Bres. in color, but that plant is rather fragile and is related to the *R. emetica* group. Michael's figures show the colors of the cap when young and not yet decolorized on the disk. It is more frequent northward and may be distinct from the European plant.

118. Russula atropurpurea Maire (ex. Kromb. non Pk.)

Bull. Sco. Myc. de France, Vol. 26, p. 167, 1910.

Illustrations: Cooke, Ill., Pl. 1025 and 1087 (as *R. rubra*).

PILEUS 5-14 cm. broad, rigid, medium to large size, convex then plane, soon depressed, rather firm, viscid, pellicle adnate and scarcely separable on the margin only, scarlet to dark crimson when fresh and young, *becoming darker to purplish when mature or on drying, pruinose,* disk often darker, sometimes blackish-red to livid olivaceus-purple, sometimes yellow spotted, margin even or only slightly striatulate in age. FLESH dark red under the pellicle, white elsewhere, not changing to ashy. GILLS *white,* dingy in age, *rather narrow,* close behind, subdistant in front, adnexed, few short, interspaces venose. STEM 4.7 cm. long, 1-3 cm. thick, subequal, medium stout, white with a dull lustre, *pruinose,* even, spongy-stuffed, apex floccose-punctate. SPORES white in mass, oval, 8-10 micr. diam., strongly echinulate, nucleate, apiculus long and stout. TASTE *acrid.* ODOR none.

Gregarious or solitary. On the ground, on much decayed logs or debris, sometimes at base of white pine or beech trees, in pine-beech woods. New Richmond. Sept. Frequent locally.

Distinguished among the "ruber" group by the mode of color change while maturing, the white gills, spores and stem, and the acrid taste. In wet weather the cap is viscid, on drying its surface is distinctly pruinose. Except for the colors of the pileus it agrees with *R. ruber* Fr. in the sense of Peck. The stem is rarely inclined to ashy in age but not distinctly so. According to Maire's conception the species is quite variable and includes plants whose stem readily turns ashy.

SUBRIGIDAE. Pileus subrigid, rather compact; cuticle soon dry, *pruinose or pruinose-velvety;* margin obtuse. Gills broader in front, equal. Spore-mass never pure white.

This group approaches the preceding by its rather compact and thick pileus, and the following by its equal gills. The pellicle is soon dry and pruinose or pruinose-velvety by which character the species are best recognized. Several aberrant species are, however, included, e. g., *R. xerampelina* with intermixed short gills and *R. mariae* with margin of pileus at first incurved.

119. Russula mariæ Pk. (EDIBLE)

N. Y. State Mus. Rep. 24, 1872.

Illustrations: N. Y. State Mus. Bull. 75, Fig. 1-8, 1904.
Plate XVIII of this Report.

PILEUS 3-9 cm. broad, firm, subhemispherical at first, then broadly convex to plane and depressed, *dry,* subviscid when wet, *pruinose-velvety,* dark crimson, *reddish-purple* or maroon-purple, *even,* substriate only when old, margin at first incurved. FLESH thick, thinner toward margin, compact, becoming softer, white, sometimes reddish under pellicle. GILLS narrowly adnate or almost subdecurrent, *rather narrow,* of nearly uniform width, *white then dingy cream-color,* close to subdistant, equal, bifurcate at base. STEM 3-9 cm. long, 8-15 mm. thick, subequal or tapering downward, firm then fragile, spongy-stuffed, *pruinose, rosy-red to dull purplish-red,* especially in the middle, rarely white except at ends, white within and unchanging. SPORES globose, tuberculate-crystallate, 7.8 micr., *creamy-whitish in mass,* scarcely yellowish-tinged. CYSTIDIA rather abundant, lanceolate, 90-95x12 micr. BASIDIA 36-42 x9 micr. *Subhymenium* of small cells, not sharply limited. TASTE mild or rarely very slightly acrid. ODOR none.

Gregarious. On the ground in frondose woods. Southern Michigan. July-August. Infrequent.

I have examined the type specimens and submitted drawings, photographs and specimens to Peck. His plants average smaller and his figures and descriptions are deceptive as to size as compared with most of the specimens found in Michigan. With us *R. mariæ* is nearly always larger and has much of the appearance of Cooke's figure of *R. expallens* (Ill., Pl. 1029), but that species is said to have a very acrid taste. The pileus varies scarlet-red, reddish-purple, maroon or dark purple. The caps of the purple forms have the appearance of those of *R. queletii, R. purpurea* and *R. drimei* of Cooke's plates; but all of these have a very acrid taste. The red forms agree quite well with Gillet's and Michael's figures of *R. linnaei,* but Romell, Maire, Bresadola and others consider *R. linnaei* as a doubtful species. The stems of *R. mariæ* are nearly always somewhat colored. The pruinosity of the cap and stem is due to minute tufts of purplish or reddish hairs as seen under the microscope. The plant was named by Dr. Peck in honor of his wife Mary. The interpretation of this species in my previous paper (Mich. Acad. Rep. 11, p. 70, 1909) was an error.

120. **Russula aeruginea** Lindb. (non Fr.) (EDIBLE)

Svampbok, 1902.

Illustrations: Ibid, Fig. 52.
Cooke, Ill., Pl. 1044 (as *R. heterophylla* Fr.). (Doubtful.)
Michael, Führer f. Pilzfreunde, Vol. II (as *R. livida* Pers.).
Ricken, Blätterpilze, Pl. 16, Fig. 2 (as *R. graminicolor* Quel.).

PILEUS 5-8 cm. broad, *moderately firm,* then fragile, convex to expanded, subdepressed, *dull greenish, dark green* to smoky-green, paler on margin, pellicle adnate, subviscid when moist, soon dry with a dull luster and *subpulverulent to pruinose-velvety,* slightly separable on margin, even or substriate in age. FLESH thick on disk, thin on margin, white, sometimes cinereous to greenish under pellicle. GILLS narrowly adnate or almost free, close to subdistant, *rather narrow,* slightly broader in front, entire or very few short ones, distinct, white at first *then pale creamy-white,* becoming dingy in age, bifurcate at base, intervenose. STEM 4-5 cm. long, 1 cm. thick, subequal or tapering downward, glabrous, *white,* spongy-stuffed, firm, even. SPORES subglobose, *creamy-white,* 6-9 micr. TASTE *mild.* ODOR none.

Gregarious or solitary. On the ground in coniferous or mixed woods of the Northern Peninsula. Marquette, Sault Ste. Marie. July-September. Infrequent.

This species is considered identical with *R. graminicolor* Quel. by the French mycologists. The "shining-white gills" (candidae) of the Friesian description is probably an error. *R. heterophylla* Fr. is now limited by most writers to a plant with pure white gills and spores and is rare. *R. olivascens* Fr., reported (Mich. Acad. Sci. Rep. 11, p. 76, 1909), has been omitted as it appears too close to this species; the specimens referred to it had a more yellowish tint to the spore-mass.

121. **Russula xerampelina** Fr. (SUSPECTED)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., 1041 (as *R. olivacea*).
Gillet, Champignons de France, No. 628 (as *R. olivacea*).
Ricken, Blätterpilze, Pl. 18, Fig. 4 (as *R. olivacea*).

PILEUS 5-10 cm. broad, *firm,* convex then plano-depressed, dry or very slightly viscid in wet weather, pellicle hardly separable, not striate on margin, surface glabrous or subpruinose, purplish-red to purplish-olive, disk olivaceous, variegated. FLESH *compact,* whitish then dingy. GILLS *creamy-white* to creamy-yellowish, then sordid, rather close, adnexed, moderately broad throughout, thickish, often forked, shorter ones usually intermingled, interspaces venose. STEM white or *rosy-tinged,* soon dingy olivaceous-yellowish where handled, 5-7 cm. long, 1.5-2.5 cm. thick, firm, subventricose or equal, spongy-stuffed, even or obscurely wrinkled, *changing* where bruised *to dirty ochraceous-brown.* SPORES creamy-yellowish, globose, echinulate, 9-10 micr. TASTE *mild.* ODOR *disagreeable with age* or when drying.

Scattered. Hemlock and coniferous or mixed woods of the Northern Peninsula. July and August.

This has usually been referred to *R. olivacea* Fr. in this country. In Europe, *R. olivacea* is a very much debated species. Fries' description requires truly yellow gills (luteis), and with this character it has seldom been found. Romell has never seen such a plant in Sweden and unites *R. olivacea* and *R. xerampelina* under the name *R. graveolens.* The series of color forms included under the last name is quite common about Stockholm, and as far as I could see it is the same as our northern Michigan species. I assume, then, that we can drop the name *R. olivacea* from our list of American Russulas, in which case our olive form goes into the present species. Our plant is near *R. squalida* Pk. as the latter is diagnosed in this paper. It differs, however, from that species in the more firm consistency, in the stem being often reddish, and its habitat in coniferous regions. *R. squalida* is soft and flexible in age.

122. **Russula squalida** Pk. (SUSPECTED)

N. Y. State Mus. Rep. 41, 1888 (as *R. atropurpurea* Pk.).
N. Y. State Mus. Bull. 116, 1907.

Illustration: Kauffman, Mich. Acad. Sci. Rep. 11, 1909.

PILEUS 7-11 cm. broad, convex then plano-depressed, firm, soon subflaccid, margin *even when young,* becoming slightly tubercular-striate in age, the pellicle continuous but rather adnate, not easily separable, subviscid in wet weather, *soon dry* and then *pruinose-velvety,* even, color varying from reddish-purple to pallid and mixed with olivaceous, tan or ochraceous, often shades of all these colors are seen in one cap, opaque and dull, not shining. FLESH white, thick on

disk, rather thin elsewhere, grayish or grayish-purple under the *cuticle*. GILLS white when young, later *creamy-yellow to ochraceous,* subdistant, becoming fragile, moderately broad, broadest toward the front, more or less forked toward base, few shorter ones, interspaces venose. STEM *white, changing to ochraceous if bruised* when fresh and young, when older becoming dirty-brown or ochraceous-brown where handled, equal and subcylindrical, rather long, 5-9 cm. by 1.5 cm. thick; glabrous, spongy-stuffed, obscurely rivulose. SPORES ochraceous to buff, globose, 7.5-10 micr. TASTE *mild.* ODOR *unpleasant,* very characteristic when plants are old or drying.

Solitary or gregarious. Hemlock and maple woods in the north, oak and maple woods in southern Michigan. July, August and September.

This is our early, abundant Russula about Ann Arbor. It occurs in great quantities during July if the weather is favorable and only sparingly later. Once recognized by its odor and changeable flesh, its many color disguises are not as deceptive as they at first seem. The colors run into each other in a rather definite way, so that the general effect to the observer, after he has compared many individuals, is quite characteristic for the species. Hundreds of individuals were examined about Ann Arbor and all had white stems, never red. When old the effect of the whole plant is that of dinginess. Although the above description extends beyond the limits allowed by Peck's description, it is doubtless his species. Originally it included only the purple or dark red forms and was called *R. atropurpurea* Pk. but since this name was pre-empted, he changed it to *R. squalida.* It seems close to the preceding.

123. Russula decolorans Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1079.
Ricken, Blätterpilze, Pl. 17, Fig. 5.

PILEUS 5-12 cm. broad, *often large,* firm, *globose at first* then convex and plano-depressed, *orange red,* usually ochre on disk and dark red on margin, pellicle separable, subviscid, margin even, slightly striate in age. FLESH white, *becoming cinereous* with age or where broken, becoming fragile. GILLS pale yellowish-ochraceous at maturity, white at first, thin, fragile, moderately broad, close, adnexed, forked at base, few short. STEM 5-12 cm. long, 1-2.5 cm. thick, *stout,* long, spongy or solid, wrinkled-rivulose, white, *the flesh becoming cinereous with age or where bruised.* SPORES subglobose, echinulate, pale ochraceous-yellow, 7-9 micr. TASTE *mild.* ODOR none.

Solitary or scattered. In coniferous or mixed woods of northern Michigan. July, August and September. Frequent.

The large size, globose young pileus, orange-red color and the changing flesh easily distinguish it. *R. depallens* Fr. in which the flesh turns ashy has not with certainty been found. It is said to have whitish gills, and the color of the pileus is dirty red to fawn. *R. decolorans* appears to prefer the regions of the pine and fir, both in this country and in Europe.

Var. *rubriceps* Kauff.

Mich. Acad. Sci. Rep. 13, p. 215, 1911.

The shape of the young and old pileus of this variety is well represented in Cooke's figure of *R. decolorans,* Plate 1079. The color of the pileus is, however, *ruber-red* (Sacc. colors) and persistent, changing only in age or on drying as a result of the cinerescent flesh. The pellicle is adnate, scarcely separable except on the margin, vanishing on the disk and sometimes ochraceus-spotted where the pellicle has disappeared. It is firm and the margin is not striate or very slightly so in age. These characters ally it to the Rigidae. It is slightly viscid. FLESH is firm, white, tinged ashy in age, *becoming dark cinereous on the stem where bruised.* The taste is *mild* and when fresh was taken for *R. lepida.* SPORES creamy-white in mass. It is smaller, at least in our specimens, than the type.

On the ground in beech and white pine woods. New Richmond, Allegan County. September. Apparently rare.

124. Russula flava Romell (Edible)

Lönnegren's Nordisk Svampbok, 1895.

Illustration: Mich. Acad. Sci. Rep. 11, p. 55, Fig. 3.

PILEUS 5-8 cm. broad, *rather fragile,* convex, then plano-depressed, *even or slightly striate* in age, dry in dry weather, somewhat viscid when moist, pellicle separable, *dull yellow* (flavus, Sacc.), color hardly fading, but sometimes ashy, discolored in age. FLESH white *becoming cinereous* with age. GILLS white at first, becoming yellowish, broadest towards front, narrowly adnate, close, distinct, becoming slowly gray in age. STEM chalk-white at first,

the flesh becoming ashy, equal or subequal, spongy-stuffed, obscurely reticulate-rivulose, rather fragile, 6-8 cm. long, 1-2 cm. thick. SPORES *yellowish,* globose, echinulate, 8-9 micr. TASTE *mild.* ODOR none.

Solitary or scattered. In coniferous or mixed woods of northern Michigan. July, August and September. Frequent.

This mild, dull or pale yellow, rather large Russula, with flesh, gills and stem becoming ashy when old, is quite easily recognized. This is *R. constans* Karst. which name was pre-empted. It differs from *R. ochraleuca* Fr. in the mild taste and unpolished pileus, etc. Its habit is very similar to that of *R. decolorans,* but it rarely reaches the same size and differs constantly by its yellow cap.

125. Russula obscura Romell (Edible)

PILEUS 4-7 cm. broad, rather pliant, convex then plano-depressed, dull, *dark blood-red,* pileus sometimes blackish on disk, thin, the pellicle continuous and separable, hardly viscid when moist, *subpruinose* when dry, even or slightly striate in age. FLESH whitish, becoming ashy. GILLS white at first, then dingy straw-color, moderately broad, narrowly adnate, close, mostly forked at base, equal, interspaces sometimes venose. STEM white, *becoming ashy or blackish,* rarely tinged red, subequal, 4-6 cm. long, 10-15 mm. thick, spongy-stuffed, rigid, soon soft, obscurely wrinkled. SPORES *pale ochraceous in mass.* TASTE mild. ODOR none.

Gregarious or scattered, in low woods of southern Michigan. July and August.

It is found frequently around Stockholm. The examples pointed out by Romell did not seem to possess such a blackish stem as some of ours. This species does not remind me of *R. decolorans,* being a more slender and smaller plant. It might be confused with *R. nigrescentipes* Pk., but that species is said to have white spores. Romell (Hymen. Lapland, 1911) suggests that a better name for this plant is *R. vinosa* Lindb. since the latter name was used by Lindbladt in his Svampbok prior to the use of *R. obscura.*

126. Russula rubescens Beards. (Edible)

Mycologia, Vol. 6, p. 91, 1914.

Illustrations: Beardslee, Mycologia, Vol. 6, Pl. 121, Fig. 1. Plate XIX of this Report.

PILEUS 4-10 cm. broad, firm, becoming fragile, convex-plane, *dull-red, variegated* with yellowish, ochraceous or olivaceous-purplish hues, at first darker, *fading,* pellicle adnate, *dry,* scarcely separable and substriate on the margin, subglabrous, margin acute and at first straight. FLESH whitish, *staining slowly red then black where wounded,* becoming cinereous from age. GILLS narrowly adnate, broader in front, close to subdistant, medium broad, *equal,* rarely forked, white at first *then pale creamy-ochraceous,* intervenose. STEM 3-7 cm. long, 1-2.5 cm. thick, subequal or tapering down, spongy-stuffed, glabrous, even, white, becoming cinereous in age, *changing slowly* to red then blackish where bruised. SPORES globose, pale ochraceous, 7-10 micr. CYSTIDIA few and short, *subhymenium* not differentiated. TASTE *mild.* ODOR none.

Gregarious or scattered. On the ground in frondose woods. Ann Arbor. July-August. Infrequent.

Remarkable among the Subrigidae for the changes which the flesh assumes on bruising. It approaches *R. nigrescentipes* Pk., but that species is said to have a shining red cap and crowded white gills, and the stem turns blackish; no mention is made of any red stains preceding the black and since the change is slow it could scarcely be overlooked. Our species has appeared from season to season but never in abundance. It is a firm plant when fresh, becoming fragile only in age. It is apparently also related to *R. depallens* Fr. but Maire says "nobody knows this, even in Sweden." *R. obscura* Rom. has a velvety-pruinose pileus whose color is rather uniform, and whose flesh is of a different consistency.

Micro-chemical tests: G. (Gills and flesh turn blue.) S V. (Gills and flesh turn bluish very slowly.) F S. (Cystidia colored brown).

As this report was ready for the press there appeared in print the above name applied by Beardslee to a species from Asheville, N. C., which seems identical with ours.

127. Russula borealis Kauff. (Edible)

Mich. Acad. Sci. Rep. 11, p. 69, 1909.

PILEUS 5-9 cm. broad, *firm and rather compact,* convex then plano-depressed, outline broadly elliptical, often with a sinus on one side, *blood-red,* disk darker or color uniform and not fading, pellicle somewhat separable, hardly viscid, margin even or obscurely striate. FLESH white, red under the cuticle, not very thick. GILLS *ochraceous,* subdistant or moderately close, *medium broad,* broader in front, narrowly adnate, rather distinct, edge often reddish anteriorly, equal, a few forked toward base, interspaces venose. STEM white and *tinged red* in places, *firm,* spongy-stuffed, thickened below, 5-7 cm. long, 1.5-2 cm. thick. SPORES deep *ochraceous-yellow* in mass. TASTE *mild,* sometimes slightly and tardily acrid. ODOR none.

Solitary. In mixed woods of hemlock, yellow birch and hard maple, in the Northern Peninsula. Huron Mountains, Marquette and Munising. August.

Russula alutacea is usually larger, stouter, the cap dull or sordid red, and with broader gills. *Russula ochrophylla* occurs in oak woods, has "buff spores, dusted" on yellow gills, and has violaceous-purple or purple-red cap. Peck saw our plant but did not refer it to either species. This species and *R. alutacea* show the futility of using the striations on the margin of the cap as an important character to distinguish the main groups. A true pellicle is present in both and is often quite easily separated especially on the margin, and this with the character of the gills connects them very closely with the Fragiles. *R. linnaei,* which is not well known in Europe, looks like it according to Cooke's figures, but is said to have white gills and spores.

128. Russula alutacea Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1096 and 1097.
Gillet, Champignons de France, No. 597.
Berkley, Outlines, Pl. 13, Fig. 8 (reduced in size).
Bresadola, Fungh. mange. e. vel., Pl. 76.
Patouillard, Tab. Analyt., No. 513.
Michael, Führer f. Pilzfreunde, Vol. II, No. 65 (as *Russulina alutacea*).

Atkinson, Mushrooms, Pl. 36, Fig. 2, 1900 (much reduced in size).
Gibson, Edible Toadstools and Mushrooms, Pl. 12, Figs. 2, 4, 6, p. 131, 1903 (much reduced in size).

PILEUS 8-15 cm. broad, large, firm, convex then depressed, with dull colors, dark reddish-purple, sordid red, sometimes mixed with other shades, the reddish color predominating, *with somewhat separable pellicle,* glabrous, somewhat viscid in wet weather, soon dry, *pruinose and subgranulose,* margin even or somewhat short-striate in age. FLESH white, thick. GILLS *ochraceous from the beginning,* deeper ochraceous to tan-colored when mature, *rather broad,* thick, *subdistant,* broader in front, rounded adnexed, of *equal* length. STEM 7-10 cm. long, 3-4 cm. thick, very *firm, stout,* solid, *tinged red* or entirely white, subequal or ventricose, almost even. SPORES ochraceous-yellow to alutaceous, subglobose, 9-11 micr. TASTE *mild.* ODOR none or pleasant.

Usually solitary and rather late. Oak and maple woods of southern Michigan. Not very common. August and September.

As limited above, no bright or shining red forms are admitted from our territory. This species and *R. integra* have been the receptacle for a good many reddish species with ochraceous gills, and even experienced mycologists cannot agree on their identification. I have kept this name for a large, solitary, often late plant, with firm or hard consistency and dull, dark red and purplish cap, with truly ochraceous gills and spores. *R. integra* has cream-colored or at least paler spores and is more fragile and often grows in troops. The descriptions of this and R. *ochrophylla* run close together. Cooke's illustration of *R. alutacea* fits our plants well.

FRAGILES. Pileus thin, fragile, the viscid pellicle continuous and quite separable, margin connivent, not incurved when young, usually strongly striate. The gills are of equal length, broader anteriorly, narrowed behind.

Section I. Taste acrid. Spores white in mass.

129. Russula emetica Fr.

Syst. Myc., 1821.

Illustrations: Fries, Sverig. Svamp., Pl. 21.
Cooke, Ill., Pl. 1030.
Gillet, Champignons de France, No. 610.

Bresadola, Fungh. mang. e. vel., Pl. 68.
Marshall, Mushroom Book, Pl. 17, p. 68, 1905 (reduced).
Gibson, Edible Toadstools and Mushrooms, Pl. 13, p. 139, 1903 (reduced).
Atkinson, Mushrooms, Pl. 36, Fig. 4, 1900 (reduced).
McIlvaine, American Fungi, Pl. 41, Fig. 2, 1900.

PILEUS 5-10 cm. broad, fleshy, soon *fragile,* convex to plano-depressed, *rosy to blood-red,* sometimes faded to white, pellicle separable, *margin strongly tubercular-striate* or even sulcate, viscid and shining. FLESH white, *red under the cuticle.* GILLS *pure white,* subdistant or close, distinct, rather broad, equal, broadest toward front, narrowly adnexed or free, interspaces venose. STEM 4-7 cm. long, 1-2 cm. thick, white or tinged red, subequal, spongy-stuffed, even. SPORES *white in mass,* globose, echinulate, 7.5-10 micr. TASTE *very acrid.* ODOR none.

Scattered or gregarious. On the ground or on debris of very rotten logs in woods. Throughout the state. July to October. Common.

The mycelium has been found to be attached to oak tree roots where it forms mycorrhiza. The very acrid taste gives it a bad reputation and it is avoided by mushroom-eaters. Some think it is harmless when thoroughly cooked. There are variations of habitat. It grows quite constantly on the crumbling remains of wood or logs, where its white strings of mycelium are easily seen; here the gills are close. One form has been found growing in troops; such were found in a tamarack swamp in late October, growing on thick beds of sphagnum. They had developed somewhat differently in this habitat as was to be expected. The stems were white, long and stout, narrower above and obsoletely wrinkled. The gills were subdistant. The taste was sharp but not as excruciating as that of the type. The disk of the pileus was glabrous and very viscid. It was a beautiful plant, apparently appearing late; it might be referred to as var. *gregaria.*

130. Russula rugulosa Pk.

N. Y. State Mus. Rep. 54, 1901.

Illustration: Ibid, Pl. 72, Fig. 12-18.

PILEUS 5-10 cm. or more broad, thin, *fragile,* convex then plano-depressed, *dark rose-red,* color sometimes thin, *surface* almost entirely *rugulose,* the rugae radiating somewhat, rather viscid, pellicle separable, margin at length distinctly tubercular-striate. FLESH thin, white, red under the pellicle. GILLS shining white, rather close, narrowly adnate, not very broad, broadest in front, few forked, equal, interspaces venose. STEM white, subequal, unchanged, glabrous, spongy-stuffed, 6-7 cm. long, 1-2 cm. thick. SPORES *white in mass,* globose, echinulate, 8-9 micr. TASTE tardily but very acrid.

In troops. Hemlock and mixed woods on the ground. August and September. Northern Michigan.

Differs from *R. emetica* in that its acrid taste develops slowly, in the uneven and rather dull pileus and in the habit of appearing in troops on the ground. It was formerly referred to *R. emetica,* and is close to it.

131. Russula fragilis Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1091.
Gillet, Champignons de France, No. 614.
Patouillard, Tab. Analyt., No. 622.
Michael, Führer f. Pilzfreunde, No. 43 (var.).
Ricken, Blätterpilze, Pl. 19, Fig. 3.
Hard, Mushrooms, Fig. 172, p. 192, 1908.

PILEUS 2.5-5 cm. broad, *very thin* and fragile, convex then plano-depressed with a thin viscid pellicle, tubercular-striate on the thin margin, glabrous, rather uniform rosy or *pale red,* sometimes faded or bleached to white. FLESH *white under the pellicle,* thin. GILLS white, thin, close, crowded, adnexed, ventricose, moderately broad. STEM 2.3-5 cm. long, .5-1 cm. thick, white, spongy then hollow, equal, fragile. SPORES *white in mass,* subglobose, 8-9 micr. TASTE promptly and *very acrid.* ODOR none.

Scattered. On the ground in woods. Throughout the state. July-August. Infrequent.

This species, as limited here, is only distinguishable from *R. emetica* relatively; it is smaller, color paler, flesh thinner and more fragile and white under the cuticle. Maire says the taste is more quickly acrid on the tongue than *R. emetica,* but not as violent. It grows in somewhat dryer situations. Var. *nivea* is a white plant, otherwise the same. *R. fallax* Cke. used to be considered a variety of it.

132. Russula fallax Cke.

Illustration: Cooke, Ill., Pl. 1059.

PILEUS 3-7 cm. broad, *thin, fragile*, color incarnate or pale rose, the *disk* pale *olivaceous or livid*, sometimes darker or purplish, soon plane or slightly depressed on disk, quite viscid, margin striate and becoming elevated, surface faintly rugulose under lens. FLESH white. GILLS white, unchanged, subdistant, attached by a point, *narrow*, edge even. STEM 3-4 cm. long, 6-10 cm. thick, pure white, cylindrical or compressed, equal, spongy-stuffed, soon hollow, longitudinally-wrinkled under a lens. SPORES *white in mass*, subglobose, 7.5 micr. TASTE promptly and very acrid.

Solitary or gregarious. In sphagnum bogs, low mossy ground in woods, etc., often attached to sphagnum. Distributed throughout the state. Not rare. July, August and September.

This species differs in two important particulars from *R. fragilis*. The gills are subdistant and the pileus is livid or olivaceous in the center. It is very characteristic of the sphagnum flora of the state. It has often been referred to *R. fragilis* as a variety. The pileus is not as lilac as shown in Cooke's figure.

133. Russula albidula Pk.

Torr. Bot. Club, Bull. 25, 1898.

PILEUS 2.5-5 cm. broad, *white*, broadly convex, glabrous, the pellicle *viscid* and separable when fresh, the margin even. FLESH white, subfragile. GILLS white, rather crowded, adnexed, not broad, *of equal length*, some basifurcate, interspaces venose. STEM 2.5-4 cm. long, 8-12 mm. thick, white, equal, spongy-stuffed, even. SPORES white in mass, subglobose, 7-10 micr. TASTE acrid. ODOR none.

Solitary. In oak woods. Ann Arbor. July and August.

In dried specimens the pileus and gills are ochraceous to yellowish, and stem whitish. The taste and viscidity seem to be the only marked differences between this species and the other two white Russulas of Peck, *R. albida* and *R. albella*. All three are rather fragile, while *R. lactea* is a compact firm plant with thick, broad, distant gills. There is a white variety of *R. emetica* which is very acrid and fragile and whose striations on the margin of the cap are like those of that species.

Section II. Taste acrid. Spore-mass cream-color, yellowish, ochraceous to alutaceous.

134. Russula sanguinea Fr. (*R. rosacea* Fr.)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1020 (as *R. rosea*).
Michael, Führer f. Pilzfreunde, Vol. II (as *R. rosacea*).

PILEUS 3-6 cm. broad, rather firm at first, *subfragile*, convex-plane or depressed, *rosy-red, viscid*, margin acute and thin, pellicle subadnate, easily separable on margin and tubercular-striate. FLESH rather thin, white, red under the pellicle. GILLS slightly adnate, close to subdistant, *equal*, not broad, *creamy-white*. STEM 4-6 cm. long, subequal or tapering down, often eccentric, *white or tinged rosy-red*, spongy-stuffed then cavernous, rather fragile, glabrous, even. SPORES *creamy-white in mass*. TASTE tardily but truly acrid.

Gregarious. On the ground among grass in frondose woods. Ann Arbor. September-October. Infrequent.

The plants referred here are *R. rosacea* in the sense of Romell, and *R. sanguinea* according to most of the modern French mycologists. They are distinguished by the cream color of the spores and gills. The gills are not decurrent as they are supposed to be in *R. rosacea*, but the stem is often eccentric as that species is described by Fries. Bresadola, Maire, etc., conceive *R. rosacea* Fr. as a plant with pure white gills and spores. Our plant agrees with a species, common around Stockholm, whose gills are usually creamy-white. It was placed by Fries among the rigid forms but is almost too fragile. It is not large and except for the color of the spores small forms might be mistaken for *R. fragilis*.

135. Russula veternosa Fr.

Epicrisis, 1836-38.

Illustrations: Bresadola, Fungh. mang. e. vel., Pl. 75.
Cooke, Ill., Pl. 1033.

PILEUS 5-7.5 cm. broad, convex then expanded, with a somewhat separable pellicle, *indistinctly striate* on the margin, deep rose-red (like *R. emetica*), viscid when moist. FLESH white, red under the cuticle. GILLS white at first, *then straw-color or pale ochraceous,*

narrow, adnate, close, broader in front, equal or few shorter, few forked, interspaces venose. STEM white, *never red,* equal or subequal, spongy-stuffed, somewhat slender, fragile, hollow, even, 1.5 cm. long, 1-1.5 cm. thick. SPORES pale *yellowish-ochraceous,* subglobose, echinulate, 8-9 micr. TASTE *very acrid.* ODOR none.

Scattered or gregarious. Oak and maple woods of southern Michigan. July and August.

This represents a group of red Russulas with acrid taste and gills varying pale ochraceous or somewhat yellowish in the different forms. I have limited the name to those with white stem and a rather firm and hardly striate pileus, although it may include several forms of which only the spore-color has so far been a distinguishable character. The separable, viscid, distinct pellicle and rather fragile stem, relates it to the Fragiles. From *R. tenuiceps* it is separated by the less deep ochraceous spores and gills, the firmer consistency of pileus and gills, and the uniform red color and even margin of the pileus.

136. Russula tenuiceps Kauff.

Mich. Acad. Sci. Rep. 11, p. 81, 1909.

Illustration: Plate XX of this Report.

PILEUS 7-12 cm. broad, thin, fragile, convex to expanded, the somewhat viscid pellicle easily separable, margin at first connivent, *striate,* deep rosy-red or blood-red, sometimes white, spotted or tinged with orange blotches, sometimes uniform red, with or without minute rugae. FLESH white, red beneath the cuticle, *very fragile at maturity.* GILLS white, then yellow-ochraceous, *crowded,* narrow, *fragile,* narrowly adnate to free, few forked, interspaces venose, equal. STEM fragile, white or rosy-tinged, spongy-stuffed, subequal or ventricose, obscurely rivulose, white within and unchanged, 5-9 cm. long, 2-2.5 cm. thick. SPORES *yellow-ochraceous,* subglobose, 6-8 micr., echinulate. TASTE acrid, sometimes tardily but very acrid. ODOR not marked.

Gregarious. Mixed woods at Marquette; in oak and maple woods at Ann Arbor. July and August. Rather frequent.

As in *R. veternosa,* it is probable that several forms are represented here. The red Russulas are very troublesome, and we seem to have a considerable number of forms with acrid taste and yellowish to deep ochraceous gills, which cannot be easily kept separate. All efforts to refer them to old species like *R. sardonia, R. rugulosa,*

R. rosacea, etc., failed repeatedly; the fragile flesh and ochraceous, almost alutaceous gills are too distinctive. The maturing of the spores is sometimes slow and care must be taken to get a good spore print in these red species. All the collections which I have referred here showed red on some or all of the stems of each collection. Their edibility was not tested.

137. Russula palustris Pk.

N. Y. State Mus. Rep. 53, 1900.

PILEUS 4-7.5 cm. broad, *fragile,* subglobose or hemispheric, then convex or nearly plane, viscid, pellicle separable, obscurely tubercular-striate on margin, *reddish*-buff or purplish-red especially on disk, glabrous. FLESH white, thin, tinged with the color of the pileus under the pellicle. GILLS narrowed behind, broader in front, close to subdistant, entire, *whitish then yellowish,* intervenose. STEM 3-7 cm. long, 6-12 mm. thick, equal, glabrous, spongy-stuffed then hollow, fragile, white or tinged red. SPORES subglobose, *pale yellow in mass,* 7.5-10 micr. TASTE *tardily acrid.*

Gregarious or scattered. In low woods or swamps. Marquette, New Richmond, Ann Arbor. August-September. Infrequent.

The pileus is sometimes faintly glaucous.

138. Russula aurantialutea Kauff.

Mich. Acad. Sci. Rep. 11, p. 81, 1909.

PILEUS 5-10 cm. broad, *thin,* fragile, convex then plano-depressed, *yellow* (citron to luteus), *or with orange shades* intermingled, especially on the margin, slightly tubercular-striate, pellicle viscid, shining and somewhat separable for some distance. FLESH *white,* thin toward the margin, *unchanged with age.* GILLS *pale yellow,* close, or subdistant at the outer extremity, equal or a few shorter, narrowly adnate, seceding with age, broadest toward front, often forked at the base, rarely elsewhere, interspaces venose. STEM 4-8 cm. long, 1.5-2 cm. thick, white, flesh concolor and unchanged, subequal, glabrous, even, spongy-stuffed. SPORES *ochraceous-yellow,* subglobose, 8-9 micr. TASTE acrid in all its parts, often very acrid. ODOR not noticeable.

Solitary or scattered. On debris or forest mould in hemlock or mixed woods of northern Michigan, in deciduous woods in the southern part of the state. July, August and September. Earlier in southern Michigan. Infrequent.

R. ochraleuca Fr. differs in having white to pallid gills and spores, and a cinerescent stem; *R. granulosa* Cke. has white gills and spores and a granular cap and stem; *R. fellea* Fr. has ochraceous or straw-yellow flesh and the more firm pileus is either straw or gilvous color, and its gills exude watery drops; *R. claroflava* Grove has a cinerescent stem and its gills are white then lemon yellow with an ochre tinge; *R. ochracea* Fr. has a mild taste, and the flesh of the cap, gills and stem is ochraceous; *R. simillima* Pk. has white spores and a pale ochraceous pileus and stem; and *R. decolorans* Fr. has cinerescent flesh and is stouter. Our species could be made on ecological variety of almost any of the above species, depending on the guess of the author who so interpreted it.

Section III. Taste mild. Spore-mass white.

139. Russula albida Pk.

N. Y. State Mus. Bull. 2, 1887 (*R. albida*).
N. Y. State Mus. Rep. 50, 1897 (*R. albella*).

Illustration: N. Y. State Mus. Bull. 105, Pl. 96 (*R. albida*).

PILEUS 3-6 cm. broad, *thin, fragile,* broadly convex to plane, slightly depressed in the center, white or whitish, even or slightly striate on the margin, not shining. FLESH white, fragile. GILLS white or whitish, thin, moderately close, entire, equal, not broad, broadest in front, rarely forked at base, adnate or subdecurrent. STEM 2.5-6 cm. long, white, subequal, glabrous, spongy-stuffed or solid. SPORES about 8 micr. diam., *white.* TASTE mild or *slightly bitterish.*

Solitary. Hemlock or mixed woods in the Northern Peninsula. July and August.

Peck's description of both *R. albida* and *R. albella* differs in minor particulars from our plants. The pileus of *R. albida* has a viscid, separable pellicle, while that of *R. albella* is dry. *R. albida* is said to have a "slightly bitterish or unpleasant taste," while our plants were sometimes bitterish, sometimes tardily and slightly acrid. *R. albida* is described with a stuffed or hollow stem; in one of my collections the stem was solid, in another it was spongy-stuffed. It is worth noting whether the spore prints are pure white or with yellow tinge; some of Peck's specimens of *R. albida* had spores with a faint yellowish tinge. In my specimens the whole plant is ochraceous when dried; specimens seen at the N. Y. Botanical Gardens were white when dry. As these species occur so seldom and far apart, it is difficult to obtain exact data with regard to their characters. *R. anomala* Pk. and *R. albidula* differ in the acrid taste.

140. Russula subdepallens Pk. (Edible)

Torr. Bot. Club Bull., Vol. 23, 1896.

PILEUS 5-14 cm. broad, *fragile,* convex then plane and depressed, margin elevated in age, *bright rosy-red,* shading into yellowish blotches as if the red color were put over the yellow, disk paler in old specimens, disk dark-red in very young plants, with a thin, separable, viscid pellicle, *tubercular-striate* on margin, obscurely wrinkled elsewhere. FLESH white, rosy under the cuticle, becoming slightly cinereous, *very fragile.* GILLS *white,* broad in front, narrowed behind, adnate, subdistant, few forked, interspaces venose. STEM white, spongy-stuffed, rather stout, 4-10 cm. long, 1-3 cm. thick, subequal. SPORES *white in mass,* globose, echinulate, 7.5-8 micr. TASTE mild. ODOR none.

Gregarious. In woods of maple, yellow birch and hemlock of northern Michigan. August.

Found in a number of places in considerable abundance. The fragile character, especially of the gills, is very marked and the mild taste, white gills and red cap help to distinguish it. The flesh does not turn so strongly ashy as in Peck's plants, and this character did not seem to be always noticeable. It is distinguished from *R. purpurina,* the brilliant-red Russula, by its gregarious habit, large size and less viscid cap; also the gills are not crenulate. Our specimens had the stature and appearance of *R. rugulosa* and *R. emetica* var. *gregaria.* Peck's plants were found in Pennsylvania by Dr. Herbst, and reported but once; the species is not included in Peck's New York monograph. Our plant has so far been limited to the north.

141. Russula purpurina Quel. & Schultz (Edible)

Hedwigia, 1885.

Illustrations: McIlvaine, American Fungi, Pl. 45 [a, p.] 188, 1900.
Plate XXI of this Report.

PILEUS 3-7 cm. broad, fragile, *viscid,* usually very viscid, subglobose then expanded and slightly depressed at the disk, *brilliant rosy-red* to blood-red or even darker, pellicle somewhat separable,

margin thin but *not striate* except when fully expanded, surface when dry as if with a bloom. FLESH white, red under the cuticle, thin, fragile, unchangeable. GILLS *white,* later dingy-white or "yellowish," medium close to subdistant, adnexed, not broad, broadest in front, mostly equal, few or none forked, interspaces sometimes venose, *edge floccose-crenulate.* STEM rather long, 5-8 cm., 8-12 mm. thick, sprinkled rosy-pink, equal or subequal, spongy-stuffed, fragile but rather soft. SPORES *white in mass,* globose, 8-10 micr. TASTE mild. ODOR none.

Solitary or scattered. In mixed or maple-birch woods of the Northern Peninsula. Infrequent. August and September.

Distinguished by its brilliant red, viscid cap, small to medium size, mild taste and white crenulate gills and spores. Peck also notes the floccose-crenulate edge of the gills, which is due to cystidia. *R. uncialis, R. sericeonitens* and *R. subdepallens* are the only others of the Fragiles group with mild taste, red cap and white spores. From *R. unciales* it differs by the deep color, character of gills and habitat. *R. sericeonitens* is hardly viscid and becomes silky-shining; it has a different stature and color. Maire points out that *R. punctata* Gill. and *R. pseudointegra* A. & G. have gills with a floccose-crenulate edge.

142. Russula uncialis Pk. (Edible)

N. Y. State Mus. Bull. 2, 1887.

Illustrations: Peck, N. Y. State Mus. Bull. 116, Pl. 107, 1907.

PILEUS 2-5 cm. *broad,* thin, rather fragile, convex then expanded-depressed, *pink or bright flesh-color, unicolorous,* the rather adnate pellicle slightly separable, slightly viscid when moist, pruinose and pulverulent when dry, margin not striate till old. FLESH white, pink under the pellicle, unchanged. GILLS pure *white,* hardly changed, *rather broad,* broadest in front, narrowed behind and adnate, subdistant or moderately close, distinct, entire on edge, few forked, interspaces venose. STEM white, rarely tinged pink, rather short, 1-3.5 cm. long, 4-10 mm. thick, spongy-stuffed, equal, glabrous. SPORES *white in mass,* subglobose, echinulate, 7-8 micr. TASTE mild. ODOR none.

Gregarious. In oak woods of southern Michigan. July and August. Quite common in places.

The persistently white gills and spores, the mild taste, uniform pink color and size, distinguishes this Russula. It is sometimes more than an inch in width.

143. Russula sericeo-nitens Kauff. (Edible)

Mich. Acad. Sci. Rep. 11, p. 84, 1909.

PILEUS 4-6 cm. broad, very *regular,* rather thin, convex then plano-depressed, *dark violet-purple* or dark blood-red tinted purplish, disk sometimes livid-blackish, the *separable pellicle* slightly viscid when moist, not striate or substriate in age, surface with a silky sheen. FLESH white, thin on margin, unchanged, purplish under the pellicle. GILLS *white,* subdistant or medium close, becoming flaccid, moderately broad, broad in front, narrowed behind, dry, equal, few forked near base, interspaces venose. STEM white, equal or thickened at apex, spongy within, unchanged, glabrous, even or obscurely rivulose, 3-5.5 cm. long, 1 cm. thick. SPORES *white in mass,* globose, echinulate, 6-7.5 micr. TASTE *mild.* ODOR none.

Usually solitary. In mixed woods of hemlock, maple and yellow birch in northern Michigan. July and August. Not uncommon.

Its thin pileus is *flexible* at maturity. The *silky sheen* and regular pileus are quite characteristic. The cap has the color of Cooke's figures of *R. queletii* Fr., *R. drimeia* Cke. and *R. purpurea* Gill. These three, including *R. expallens* Gill., have been placed together by some modern authors as one species, characterized by "a pruinose, violaceous, decolorate stem, and very sharp taste." The taste is said to be so peppery that even when the color is washed out by rains they can be recognized by this character. All of the four are violet or reddish on the stem. Our specimens all had a white stem and an impeachable mild taste.

Section IV. Taste mild; spore-mass cream-white, yellowish or ochraceous.

144. Russula integra Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1093 and 1094.

PILEUS 5-10 cm. broad, firm, *soon fragile,* discoid, convex or campanulate then plano-depressed covered with *a viscid separable pellicle,* thin on the margin, at length *coarsely tubercular-striate,* variable as to color in different plants, *colors dingy or sordid,* from buff through to reddish-brown and dark dull red, *fading.* FLESH white, not changing. GILLS *white at first,* then creamy-yellow

to buff-ochraceous, not strongly ochre, *broad, distinct,* equal, nearly free. STEM white, unchanged, *never red,* soon quite fragile, conic or short-clavate at first, then subequal or ventricose, spongy-stuffed, even. SPORES *creamy-yellow to pale ochraceous.* TASTE mild. ODOR none.

Gregarious. In woods, probably throughout the state. Ann Arbor. July and August. Not common.

This species is a sort of clearing house for various colored Russulas with broad, pale ochraceous gills and mild taste, especially reddish forms. I have given Fries' description above, supplemented for the most part from notes of my own collections about Stockholm. Romell describes the cap as "brown, blackish-brown, reddish-brown, dark red, violaceous, yellow or greenish, either unicolorous or with whitish or yellowish spots." I saw only the dirty reddish-brown, dark dull red and sordid-buff forms at Stockholm. In favorable weather or situations they occur in troops and seem very common in Sweden. Peck says they are rare in New York state. The European mycologists do not agree among themselves as to this species, but there seems to be a fair unanimity that the "dusting" of the gills by the spores is too deceptive for practical use in identification. *R. integra* is to be separated from *R. alutacea* by its gills being white at first, by the white fragile stem, the paler spores and more striate pileus; under certain conditions these two species are hardly distinguishable.

The two plates of Cooke referred to, give the best idea of the species as here limited. The figures of this species with bright red caps, shown by various authors, illustrate segregated species for the most part. Maire (Soc. Myc. Bull. 26, 1910) has named one form, *R. romelii,* and considers another to be *R. melliolens* Quel. As Fries pointed out long ago, it is easy to separate new species from the mass of plants usually referred here, and the more exact method with the microscope will doubtless produce many more. I have found this species rarely but then in quantity, as they usually cover quite an area from the same mycelium.

145. Russula amygdaloides sp. nov. (Edible)

(See under *R. barlae* Quel., Mich. Acad. Sci. Rep. 13, p. 221, 1911.)

PILEUS 4-8 cm. broad, thin, medium size, ovate at first with straight margin, then convex-plane or depressed, very viscid, *fragile, pale rosy-flesh color tinged with yellow,* sometimes *peach color,* sometimes dull citron-yellow, varying in color from young to old, pellicle continuous and entirely separable, *margin becoming* strongly tuberculate-striate. FLESH thin, white, not changing color, soft. GILLS *bright ochraceous-yellow* (flavus, Sacc.), white at first, *rather narrow,* broadest in front, narrowed and adnexed behind, subdistant at maturity, dusted by the spores. STEM 4-8 cm. long, 1-2 cm. thick, *subequal to ventricose, soft* and *fragile,* loosely stuffed then cavernous (but not from grubs), white, rarely tinged with delicate pink, slightly wrinkled, subglabrous. SPORES subglobose, 7-9 micr., echinulate, nucleate, bright ochre-yellow in mass. TASTE mild. ODOR none. CYSTIDIA very few. *Subhymenium narrow,* sharply differentiated from gill-trama.

Solitary or scattered. In mixed woods of hemlock and beech, among beds of white pine needles at New Richmond; among grass, etc., in oak woods at Ann Arbor. July-October. Frequent.

This very fragile Russula is known from the other members of the "Fragiles" group by its medium size, bright yellow-ochraceous spores and gills, the hollow, often subventricose stem, the mild taste and the pinkish-yellow to peach-colored pileus. The stem is sometimes enlarged at the apex, sometimes at the base, always fragile. Very few of our Russulas have such bright-colored spores and gills. The color of the cap varies rather rarely to a deeper red on the one hand or to ochraceous-tan and straw-color on the other. The flesh does not change on bruising, and the odor is not noticeable even in age. It is very different from *R. integra* Fr. It approaches *R. nitida* and is no doubt the plant usually referred to that species in this country. It differs in the lack of the nauseous, disagreeable odor which is known to be constant in *R. nitida.* I formerly referred it to *R. barlae* Quel. which, however, is described as compact and firm. *R. aurata* Fr. has gills with a chrome-yellow edge.

Micro-chemical tests: G. (Flesh turns blue quickly; gills become greenish-blue.) S V. (Flesh and gills slowly pinkish then blue.) F S. (Cystidia colored brown.)

146. Russula roseipes Secr.—Bres. (Edible)

Fung. Trid., Vol. I, 1881.

Illustration: Ibid, Pl. 40.

PILEUS 2.5-5 cm. broad, *thin, fragile,* convex then plano-depressed, with a viscid, separable pellicle, margin tubercular-striate when mature, soon dry, *rosy-red or flesh-red,* disk tending to ochre-yellowish. FLESH white, thin, unchanged. GILLS soon truly

ochraceous, subdistant, mostly equal, broadest in front, ventricose, narrowly adnate or almost free, few forked, interspaces venose. STEM white and *rosy-sprinkled,* stuffed then cavernous, equal or tapering upward, even, 2.5-5 cm. long, 5-12 mm. thick. SPORES *ochraceous,* globose, echinulate, 8-10 micr. TASTE mild. ODOR none or pleasant.

Solitary or scattered. In mixed woods, but usually under conifers. Only found in the northern part of the state. July and August.

A middle-sized to small plant, fragile, and with a rosy mealiness on the stem. This last is quite characteristic of the species. It occurs under spruces and balsams in moist places. It is quite distinct from *R. puellaris* Fr. to which Fries, who had never seen Secretan's plant, referred it as a variety. *R. purpurina* also has a rosy-sprinkled stem, but is very viscid and more brilliant shining red on the cap. Peck (Rep. 51, p. 307) says the stem is not rosy-sprinkled in his plants, but that the color resides in the stem; he does not seem to have had the typical plant.

147. Russula puellaris Fr.

Monographia, 1863.

Illustrations: Cooke, Ill., Pl. 1065.
Bresadola, Fung. Trid., Vol. I, Pl. 64.
Ricken, Blätterpilze, Pl. 17, Fig. 2.

PILEUS 2-4 cm. broad, *very thin,* convex then plano-depressed, viscid, *tubercular-striate* on the margin, livid-purplish or livid-brownish, then sometimes yellowish. FLESH white at first, soon watery subtranslucent, fragile. GILLS pallid white to pale yellow, watery honey-colored in age, equal, thin, subventricose, narrowed behind and adnexed, interspaces venose. STEM whitish, then *watery honey-colored toward base,* spongy-stuffed, soon cavernous, soft and fragile, subequal or subclavate at base, 4-5 cm. long, 7-10 mm. thick. SPORES subglobose, echinulate, *pale yellow,* 6-8 micr. TASTE mild or slightly acrid. ODOR none.

Found in low, moist places in conifer or mixed woods of Europe. It has not yet been reported from Michigan with certainty. I have given Bresadola's description as that of a typical plant, which is verified by my notes of the Stockholm plants. I have not seen the typical Swedish plant in this country, and Peck's specimens were evidently not typical as he says no yellowish stains occur in the stem. The stem soon becomes soft and then develops this characteristic, translucent, light-yellowish color. Several varieties occur in Michigan differing mainly from the above description in the red caps and non-lutescent stems; these are referred here for the present.

148. Russula sphagnophila Kauff.

Mich. Acad. Sci. Rep. 11, p. 86, 1909.

PILEUS 2-4.5 cm. broad, *very fragile,* convex, *umbonate,* margin at length elevated and disk depressed and purplish-red or rosy-red, the space between the umbo and the margin pale olive-brown, covered by a viscous pellicle, glabrous, margin slightly striate. FLESH reddish under the cuticle and under the surface of the stem fragile. GILLS white then pale ochraceous, narrow, adnato-decurrent, rather close, narrowed toward both ends, few forked here and there. STEM *rosy-colored,* usually ventricose or irregularly swollen, spongy-stuffed *then cavernous,* very fragile, rivulose-uneven, 4-5 cm. long, 7-12 mm. thick. SPORES cream-color, globose, echinulate, 6-7 micr. TASTE *mild.*

Scattered. On sphagnum, in swamps. Cold Spring Harbor. August and September. Rare.

Whole plant very fragile, always with an umbo, subpellucid and rosy stem, and pale gills. The only other Russula with an umbo, known to me, is *R. caerulea* Pers. which differs in color and habitat. The red color rubs off on paper when moist. In some points it is near *R. roseipes,* in others it is nearest *R. puellaris,* and might perhaps be referred to the latter as a variety but without settling anything as to its origin.

149. Russula chamæleontina Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Pl. 1908.
Gillet, Champignons de France, No. 600.
Ricken, Blätterpilze, Pl. 18, Fig. 2.

PILEUS 2-5 cm. broad, *rather small,* fragile, thin, plano-depressed, with a viscid separable pellicle, margin even at first then striatulate, *color varying for different pilei,* mostly some shade of red, purple, etc., fading to yellowish especially on disk. FLESH white, thin. GILLS thin, crowded or close, adnexed or almost free, equal, rather broad, sometimes almost narrow, few forked, interspaces venose,

ochraceous or ochraceous-yellow. STEM 2-5 cm. long, 4-6 mm. thick, white, spongy-stuffed then hollow, *slender,* equal or subequal to subventricose, sometimes subclavate, even or obscurely rivulose. SPORES *ochraceous.* TASTE mild. ODOR none.

Scattered or gregarious. In coniferous or mixed woods. So far reported only from northern Michigan.

Like *R. integra* this has to be considered at present a composite species, from which several species have, from time to time, been segregated. According to von Post, a pupil of Fries, the master himself included many forms which do not fit into his own description; and Romell follows the Swedish tradition and refers to *R. chamaeleontina* all small forms with mild taste and ochraceous gills not otherwise accounted for. "No subacrid forms are included" writes Romell. Specimens with the caps a uniform red, rose colored, purplish, lilac, etc., and accompanied with a yellowish tint, are always included; sometimes also, whitish, faded forms must be placed here.

150. Russula abietina Pk.

N. Y. State Mus. Rep. 54, 1901.

Illustration: Ibid, Pl. 72, Fig. 1-11.

"PILEUS 1-2.5 cm. broad, thin, fragile, convex becoming plane or slightly depressed in the center, covered with a viscid, separable pellicle, tubercular-striate on the thin margin, *variable in color,* purplish, greenish-purple or olive-green with a brown or blackish center, or sometimes purplish with a greenish center. FLESH white. GILLS narrowed toward the stem, subdistant, equal, rounded behind and nearly free, ventricose, whitish becoming *pale yellow.* STEM 1-2.5 cm. long, equal or tapering upward, stuffed or hollow, white. SPORES bright yellowish-ochraceous, subglobose, 8-10 micr. TASTE mild."

Its place of growth is only *under balsm fir.* It has been reported from Michigan, but the description given is that of Peck. The important characters seem to be the bright yellow tinged spores. It is separable from *R. puellaris,* "by the viscid cap, the gills rather widely separated from each other and nearly free, the stem never yellowish nor becoming yellow where wounded, and the spores having an ochraceous hue."

151. Russula lutea Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 1082.
Gillet, Champignons de France, No. 622.
Patouillard, Tab. Analyt., No. 321.
Bresadola, Fungh. mang. e. vel., Pl. 79.
Michael, Führer f. Pilzfreunde, No. 61.
Ricken, Blätterpilze, Pl. 18, Fig. 3.
Plate XXII of this Report.

PILEUS 3-6 cm. broad; *small, thin,* convex then plano-depressed, pellicle easily separable, viscid, margin *even,* becoming slightly striate in age, unicolorus, bright *yellow* or pale golden yellow. FLESH white, very thin, fragile. GILLS at length *deep yellow-ochraceous, subdistant,* rather broad in front, narrowed behind and free, equal, interspaces often venose. STEM white, unchanged, subequal, stuffed then hollow, soft, fragile, even or obscurely wrinkled, glabrous, 3-5 cm. long, 4-8 mm. thick. SPORES globose, echinulate, yellow, 8-10 micr. in diam. TASTE *mild.* ODOR none.

Solitary, in coniferous and mixed woods of northern Michigan, in frondose woods in the south. July and August. Infrequent and few in number.

Our plant is the same as the one occurring about Stockholm. It agrees with the characters as given in Hymenomycetes Europaei, except that the gills are subdistant, not truly narrow but relatively broad in front. The Stockholm specimens had the thin margins of the pileus at length slightly striate, as is also the case with the Michigan plants. Peck says he has found it but once in New York. I have found it a number of times in Michigan. *R. vitellina* Fr. which is said to resemble this species, is not known to Romell for Sweden, and he refers all their forms to *R. lutea.* It may be that *R. lutea* and *R. vitellina* represent extremes of the species. Our plant described above and that about Stockholm do not agree with either of the descriptions, but is a compromise between the two. Our plants are not strongly striate nor have they any marked odor like *R. vitellina;* on the other hand they have broader and more distant gills than is warranted by the description of *R. lutea.* According to Fries, *R. lutea* is found in beech forests and *R. vitellina* in coniferous woods. *R. flaviceps* Pk. is said to be larger, with narrow and close, pale yellow gills.

HYGROPHOREAE

Fruit body soft, fleshy. Stem central, confluent with the pileus. Gills with a waxy consistency, more or less distant, thick, well-developed, with acute edge.

This subfamily is well defined and set off from the others. The characteristics are not easily described in words, but the habit of the plants and the nature of the gills are soon learned by field study. The gills, although acute on the edge, thicken toward the pileus, and are built up of a thick central layer (the trama), coated on both surfaces by a thick, waxy, hymenial layer of long basidia, which is more or less removable.

Our species are included under two genera:

Spores white. *Hygrophorus.*

Spores blackish. *Gomphidius.*

Gomphidius Fr.

(From the Greek, *gomphos,* a wooden bolt or peg, referring to the shape of the young plants.)

Black-spored to smoky-olive-spored; *gills of a waxy* or subgelatinous *consistency,* decurrent, subdistant to distant, forked, edge acute; stem central, confluent with the pileus; pileus fleshy, *viscid;* partial veil when present membranous glutinous; spores elongated-subfusiform; cystidia abundant.

Terrestrial and putrescent fungi, very infrequent in this region, sharply distinct by the nature of its gills and spores. The genus appears to have some relationship with Hygrophorus on the one hand and with Paxillus on the other. In Europe, *G. viscidus* Fr. and *G. glutinosis* Fr. are a prominent part of the mushroom flora, although with us these two species seem to be entirely lacking, and no species can be said to be frequent. Peck has described five species from the United States; four of these came from the eastern states and are smaller than the two common European species mentioned above. Nothing is known of the edibility of our species.

The genus is best recognized by the smoky, decurrent and usually distant gills, the viscid or glutinous cap, and the spotted stem. In the young stage a viscid veil connects the margin of the pileus with

the stem; as the plant matures the veil collapses on the stem and in most cases causes the stem to appear viscid and at length spotted or blotched by the drying remnants of this veil. In our species this veil is scanty and it apparently disappears very early, and in most cases cannot be definitely seen. Our species occur in swampy ground or in tamarack bogs. Only three species have been found in the state. *G. nigricans* Pk. reported in the 8th Rep. Mich. Acad. Sci., is doubtful. *G. rhodoxanthus* (Schw.) is referred to Paxillus.

Key to the Species

(a) Pileus 2-5 cm. broad, obtuse or depressed; stem dry, becoming reddish-black spotted, yellow at base. 152. *G. maculatus* Fr.
(aa) Pileus 1-2.5 cm. broad, often umbonate; stem at first viscid from the veil, slender.
(b) Stem yellow downwards. 154. *G. flavipes* Pk.
(bb) Stem brick color to wine-reddish; not yellow at base. 153. *G. vinicolor* Pk.

152. Gomphidius maculatus Fr.

Epicrisis, 1836-38.

Illustrations: Ricken, Blätterpilze, Pl. 3, Fig. 2.
Plate XXIII of this Report.

PILEUS 2-5 cm. broad, convex, obtuse, soon plane or depressed, with a viscid, separable pellicle, glabrous, *brownish-incarnate to pale clay color,* rugulose, spotted and shining when dry. FLESH thick, soft, white or faintly incarnate. GILLS decurrent, narrowed behind, thickish, subdistant to distant, distinct, subgelatinous to soft-waxy, *dichotomously forked,* at first whitish, then *pale olivaceous-gray, finally smoky,* moderately broad. Stem 4-7 cm. long, apex 5-12 mm. thick, tapering downward, solid, firm, even, whitish above or with a tinge of incarnate, at first dotted with reddish scurf, glabrescent, *becoming black-spotted* or blackish in age or when handled, *base yellow.* VEIL *none* or very evanescent. SPORES variable in size, cylindrical-subfusiform to elongated-elliptical, 15-23x6-7.5 micr., smooth, pale smoky-brownish under the microscope. CYSTIDIA abundant on sides and edge of gills, cylindrical, obtuse, variable, 100-135x15-25 micr. TASTE mild. ODOR none or slight.

Gregarious, subcaespitose or scattered, under tamarack- trees (Larix), in bogs, on moss or debris. Between Chelsea and Jackson. October-November. Rare or local.

Apparently this species occurs only in restricted localities in the bogs near inland lakes. This is the largest form so far found in

the state, although it varies in size and the smaller plants have less distant gills, smoother stems and smaller spores. Probably because of the advance of cooler weather the plants mature slowly and the spores have not attained their full size in the small plants. The yellow color is sometimes confined to the base, sometimes it extends halfway or more than halfway the length of the stem. The latter condition may turn out to represent *G. flavipes* Pk. The plants turn blackish when dried, but differ from *G. nigricans* Pk. in the absence of a partial veil. Ricken considers *G. gracilis* Berk. to be identical, which is very probable. *G. furcatus* Pk. differs chiefly, according to Peck's description, in the lack of the yellow color at the base of the stem; it is said to occur under tamaracks also.

153. Gomphidius vinicolor Pk. minor.

N. Y. State Mus. Rep. 51, 1898.

PILEUS 1-2 cm. broad, convex then plane, sometimes umbonate, glabrous, even, with a viscid or glutinous separable pellicle, wine-red to rufous-cinnamon, fuscous in the center, paler toward margin. FLESH thick, pale incarnate. GILLS decurrent, subtriangular, rather distant, distinct, *thickish,* broad in the middle, *not or rarely forked,* olive-brown to fuscous-brown, sprinkled by dark spores. STEM 3-4 cm. long, 2-4 mm. thick, *slender, equal,* even, solid, *viscid* from the evanescent veil, flexuous, brick-color to vinaceous, concolor within, *not yellow at base,* silky-fibrillose. SPORES elongated-oblong to subfusiform, 13-16x6-6.5 micr., smooth, smoky-brown. CYSTIDIA abundant, subcylindrical, obtuse, 120-135 x 16-18 micr. ODOR very slight but disagreeable.

Gregarious or solitary. On the ground in low, swampy woods in region of hemlock and pine. New Richmond. September. Rare.

This species is referred here as a minor form of *G. vinicolor* Pk. from whose description it differs in the smaller size and smaller spores. My experience with *G. maculatus* leads me to suspect that the spores of small plants do not mature readily, as is shown also by the less smoky gills. Peck gives the spores 17.5-20x6-7.5 micr. and the type plants were much larger. I have found our plant on several occasions and as it seems to be constant, it may be necessary to separate it. When dried, it becomes black. Some consider *G. vinicolor* Pk. identical with *G. gracilis* B. & Br.; the latter is described with the base of the stem yellow.

154. Gomphidius flavipes Pk.

N. Y. State Mus. Rep. 54, 1901.

Illustration: Ibid, Pl. I, Fig. 1-4.

PILEUS 1-2.5 cm. broad, convex or plane and sometimes umbonate, viscid, *dingy pink or yellowish, tinged reddish,* minutely tomentose on center, slightly fibrillose on the margin. GILLS decurrent, arcuate, subdistant to distant, *scarcely forked,* whitish then pale smoky-brownish. STEM 3-5 cm. long, 3-7 mm. thick, equal or tapering down, solid, slightly fibrillose, whitish at apex, *elsewhere yellow within and without.* SPORES elongated-fusiform, 20-30x6-7.5 micr., smooth, smoky-brown to brownish black. CYSTIDIA present.

Solitary or gregarious. On the ground in mixed woods. Harbor Springs. September. Rare.

Only one collection has been made of what seems to be this plant. The spores were clearly immature and had not yet attained the size given by Peck.

Hygrophorus Fr.

(From the Greek *hugros,* moist; and *phero,* to bear.)

White-spored. *Consistency of the gills waxy;* of pileus and stem waxy-fleshy or fleshy. Hymenophore *continuous with the trama of pileus and stem.* Stem central. Gills variously attached, soft, not membranous, edge acute. Hymenium loosely adherent to the trama of the gills. Trama of gills various: parallel, divergent or interwoven.

Putrescent, soft, terrestrial mushrooms, growing in woods, meadows, etc., and uniformly harmless. They are medium or small in size and often brightly colored. The gills are usually distant or subdistant, characters which ordinarily distinguish them from the species of Clitocybe for which those with decurrent gills might be mistaken. The genus corresponds to Gomphidius and Paxillus of the ochre-spored group, but is distinguished from them by the gills not easily separating from the trama of the pileus.

The PILEUS varies from conical to convex at first, in most cases becoming plane at maturity, with or without an umbo and sometimes umbilicate. In a great many species the expanded pileus is obversely subconical, pulling the gills into an ascending position,

so that they appear decurrent, even in those cases where they were merely adnate or adnexed at first. With age, the margin of the pileus becomes recurved or split. The surface is viscid or glutinous in many cases, others are hygrophanous, but those of one subgenus include some with a dry pileus; a small number have minute squamules over the surface or on the disk. A great variety of colors is present; white, yellow, orange, red, green, ashy, brown, etc. Some have a striate margin, and others are even and glabrous. The FLESH is usually soft, and somewhat waxy or watery, often permeated by differentiated lactiferous hyphae or crystals of oxalate of lime. The GILLS are peculiar in structure, and furnish the main characters by which we separate the genus. Their edges are acute, but they gradually thicken towards their attachment with the pileus, so as to be narrowly triangular in cross-section. The hymenial layer becomes soft when mature and rubs off from the trama proper of the gills, leaving the skeleton of trama behind. They are mostly *subdistant to distant* or very distant, and this character, along with the waxy consistency and their shape in section, constitutes a set of marks by which, after a little experience, one can tell the genus. As McIlvaine says, "There is an indescribable, watery, waxy, translucent appearance about the gills, which catches the eye of the expert, and is soon learned by the novice." Their attachment varies from adnexed to adnate and decurrent. They are usually white, but may be similar in color to that of the pileus. The interspaces are often veined in a marked fashion. The STEM is central and similar in texture to the pileus, often very fragile or watery. It is either solid or if it is stuffed becomes quickly hollow. It often splits longitudinally with considerable ease. In the subgenus Limacium, the plant when young is sometimes enveloped by a slimy universal veil which breaks up into glutinous patches, scales or flocci on the stem or pileus, or by a partial floccose veil which is connected to the margin of the pileus and to the stem; as the plant expands or dries this partial veil breaks up into a floccose annulus or more often in the form of scabrous or punctate flocci at the apex of the stem. The plants of the other two subgenera do not possess either of these veils, but those species which are viscid develop this character from the cuticle of the pileus or stem which is gelatinous and which dissolves into a slimy substance in moist weather, as in *H. psitticinus.* The SPORES may be subglobose, oval, oblong, cylindrical or elliptical. Fries (Hymen. Europ), speaks of them as "globose" only, and Patouillard says they are ovoid. DeSeynes (Ann. Sci. Nat. Ser. 5, 1 (1864) Tab. 13, Fig. 3,) figures the spores of *H.*

ceraceus as obovate with an obscure constriction in the middle, and says they vary characteristically in this genus to reniform, irregular, etc. I am quite certain that the spores are often quite irregular, angular, etc., when immature, but have a regular outline when mature, although they often tend to be slightly thicker at one end in a number of species. In most species they appear granular-punctate, and usually have a transparent spot on one side, as if perforated. Between most of our species there is not much difference in spore-size, but sufficient difference to be of diagnostic value. The spores are white in mass, and hyaline under the microscope. The BASIDIA are quite characteristic within the genus; they are long and slender, tapering to a narrow stalk. They are said to be often 2-spored. CYSTIDIA are not present in the subgenus Limacium, but occur in some of the species of the other subgenera. The ODOR is not marked in any of our species. Several European species are said to have a characteristic odor; for example: in *H. cossus* Fr. it is disagreeable, like that of a kind of moth; in *H. nitratus* Fr. it is strongly alkaline; in *H. agathosmus* Fr., like oil of bitter almonds. The TASTE is usually mild, and most of them are to be classed *among our best edible mushrooms.* The HABITAT varies. They grow on the ground, usually in moist or wet situations, in woods, copses, fields and pastures, although in our climate they develop mostly in shaded places. Some appear in early summer, and others are found only in late fall—some species never develop till after the frosts appear. *H. hypothejus* (Ricken, Blätterpilze) is said to occur only after the first frost. *H. speciosus* is found, often in good condition, as late as December first.

The genus is divided into three subgenera, fundamentally limited by the structure of the gill-trama:

I. Limacium (Hygrophorus proper).

II. Camarophyllus.

III. Hygrocybe.

These three subgenera are raised by some authors to the rank of genera, and from a scientific standpoint should be so considered. But for practical purposes the old arrangement seems better.

The key includes all species which are likely to be found within the limits of the state.

Key to the Species

(A) Plant white, disk of pileus with yellowish or reddish tints in some specimens. [See also (AA), (AAA) and (AAAA)]
- (a) Pileus viscid or glutinous.
  - (b) Pileus entirely white, changing only in age.
    - (c) Stem glutinous or viscid.
      - (d) Apex of stem with white dots or squamules. Gills adnate to decurrent.
        - (e) Stem floccose-tomentose below the glutinous annulus, apex at length reddish-dotted. 156. *H. rubropunctus* Pk. (syn. *H. glutinosus* Pk.).
        - (ee) Stem glabrous, not annulate.
          - (f) Stem firmly stuffed to hollow; plant persistently white. 156. *H. eburneus* Fr.
          - (ff) Stem solid, plant changing color on drying. 156. *H. eburneus* var. *unicolor* Pk.
          - (fff) Stems solid, caespitose. 156. *H. eburneus* var. *decipiens* Pk.
      - (dd) Apex of stem not scabrous-scaly-dotted.
        - (e) Gills emarginate-adnexed; pileus at first conical. *H. purus* Pk.
    - (cc) Stem dry.
      - (d) Pileus large, 8-15 cm. broad, stout; autumnal. 165. *H. sordidus* Pk.
      - (dd) Pileus small, scarcely viscid, subumbilicate, thin, toughish. 170. *H. niveus* Fr.
  - (bb) Pileus not entirely white.
    - (c) Apex of stem decorated with yellowish granules or yellow glandular dots.
      - (d) Pileus whitish, covered by yellowish or brownish gluten. 159. *H. paludosus Pk.*
      - (dd) Pileus white, with numerous golden yellow granules on margin. 155. *H. chrysodon* Fr.
    - (cc) Apex of stem white-scaly-dotted or slightly floccose.
      - (d) Disk of pileus pinkish or pale reddish-brown. 157. *H. laurae* Morg.
      - (dd) Disk of pileus yellowish or reddish-yellow. 158. *H. flavodiscus* Frost.
- (aa) Pileus and stem not viscid nor glutinous.
  - (b) Plant stout. Pileus 3-7 cm. broad, dry, white. 169. *H. virgineus* Fr. (See also *H. pratensis* var. *pallidus.*)
  - (bb) Plant slender; pileus 1-3 cm. broad, whitish. 171. *H. borealis* Pk.

(AA) Plant yellow, bright green, olivaceous, orange or shades of these colors.
- (a) Pileus glutinous or viscid when moist.
  - (b) Pileus at first olivaceous or green.
    - (c) Pileus 3-5 cm. broad, color at length orange-yellow to tawny; gills yellow. 161. *H. hypothejus* Fr.
    - (cc) Pileus 4-8 cm. broad; gills white-incarnate. 163. *H. olivaceoalbus* Fr.
    - (ccc) Pileus 1-2.5 cm. broad, parrot green at first; gills yellowish or greenish. 184. *H. psitticinus* Fr.
  - (bb) Pileus orange-yellow, yellow, yellowish or tawny.
    - (c) Becoming blackish in age or when bruised; pileus conical; gills free. 180. *H. conicus* Fr.
    - (cc) Not becoming black when bruised.
      - (d) Gills emarginate-adnexed; pileus 2-5 cm. broad, citron to golden-yellow. 178. *H. chlorophanus* Fr.
      - (dd) Gills broadly adnate to decurrent.
        - (e) Pileus 3-8 cm. broad, yellow in age; in tamarack swamps in late fall. 160. *H. speciosus* Pk.

(ee) Pileus 1-3 cm. broad.
(f) Tough; pileus tawny-yellowish, not fading in age. 182. *H. lactus* Fr.
(ff) Fragile; pileus wax-yellow to yellow.
(g) Gills truly decurrent; pileus and stem fading to whitish in age. 181. *H. nitidus* B. & C.
(gg) Gills adnate-decurrent; pileus not fading. 172. *H. ceraceus* Fr.
(aa) Pileus not viscid nor glutinous.
(b) Golden-orange-yellow; fragile; pileus and stem markedly fading; gills adnexed, deep orange-yellow. 179. *H. marginatus* Pk.
(bb) Pale yellow; pileus 6-12 mm. broad; stem darker. *H. parvulus* Pk.
(AAA) Plant vermillion, scarlet, pink, flesh-color, rufous or shades of these.
(a) Pileus viscid or glutinous.
(b) Stem stout; pileus rather large, compact, firm.
(c) Gills not becoming reddish-spotted.
(d) Pileus scarlet, crimson or orange; stem viscid, in tamarack swamps. 160. *H. speciosus* Pk.
(dd) Pileus tinged flesh color; stem dry. 164. *H. pudorinus* Fr.
(cc) Gills becoming reddish-spotted. 163. *H. Russula* (Fr.).
(bb) Stem medium or slender; pileus fragile.
(c) Pileus 1-2 cm., pinkish-flesh-color; stem slender and viscous. 183. *H. peckii* Atk.
(cc) Pileus 3-7 cm., scarlet or vermillion; stem moist, not viscid.
(d) Gills arcuate-adnate; base of stem yellow or orange. 176. *H. coccineus* Fr.
(dd) Gills slightly adnexed; base of stem white; spores larger. 177. *H. puniceus* Fr.
(aa) Pileus not viscid nor glutinous.
(b) Pileus 1-3 cm. broad, subglabrous to minutely scaly, vermillion to reddish-yellow. 175. *H. miniatus* Fr. *H. cantherellus* Schw.
(bb) Pileus 3-7 cm. broad, flesh-color to tawny-reddish, glabrous. 168. *H. pratensis* Fr.
(bbb) Pileus 3-10 cm. broad, salmon-rufous to testaceus; hoary when young; gills decurrent. 167. *H. leporinus* Fr.
(AAAA) Plant neither white, yellow, orange nor bright red.
(a) Pileus and stem glutinous or viscid. [See also (aa) and (aaa)]
(b) Gills pure white; pileus grayish-brown, cinereous or fuliginous.
(c) Stem hollow, fuliginous. 185. *H. unguinosus* Fr.
(cc) Stem solid, white or whitish. *H. fuligineus* Frost.
(bb) Gills not pure white, or at least changing in age, adnate-decurrent.
(c) Pileus purplish-red, virgate with darker fibrils; stem and gills concolor. *H. capreolarius* Bres.
(cc) Pileus some shade of brown. [See also (ccc)]
(d) Stem hollow, slender; plant fragile; pileus olive-brown, 1-2 cm. broad. *H. davisii* Pk.
(dd) Stem solid, plant firm, larger.
(e) Growing in sphagnum swamps; pileus white, covered with yellowish-brown gluten. *H. paludosus* Pk.
(ee) In grassy woods; pileus smoky-olive, 3-6 cm. broad; spores 12 x 8 micr. *H. limacinus* Fr.
(ccc) Pileus dark brownish olivaceous. 162. *H. olivaceoalbus* Fr.
(aa) Pileus with a gelatinous, subviscid pellicle; stem dry.
(b) Pileus violaceous to smoky-lilac, hygrophanous, fading to grayish; stem stuffed to hollow. 174. *H. pallidus* Pk.
(bb) Pileus livid-rufescens to brownish, hygrophanous; stem stuffed to hollow; gills decurrent. 173. *H. colemannianus* Blox.
(bbb) Pileus grayish-brown or blackish-brown; stem solid.
(c) Spores 6-8 micr. long. 166. *H. fusco-albus* var.
(cc) Spores 10-12 micr. long. *H. morrisii* Pk.

(aaa) Pileus and stem not viscid nor glutinous (slightly viscid in *H. amygdalinus*).
(b) Odor markedly noticeable.
(c) Stem solid; pileus grayish-brown; gills adnate decurrent; odor of almonds. *H. amygdalinus* Pk.
(cc) Stem stuffed then hollow; pileus hygrophanous.
(d) Gills decurrent; pileus sooty-brown (moist); spores subglobose, 5-6 micr.; odor "peculiar." *H. peckianus* Howe.
(dd) Gills sinuate-adnexed; pileus yellowish-brown (moist), odor offensive. *H. mephiticus* Pk.
(bb) Odor not marked; stem solid.
(c) Plant stout; pileus smoky or blackish, virgate with fibrils; spores 8-9x5 micr. *H. carpinus* Fr.
(cc) Plant slender; pileus grayish-brown to blackish-brown, glabrous; spores 10-12x6-7 micr. *H. nigridius* Pk.

(Peck in his monograph, N. Y. State Mus. Bull. 116, 1907, of New York species mentions the following as very rare: *H. virgatulus* Pk., *H. burnhami* Pk., *H. metapodius* Fr., *H. basidiosus* Pk., *H. subrufescens* Pk., *H. immutabilis* Pk., *H. laricinus* Pk., *H. luridus* B. & C., *H. minutulus* Pk. Peck has described also *H. serotinus* Pk., *H. ruber* Pk., *H. albipes* Pk., from Massachusetts; *H. elegantulus* Pk. from Maryland and *H. sphoerosporus* Pk. from Iowa.)

SUBGENUS LIMACIUM: Provided with a glutinous universal veil or a floccose cortina or both. *Trama of gills of divergent hyphae.*

Section I. Universales

Provided with *both* a universal veil and a floccose cortina; the latter is connate to the inner surface of the former along the stem, sometimes forming a slight annulus at the apex of the stem, or a floccose-downy edge on the incurved margin of the pileus. Stem *viscid,* subglabrous to floccose-fibrillose, *shining or glistening-spotted when dry,* apex scabrous-dotted or subglabrous.

This section is intended to include only those with a universal veil. It corresponds to the subgenus Myxacium of the genus Cortinarius. This veil surrounds the very young button as a thick gelatinous layer, which becomes attenuated on the stem as this elongates and dissolves into a hyaline, or, in some species, into a somewhat colored gluten in wet weather. The apex of the stem is glandular or scabrous-dotted in those species in which the margin of the pileus is at first inrolled, but in those in which the margin of the pileus is merely incurved and continuous with the cortina, the apex of the stem is subglabrous and not floccose-dotted. *H. speciosus* is an example of the latter group.

155. Hygrophorus chrysodon Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Fig. 112, p. 110, 1900.
Cooke, Ill., Pl. 885.
Ricken, Blätterpilze, Pl. 6, Fig. 4.

"PILEUS 3-7 cm. broad, convex then expanded, viscid (moist), shining (dry), white, *concolorous except for the numerous golden granules on the margin,* or sometimes over entire surface, margin involute at first. FLESH white, rather thick. GILLS decurrent, distant, *white or yellow-powdered on the edge,* interspaces venose. STEM 4-7 cm. long, 6-10 mm. thick, soft, equal, stuffed, white, *apex decorated by yellowish granules,* sometimes in the form of an imperfect ring. SPORES oval-elliptical, smooth, 7-10x4-6 micr., white.

"Gregarious. In late summer or autumn. On the ground in open woods."

Not yet reported from Michigan.

156. Hygrophorus eburneus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Atkinson, Mushrooms, Pl. 34, Fig. 113, p. 111, 1900.
Murrill, Mycologia, Vol. 6, Pl. 131.
Hard, Mushrooms, Fig. 164, p. 207, 1908.
Marshall, Mushroom Book, Pl. 30, p. 84, 1905.
Peck, N. Y. State Mus. Bull. 54, Pl. 77, Figs. 13-14, 1902. (As *H. laurae* var. *unicolor.*)
Peck, N. Y. State Mus. Bull. 94, Pl. 88, Figs. 8-11, 1905. (As *H. laurae* var. *decipiens.*)
Cooke, Ill., Pl. 886.
Ricken, Blätterpilze, Pl. 6, Fig. 5.

PILEUS 2-7 cm. broad, convex-expanded, *pure white* when fresh, glutinous, *shining,* even, glabrous, margin at first involute and floccose-pubescent. FLESH white, rather thick and firm. GILLS adnate to decurrent, subdistant, moderately broad behind, narrowed in front, subvenose, *white,* often dingy yellowish in age, trama of divergent hyphae. STEM 6-15 cm. long, 3-8 mm. thick, elongated, subequal, tapering or fusiform, often flexuous, glutinous, shining-spotted when dry, *persistently stuffed or becoming hollow,* glabrous, apex with white dots or squamules, not annulate, *white* often becoming dingy in age. ODOR and TASTE mild. SPORES cylindrical-elliptic, smooth, 6-8x4-5.5 micr. BASIDIA slender, 4-spored, 40-42x7 micr.

Gregarious or subcaespitose in woods, thickets, etc., often among grass. October-November. Frequent. Ann Arbor and probably throughout the State.

Var. *unicolor* Pk. This is said to differ by its solid stem and change of color on drying. It was referred by Peck to *H. laurae* as a variety. If it is distinct at all it appears to be better to attach it to *H. eburneus.* Gillet says the stem of *H. eburneus* is solid or hollow. There is so much variation in this respect in our plants—some having a persistent pith and appearing solid, and others becoming hollow—that it seems to me best to merge the variety in the species. Berkeley notes that sometimes the English plants turn "fox-red in parts" when they decay.

Var. *decipiens* Pk. is closely related to the preceding variety, but is caespitose and the gills are said to remain white. It was also attached to *H. laurae* by Peck.

All these have a uniform white color when young or fresh, and are provided with a hyaline, glutinous, universal veil which makes the cap and stem slippery and difficult to pull up or to handle. The shining pileus when dry reminds one of *Tricholoma resplendens,* but the pileus averages smaller than in that species, and the stem is glutinous. *Hygrophorus rubropunctus* Pk. is also said to be a white plant, but differs from the preceding by its stem being floccose-tomentose below the glutinous annulus, and studded at the apex with drops of moisture which in drying form glandular red dots; its stem is short but thick; and the spores measure 7.5-10x5-6 micr. It has not been detected by me in Michigan. These white forms are all closely allied, and may be considered variations of one species.

157. Hygrophorus laurae Morg. (Edible)

Cincinnati Soc. Nat. Hist., Vol. 6, 1883.

Illustrations: Ibid, Pl. 9.
Peck, N. Y. State Mus. Bull. 54, Pl. 77, 1902.
Hard, Mushrooms, Fig. 170, p. 214, 1908.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 10.

PILEUS 3-10 cm. broad, convex-expanded or depressed on disk,

umbonate, more or less irregular, pinkish-brown or reddish on disk, white on margin, glutinous when fresh, glabrous, even, margin at first involute. FLESH thickish, white. GILLS adnate to decurrent, subdistant, rather narrow, white or tinged with cream-flesh-color, trama of divergent hyphae. STEM 3-8 cm. long, 6-12 mm. thick, equal or tapering downward, *solid, glutinous,* white or yellowish-white, upper half often squamulose-scabrous, the apex dotted with scabrous points. SPORES elliptical, smooth, apiculate, 7-9x 4-5.5 micr., white in mass. BASIDIA slender, about 38x6 micr. ODOR and TASTE mild.

Gregarious or subcaespitose. On the ground in frondose woods, thickets, etc., among fallen leaves. Detroit, Ann Arbor, New Richmond. August-November. Frequent.

This species usually has a cap which is wider than the length of the stem, while *H. eburneus* usually has an elongated stem and narrow pileus. There is some discrepancy in the spore-measurements as given by Morgan and Peck. The latter author gives them as 6-7.5 micr. long. Such discrepancy usually points to different species studied by the different authors, but in the genus Hygrophorus, as in some other white-spored genera, the spores often mature slowly, and it is often not easy to distinguish mature from immature plants, so that the best of observers may disagree. *H. laurae* is said to stain one's fingers as if with sumach. (S. Davis, Rhodora, 13, p. 63, 1911.)

158. Hygrophorus flavodiscus Frost (Edible)

N. Y. State Mus. Rep. 35, 1884.

Illustrations: Peck, N. Y. State Mus. Mem., Vol. 3, Pl. 50, Fig. 1-6.
Hard, Mushrooms, Fig. 167, p. 210, 1908.
Murrill, Mycologia, Vol. 4, Pl. 56, Fig. 11.

PILEUS 3-7 cm. broad, convex or nearly plane, *glutinous* when fresh, *pale yellow or reddish-yellow on disk,* white elsewhere, glabrous, even, margin at first involute. FLESH white. GILLS adnate to decurrent, subdistant, white sometimes with a slight flesh-colored tint, trama of divergent hyphae. STEM 3-7 cm. long, 6-12 mm. thick, nearly equal, *solid,* very glutinous, apex with white scabrous points, white or yellowish below. Spores elliptical, inequilateral, 6-7.5x4-5 micr., white.

Gregarious. On the ground in hemlock and beech woods. New Richmond. September.

This is close to the preceding, and may be a form of it peculiar to conifer woods. Peck thinks it belongs nearest to *H. fuligineus,* in whose company he has found it. According to this author, there are no scabrous points at the apex of the stem. In my specimens they were present, at least in the younger stages. The species was first published by Peck who obtained the name from Frost's manuscript description. The pileus has a thick fleshy disk, its margin is at first inrolled and is densely white-floccose on the side next the stem. The gills are sometimes intervenose; at first they are simply adnate, but on the expansion of the pileus become decurrent. This change from the young to the old gills has caused some discrepancies in the descriptions by different authors of this and the preceding species. The layer of glutinous tissue is very thick on the cap, thin on the stem.

159. Hygrophorus paludosus Pk.

Torr. Bot. Club Bull., Vol. 29, 1902.

"PILEUS 2-4 cm. broad, convex, obtuse, *whitish,* covered with a thick *yellowish or brownish gluten.* FLESH white. GILLS adnate or slightly decurrent, subdistant, whitish, *stained with greenish-yellow when old.* STEM 5-10 cm. long, 4-6 mm. thick, subequal, *long and slender,* flexuous, often curved at the base, *solid,* glutinous, white with yellow glandular dots at the top, streaked with brownish fibers or shreds of the dried gluten when dry. SPORES broadly elliptical, 8-10 x 5-7 micr., white. ODOR earthy. TASTE slightly *acrid.*"

Growing among peat mosses. Greenville. September. Reported by Longyear.

The yellowish dots at the apex of the stem are said to become black on drying, and there are yellowish stains at the base of the stem. The plant seems rare, as it has not been reported since its discovery. It needs further study to show its relationship.

160. Hygrophorus speciosus Pk. (Edible)

N. Y. State Mus. Rep. 29, 1878.

Illustrations: Peck, N. Y. State Mus. Mem. 4, Pl. 51, Fig. 21-28, 1900, and Rep. 29, Pl. 2, Fig. 1-5, 1878.
Hard, Mushrooms, Fig. 168, p. 211, 1908.
Fries, Icones, Pl. 166 (*Hygrophorus aureus* Fr.).

Bresadola, Fungi Trid., Vol. I, Pl. 9 (*Hygrophorus bresadolae* Quel.).
Plate XXIV of this Report.

PILEUS 2-8 cm. broad, oval, subconic or flattened convex when young, broadly convex and at length almost plane when mature, or varying subcampanulate and umbonate, umbo usually subobsolete, *glutinous* when fresh, *bright red or orange-vermillion* when young or in full vigor, becoming paler with age or after freezing, often subvirgate, even or slightly rugulose from the drying gluten, margin at first incurved then decurved or spreading. FLESH white or tinged orange under the separable pellicle, soft, rather thick. GILLS decurrent, *distant, moderately* broad in middle, acuminate at ends, arcuate, thick, intervenose, white or tinged yellowish, trama of divergent hyphae. STEM stout, 3-10 cm. long, 8-20 mm. thick, variable in length, equal or irregularly subcompressed, soft and spongy within, *not hollow,* straight or flexuous, *hyaline-white, floccose-fibrillose to the apical, obsolete annulus,* almost glabrous at times, variegated with glistening spots from the drying of the gluten, sometimes ochraceous-stained when old, apex subglabrous to silky, base usually deeply imbedded in substratum or subrooting. UNIVERSAL VEIL of hyaline gluten. SPORES 8-9.5 x 5-6 micr., broadly elliptical, smooth, white in mass. BASIDIA slender, 50-60 x 6-8 micr., 4-spored, sterigmata long and prominent. ODOR and TASTE mild.

In troops, etc., solitary or caespitose. In tamarack swamps. Ann Arbor. October-November. Frequent locally, appearing every fall in the same places.

This is the American form of *Hygrophorus aureus* of Europe. The illustrations of European authors as well as those of Peck, indicate a smaller average size and a pileus markedly umbonate. In our region as well as in the Adirondack Mountains I have seen such plants occur with the rest, but the majority are broadly convex with or without an obsolete umbo and as a rule are larger than the European form. Sometimes vestiges of a distinct floccose annulus occur, but more often this cannot be seen; on the other hand, the stem is usually covered by a white, floccose-fibrillose, appressed sheath which becomes dingy ochraceous or pale sordid reddish on drying, especially where gluten has dropped from the margin of the cap on the stem. Plants in the same patch vary greatly in the size of the pileus and the stem. The stem of the young plant is at first large and stout as compared with the flat or convex, narrow young pileus. The partial veil is floccose-fibrillose. The margin of

the pileus is merely incurved at first, not inrolled as it is said to be in *H. glutinifer* Fr. The color of the pileus of the typical American plant is a brighter red than that in Europe. This, however, is not unusual, as the reverse is true in *Amanita muscaria.* The pileus usually becomes pallid yellowish after exposure to sun and wind, or after being frozen. In the Adirondack Mountains I collected a color variety growing with the species, which differed from it at every stage of its development by its cadmium-yellow pileus. *Hygrophorus coloratus* Pk. is said to differ from *H. speciosus* by having a stuffed or hollow stem and a partial, floccose, white veil. As the latter is sometimes noticeable in the Michigan plants, and because of the soft structure of the interior of the stem in our plants, I doubt whether *H. coloratus* is more than a variety of the species.

161. Hygrophorus hypothejus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Plate 891.
Patouillard, Tab. Analyt., No. 510.
Gillet, Champignons de France, No. 337.
Ricken, Blätterpilze, Pl. 5, Fig. 5.

"PILEUS 3-5 cm. broad, convex-expanded, at length depressed in center, obtuse, glutinous, *olive-brown,* virgate with radial fibrils, even, *becoming pale, or citron-golden-yellow, tawny after the disappearance of the olive-brown superficial gluten.* FLESH pale yellowish with a yellow periphery, thin. GILLS decurrent, distant, *yellow* to orange-yellow, thickish. STEM 5-7 cm. long, 6-8 mm. thick, equal, stuffed to hollow, yellow to pale yellowish, glabrous, glutinous, *evanescently annulate from the partial floccose veil.* SPORES cylindrical-elliptical, smooth, 7-9 x 4-5 micr. ODOR and TASTE mild."

This species has not yet come to my notice within the State. It is said to be more common farther south, although its known northern limit should include Michigan. It is an inhabitant of pine woods, and Ricken says it never appears until after the first frost in the autumn, when it flourishes till the snow falls. Its yellow gills distinguish it from related species. Some consider *H. fuligineus* Frost identical.

162. Hygrophorus olivaceoalbus Fr.

Syst. Myc., 1821, and Fung. Trid., 1881.

Illustrations: Fung. Trid., Vol. I, Pl. 92.
Plate XXV of this Report.

PILEUS 4-8 cm. broad, at first acorn-shaped or rounded-campanulate, then convex to subexpanded, umbonate, umbo often obsolete, *covered by a thick gluten, dark, olive-gray,* stained ferruginous in age, at length somewhat wrinkled from the drying gluten, margin at first involute. FLESH white, thick, rather soft. GILLS adnate to decurrent, subdistant to close, moderately broad, distinct, white or slightly incarnate, trama of divergent hyphae. STEM rather stout, 4-7 cm. long, 8-15 mm. thick, equal or tapering downward, *peronate at first and floccose-scaly from the glutinous veil,* at length marked by rusty-fuscous, subannular, irregular stains, apex at first beaded with drops and densely white-scaly-dotted, solid, subrooting and curved at base. SPORES broadly elliptical, smooth or slightly rough-punctate, 9-12 x 6-7 micr. BASIDIA elongated, 50 x 8-9 micr. ODOR and TASTE mild.

Gregarious or subcaespitose. On the ground in woods of oak, maple, etc. Ann Arbor. October. Found but once.

This is a very marked species. The sheathed, floccose stem with its several rings of staining gluten separates it from nearby species. The base of the stem is usually deep in the ground. Bresadola's figures show a darker plant, while Gillet, Michael and Ricken figure a more slender plant. The colors of our plants approach more nearly those of the last three authors.

Section II. Partiales. Universal veil none. Partial veil or cortina floccose, adhering to the involute margin of the pileus. Stem *dry,* apex floccose-scabrous or subglabrous.

This section corresponds to the subgenus Phlegmacium of the genus Cortinarius. The stem is dry except when the gluten of the cap falls upon it. The viscidity of the pileus is due to a gelatinous layer on its surface which becomes glutinous in some species in wet weather.

163. Hygrophorus Russula Fr. (Edible)

Syst. Mycol., 1821 (as Tricholoma).

Illustrations: Hard, Mushrooms, Fig. 51, p. 71, 1908. (As *Tricholoma Russula.*)
Michael, Führer f. Pilzfreunde, Vol. II. (as *Tricholoma Russula.*)
Ricken, Blätterpilze, Pl. 4, Fig. 1.
Peck, N. Y. State Mus. Bull. 54, Pl. 77, Fig. 1-5, 1902. (As *Tricholoma Russula.*)
Bresadola, Fungh. mang. e. vel., Pl. 22. (As *Tricholoma Russula.*)
Plate XXVI of this Report.

PILEUS 5-12 cm. broad, firm, convex, at length plane or depressed with margin elevated-wavy, *viscid* when moist, *pale pink to rosy-red,* somewhat variegated, disk somewhat scaly-dotted, margin at first involute and floccose-pruinose. FLESH compact, thick, white or at length reddish-tinged. GILLS rounded behind, at length spuriously decurrent, narrow, acuminate at ends, thickish, white at first then reddish-spotted, *trama of divergent hyphae.* STEM stout, usually short, 3-7 cm. long, 15-25 mm. thick, firm, solid, *dry,* equal or subventricose, apex white-flocculose, *white, becoming reddish in age.* SPORES narrowly elliptical, apiculate, smooth, white in mass. BASIDIA slender, elongated, 45 x 5-6 micr. ODOR and TASTE mild.

Solitary or caespitose in troops. On the ground, among leaves, in frondose woods of oak, maple, etc. Ann Arbor, Detroit, Marquette, New Richmond and throughout the State. September-November. Common.

This Hygrophorus has usually been placed with the Tricholomas with which it has some affinity; but the character of the gills, which are somewhat waxy and whose trama is composed of divergent hyphae, the attenuated lower part of the basidia and its general characters ally it much better to Hygrophorus where Quelet and Ricken also place it. The involute, slightly floccose margin of the pileus is similar to that of *H. pudorinus.* It often occurs in troops in late autumn, when it is covered by leaves which it pushes up so as to form humps which betray its presence. It is among the very best of edible mushrooms, especially after cold weather sets in, at which time it is free from grubs. The bright color is similar to that of some Russulas, hence the specific name. *Tricho-*

loma rubicunda Pk. is doubtless *H. Russula* in spite of the argument for its autonomy by E. M. Williams in the Plant World, Vol. 4, p. 9, 1901. *H. erubescens* Fr. is similarly colored, but consistently of a different habit, long stemmed and narrow-capped. The latter species as I saw it in Sweden, seems to me to be quite distinct.

164. Hygrophorus pudorinus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Plate 911.
Gillet, Champignons de France, No. 347.
Peck, N. Y. State Mus. Bull. 67, Pl. 83, 1903.
Ricken, Blätterpilze, Pl. 4, Fig. 3, 1910.

PILEUS 2-10 cm. broad, firm, convex-campanulate, subexpanded, obtuse, *viscid* when moist, *pale tan color, pinkish-buff or tinged incarnate,* glabrous, even, margin at first involute and minutely downy. FLESH compact, thick, white or tinged flesh-color. GILLS acuminate-subdecurrent, subdistant, thickish, narrow, sometimes forked, interspaces venose, *usually connected at the stem by a narrow border,* trama of divergent hyphae. STEM 3-8 cm. long, 5-20 mm. thick, *stout,* compact, solid, *dry,* equal or tapering downward, white, buff or incarnate-tinged, *floccose-scabrous at apex,* floccose-fibrillose or glabrescent downwards. SPORES cylindric-elliptical, smooth, 6-9 x 3.5-5 micr. BASIDIA slender, 45-50 x 6-7 micr., 4-spored. ODOR and TASTE mild. *Edible.*

Gregarious to caespitose. On the ground, often among grass, in hemlock or frondose woods or thickets. Ann Arbor, Detroit, New Richmond. September-November. Frequent.

This is a variable species with us as regards size and coloration. Late in the season a small form appears (form *minor*) which has always a white stem, and forms considerable patches in oak woods. It is possible that this form is *H. arbustivus* Fr. In the typical and luxuriant specimens of *H. pudorinus* the stem is tinged flesh-color to pale isabelline. Occasional specimens are larger than the sizes given above, which are made to include form *minor*. All of these are delicious food.

165. Hygrophorus sordidus Pk. (Edible)

Torrey Bot. Club, Bull. 25, 1898.

Illustrations: Hard, Mushrooms, Fig. 176, p. 220, 1908.
Plate XXVII of this Report.

PILEUS *large,* 8-16 cm. broad, convex-expanded to plane, firm, *viscid* when moist, pure white, rarely tinged yellowish-buff, glabrous, even, margin at first incurved and slightly floccose. FLESH compact or somewhat soft, white, *thick.* GILLS adnate to decurrent, subdistant, rather broad in middle, attenuate at both ends, *white,* slightly yellowish in age, waxy, interspaces sometimes veined, trama of divergent hyphae. STEM *stout,* 6-10 cm. long, 15-30 mm. thick, *short,* solid, *dry,* equal or attenuated downwards, white, glabrous or obscurely floccose-mealy at apex, even. SPORES elliptical, smooth, 6-8 x 4-5 micr. ODOR and TASTE mild.

Gregarious. On the ground among leaves in frondose woods of maple, oak, etc. September-November. Ann Arbor, New Richmond. Frequent locally.

This is the largest and finest of the genus. Small individuals may be confused with *Tricholoma resplendens,* but due regard to broader pileus, shorter stem and the waxy gills which are decurrent in expanded plants, will distinguish it at once. Microscopically the divergent hyphae of the gills, as well as the basidia, are a certain distinction. It has been met with for a series of years, every autumn, and is consistently a large white plant, so that it can hardly be referred to *H. pudorinus.* When young, a floccose cortina is present. The universal veil is entirely lacking. It is edible, and vies with any mushroom in its abundant flesh and pleasant flavor. The pileus is sometimes quite obscured by adhering leaves or dirt.

166. Hygrophorus fusco-albus Fr. var. occindentalis var. nov.

Epicrisis, 1836-38.

Illustrations: Cooke, Ill., Plate 899.
Plate XXVIII of this Report.

PILEUS 2-5 cm. broad, convex-expanded, at length plane or depressed, *viscid* when moist, *livid grayish-brown to brownish-ashy,* sometimes blackish on disk, glabrous, even, becoming fragile, margin at first involute and floccose-downy. FLESH white, *rather thin,*

rather soft. GILLS adnate to decurrent, subdistant to close, *rather narrow,* creamy-white, interspaces venose, *trama of divergent hyphae.* STEM slender, rarely stout, 3-7 cm. long, 4-6 mm. thick (rarely 10-12 mm.), equal or tapering downward, *dry,* solid, straight, or curved at base, sometimes flexuous, rather fragile, apex floccose-scabrous, *floccose-pruinose elsewhere,* glabrescent, *white or pallid.* SPORES elliptical, smooth, 6-8 x 3.5-4.5 micr., white. BASIDIA slender, 36-38 x 6-7 micr., 4-spored. ODOR and TASTE mild.

Gregarious or subcaespitose. On the ground in oak woods. Ann Arbor, Detroit. October. Infrequent.

This plant has been found in several places in successive years. It is well-marked, but differs in some respects from the published descriptions and figures of *H. fusco-albus.* It appears that there is no unanimity among European mycologists as to this species. It was first figured by Lasch. Ricken figures it as a stout plant with a viscid stem and says the stem is glutinous-peronate. This departs widely from the description of Fries, Gillet, Massee and others. Cooke's figure more nearly depicts our plant. Fries says the gills are broad, but in our specimens they were always rather narrow. Peck (N. Y. State Mus. Bull. 116) has included it under *H. fusco-albus,* in the sense of Fries, in his monograph. The spores of our plant are slightly smaller than given by Peck, and much smaller than those given by Cooke and Massee. In view of these discrepancies and differences, it has seemed best to bestow on our plant at least a varietal position. It seems to come halfway between *H. fusco-albus* and *H. livido-albus.* The partial floccose veil disappears early except on the involute edge of the pileus. The stem is delicately floccose and entirely dry when fresh or young.

167. Hygrophorus leporinus Fr.

Epicrisis, 1836-38.

Illustration: Cooke, Ill., Pl. 930.

PILEUS 3-10 cm. broad, at first oval-campanulate, at length expanded-plane, obtuse, often gibbous or irregular, opaque, *rufous-testaceous* to fulvous-rufescent, *variegated with a white, hoary, silkiness when young,* especially on margin, provided with a subviscid, separable, thin pellicle, becoming subfibrillose or subvirgate. FLESH thick, compact on disk, abruptly thin on margin, firm, pallid, tinged rufescent to rufous-fulvous. GILLS arcuate-*decurrent, rigid, thick, subdistant,* distinct, attenuate at both ends, *ferrugi-*

nous-fulvous to gilvous, pruinose, trama divergent. STEM 3-8 cm. broad, subequal or tapering downward, *attenuated at base,* often curved, rigid, 8-16 mm. thick above, at first with an appressed, glaucous silkiness, glabrescent, innately fibrous and shining, *solid, rufescent* within and without. SPORES narrowly elliptic-lanceolate to ovate, smooth, 7-9 x 4 micr., white. BASIDIA very slender, about 60 x 4 micr. ODOR none. TASTE mild.

Scattered or gregarious. On the ground among fallen leaves in frondose woods. October. Ann Arbor. Rare.

I have referred this large, well-marked plant to the above species on the strength of Cooke's figure, but with some hesitancy. It agrees well with that illustration. *H. leporinus* is usually placed under the subgenus Camarophyllus, but the divergent gill-trama of our plant indicates plainly its position in my grouping. The spore-measurements do not agree with those given by others. Massee says they are subglobose, 5-6 micr.; Ricken describes them as cylindric-elliptical, like ours, but smaller, 5-6 x 4 micr., which approximates somewhat closely. Berkeley says spores of *H. leporinus* are umber-colored; this is manifestly an error. The rather rigid habit and color suggest a large and deeply colored *Clitocybe laccata,* but otherwise they have nothing in common. The whole plant is more or less salmon-rufescent in color. The trama of the gills is composed of slender, diverging, compact hyphae, 5-7 micr. in diameter. The trama of the pileus is also pseudo-prosenchymatous, i. e., of narrow, compact hyphae. The species is variable in size and stout even when young. It is not found till late fall. It may turn out to be distinct.

SUBGENUS CAMAROPHYLLUS. Veil none. *Trama of gills of interwoven hyphae.* Pileus and stem usually dry. Stem glabrous or fibrillose, not scabrous-punctate at the apex.

Although this subgenus was separated by Fries from the subgenus Hygrocybe on account of its "firm, non-viscid" pileus, he nevertheless, placed under it a number of thin, viscid species like *H. fornicatus, H. niveus,* etc. In view of the fact that such typical species of this group as *H. pratensis* and *H. virgineus* have a gill-trama of interwoven hyphae, and typical species of the subgenus Hygrocybe have a gill-trama of parallel hyphae, it seems that we have here a fundamental and natural separation of the two groups, as was insisted on by Fayod (Ann. d. Sci. Nat., 7 Ser., Vol. 9, p. 305). Thus, despite the statement of Peck and Earle, the dry character of the pileus cannot be retained to characterize this subgenus.

168. Hygrophorus pratensis Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 917 and 932.
Ricken, Blätterpilze, Pl. 7, Fig. 2.
Gillet, Champignons de France, No. 345.
Swanton, Fungi, Pl. 9, Fig. 11-12, 1909.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 1.
Peck, N. Y. State Mus. Rep. 48, Bot. ed., Pl. 28, Fig. 11-17, 1896.

PILEUS 2-7 cm. broad, disk compact, convex, subexpanded, often turbinate, obtuse or umbonate, glabrous, even, *reddish-fulvous or pale tawny,* moist when fresh, not viscid, margin thin. FLESH white or tinged like pileus. GILLS decurrent, distant, *thick,* whitish, yellowish or tinged like pileus, *intervenose,* very broad in the middle, trama of interwoven hyphae. STEM short, 4-7 cm. long, 7-12 mm. thick, equal or narrowed downwards, *glabrous,* even, persistently stuffed, white or tinged like the pileus. SPORES 6-8 x 4-5.5 micr., broadly elliptical or elliptic-ovate, smooth, white. BASIDIA slender, 40-42 x 5-6 micr. ODOR and TASTE mild.

Solitary, gregarious or caespitose. On the ground, woods, thickets, grassy places, etc. Marquette, Houghton, Bay View, New Richmond, Ann Arbor, etc. Most common apparently in the northern part of the State; mostly in frondose woods. July-October. Frequent.

Var. *pallidus.* Plant whitish (Detroit).

Var. *cinereus.* Plant cinereous or stem whitish. Otherwise like the typical form.

The dry surface of the pileus often becomes rimulose in expanded plants from the cracking of the cuticle. Such a condition is shown in Hard's Fig. 163, Plate 24, op. page 204; in other respects that illustration does not show the characteristic top-shaped pileus of the plant, nor the short stubby stem. It is distinguishable by its glabrous cap and stem, its top-shaped pileus and the compact flesh of the center of the cap. It grows more often in exposed, grassy places than our other Hygrophori.

169. Hygrophorus virgineus Fr. var. (Edible)

Syst. Myc., 1821.

Illustrations: Hard, Mushrooms, Fig. 175, p. 219, 1908.
Peck, N. Y. State Mus. Mem. 4, Pl. 52, Fig. 8-12, 1900.
McIlvaine, American Mushrooms, Pl. 37, Fig 6, p. 146, 1900.
Cooke, Ill., Pl. 892.
Gillet, Champignons de France, No. 351.

PILEUS 2-5 cm. broad, convex, *often plane to depressed, dry,* obscurely pruinose, even *white,* margin thin. FLESH thick in center of cap, white. GILLS decurrent, close to subdistant, thickish, white or at length tinged cream-flesh color, scarcely ever forked or veined, trama of interwoven hyphae. STEM short, 2-4 cm. long, 6-10 mm. thick, equal or tapering either way, solid, *white* within and without, *glabrous,* even. SPORES narrowly ovate or elliptic-ovate, smooth, 6-8 x 3.5-4 micr. ODOR and TASTE mild.

Solitary or gregarious. On sandy ground, in mixed, open woods of pine, beech and maple. New Richmond, Detroit. September-October. Found infrequently.

This species, it is said, is to be looked for among grass in meadows, etc., but the writer has not found it in such localities. The description applies to the American form, which is usually smaller, its cap is rarely distinguished by rimose cracks, and the spores are smaller than given for the European plant. The recorded European spore-measurements vary from 8-10 x 5 to 10-12 x 6-7 micr. Our plant is probably a distinct variety if not a species. It has also closer gills than the type. It is hard to distinguish from the pallid variety of *H. pratensis* except for its narrower spores, and less umbonate or turbinate pileus, which is commonly pure white.

170. Hygrophorus niveus Fr. (Edible)

Epicrisis, 1836-38.

Illustrations: Michael, Führer f. Pilzfreunde, Ill. No. 89.
Ricken, Blätterpilze, Pl. 7, Fig. 3.
Cooke, Ill., Pl. 900.

PILEUS 1-3 cm. broad, convex or campanulate at first, then plane, *umbilicate, hygrophanous-white,* glabrous, slightly viscid, *striatulate when moist.* FLESH *thin,* white. GILLS decurrent, distant, narrow, white, thin, subvenose, trama of interwoven

hyphae. STEM 2-8 cm. long, 2-5 mm. thick, stuffed then usually hollow, equal or tapering downward, *white,* glabrous. SPORES broadly elliptical, smooth, 7-8 x 5-6 micr. CYSTIDIA none. BASIDIA 40-45 x 5-6 micr., slender. ODOR none.

Gregarious. On moist ground in low woods or on mosses in swamps. Ann Arbor, New Richmond, Marquette. Throughout the State. August-September. Infrequent.

Most of our collections were composed of small plants, with slender stems often only 2 mm. thick. The pileus varies from truly convex to campanulate in the same patch. In some localities the pileus was tinged a slight cream-color, but otherwise the plant was the same. The umbilicus is sometimes obsolete. The pileus has a thin subviscid pellicle. This species, with us, differs from *H. borealis* in its more slender habit and its pileus, which is very thin and umbilicate on the disk. It is rather tough, and when moist the pileus is slightly viscid.

171. Hygrophorus borealis Pk. (Edible)

N. Y. State Mus. Rep. 26, 1874.

PILEUS 1-3.5 cm. broad, convex then subexpanded, obtuse, *moist,* glabrous, *even,* white. FLESH thickish on disk, thin elsewhere, concolor. GILLS decurrent, arcuate, distant, intervenose, white. STEM slender, 2-5 cm. long, 2-5 mm. thick, firm, equal or tapering downward, straight or flexuous, stuffed, white, glabrous. SPORES 7-9 x 5-6 micr., broadly elliptical. ODOR none. TASTE mild.

Gregarious or subcaespitose. On moist ground in swamps or woods of birch, maple, hemlock, etc. Marquette, New Richmond, Ann Arbor. August-October. Infrequently found, but probably common in our northern woods.

This is a slightly larger and firmer species than the preceding. Its pileus is rarely striate and is not viscid. It is, however, closely related to *H. niveus.* No data are at hand to determine what may be the structure of the gill-trama.

Var. *subborealis,* var. nov. A plant has been found which simulates *H. borealis,* whose spores are markedly larger. If these prove to be constant, it deserves to be considered a separate species. The full description follows:

PILEUS 1-3 cm. broad, convex, broadly umbonate, obtuse or sometimes depressed-umbilicate, *thick on disk,* firm, watery white, *sub-hygrophanous,* not shining, *glabrous,* even, the thin margin at first slightly incurved, at length spreading. FLESH white. GILLS

decurrent, distant, *veined,* forked, concolor, trama of interwoven hyphae. STEM 3-4 cm. long, 4-7 mm. thick, tapering downward, dull white, stuffed then hollow, glabrous or innately silky-fibrillose. SPORES *cylindric-elliptical,* smooth, 10-12 (rarely 13) x 4-5.5 micr. BASIDIA slender, 45-50 x 6-7 micr., with sterigmata about 6 micr. long. ODOR none. TASTE mild.

Ann Arbor, New Richmond. August-October.

172. Hygrophorus ceraceus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Michael, Führer f. Pilzfreunde I, No. 33.
Hard, Mushrooms, Fig. 174, p. 218.
Cooke, Ill., Pl. 904 (B).
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 2.

PILEUS 1-4 cm. broad, convex-capmanulate, obtuse, soft and *fragile, viscous,* pale ceraceus to lemon-yellow, sometimes tinged orange, *not pallescent,* pellucid-striate, glabrous. FLESH concolor, fragile. GILLS broadly adnate to subdecurrent, broad behind to subtriangular, thickish, subdistant, pale yellowish or whitish, trama of interwoven hyphae. STEM 2-5 cm. long, 2-4 mm. thick, equal, terete or compressed, *hollow,* glabrous, slightly viscid, soon dry, shining-undulate, waxy-yellow, sometimes tinged orange. SPORES 6-8 x 4 micr., short-elliptic, smooth. CYSTIDIA none.

Gregarious. On moist ground, in woods of the northern and western part of the State. July-September. Frequent.

This little species is usually placed under the subgenus Hygrocybe, but the interwoven hyphae of the gills bar it. It is distinguished from *H. nitidus,* a very similar species, by the color of the cap not fading as in that species; and from *H. chlorophanus* by the broadly adnate or subdecurrent gills. It seems to prefer the region of conifer woods, although it is not necessarily found only among conifers.

173. Hygrophorus colemannianus Blox.

Outlines of British Fungology, Berkeley, 1860.

Illustrations: Cooke, Ill., Pl. 903.
Bresadola, Fung. Trid., Vol. 2, Pl. 125.
Ricken, Blätterpilze, Pl. 7, Fig. 5.
Plate XXIX of this Report.

PILEUS 1.5-4 cm. broad, convex with obtuse umbo, *finally turbinate* and plane to depressed, *hygrophanous,* with a thin, separable, subviscid pellicle, even or at length pellucid-striate, glabrous, livid rufescent then *brownish-flesh color,* margin soon spreading. FLESH thin except disk, rather fragile, concolor. GILLS *decurrent* from the first, distant, not broad, acuminate at ends, very veiny, whitish, tinged grayish-brown, *trama of interwoven hyphae.* STEM 3-6 cm. long, 3-6 mm. thick, *equal or subequal,* elastic, innately fibrillose-striatulate, apex naked, stuffed or at length hollow, *whitish.* SPORES broadly elliptical, smooth, 6-9 x 5-6 micr., white. BASIDIA slender, 40 x 6 micr., 4-spored. CYSTIDIA none. ODOR none. TASTE mild.

Gregarious or solitary. On the ground in mossy or grassy moist places, in low woods or edge of swamps. Ann Arbor, New Richmond. Infrequent.

Bresadola gives a good figure, though our plants average smaller than his. It has the shape of *H. pratensis* but is hygrophanous and thinner, and must not be confused with the gray variety of that species. It prefers springy or moist places. The entire lack of odor separates it from *H. foetens* Phil. and *H. peckianus* Howe.

174. Hygrophorus pallidus Pk.

Torrey Bot. Club, Bull. 29, p. 69, 1902.

Illustration: Plate XXIX of this Report.

PILEUS 2-6 cm. broad, convex-campanulate, then expanded-plane to subdepressed, subturbinate, *hygrophanous,* glabrous, *smoky-violaceous or smoky-lilac when fresh and moist,* fading to pale gray, *with a thin gelatinous pellicle,* subviscid when moist, soon dry and shining, even. FLESH white, rather thin. GILLS arcuate-adnate to decurrent, *distant,* not broad, intervenose, *colored like the pileus when moist,* at length whitish or grayish-white, trama of interwoven hyphae. STEM 3-6 cm. long, 2-8 mm. thick, slender or stout, equal or narrowed downwards, slightly fibrillose or glabrous, *apex naked,* at first *stuffed by a large soft pith which disappears,* at length hollow and easily splitting, white or pale silvery-gray. SPORES ovate-subglobose, smooth, 5-6.5 x 4-5 micr. BASIDIA short, 30 x 6-7 micr. ODOR none. TASTE mild.

Gregarious or solitary. On moist ground in low woods or swamps. Ann Arbor, Marquette, Negaunee, New Richmond. Rather rare.

A beautiful Hygrophorus when fresh and moist, but very variable in the degree of color and viscidity. The deep color and the viscidity of the pileus disappear quickly on exposure to the wind, causing it to appear like quite a different plant. The gelatinous cuticle can, however, be demonstrated in all conditions by means of the microscope. Examples of our specimens were seen by Simon Davis, who collected the type specimens which were named by Peck. *Hygrophorus subviolaceous* Pk. is very close to it, according to the description, differing only in its solid stem; Peck has, however, referred it to the subgenus Limacium. I suspect that *H. caerulescens* B. & C. is the same plant.

SUBGENUS HYGROCYBE. Veil none. *Trama of gills of parallel hyphae.* Entire fungus thin, watery-succulent, fragile. Pileus viscid when moist, shining when dry, rarely floccose-scaly. Stem *hollow,* not scabrous-punctate at apex.

Most specimens of this subgenus are brightly colored, are soft, and grow in moist or wet places. As no data are at hand concerning the gill-trama of several species, these have been included temporarily under the subgenus Hygrocybe.

175. Hygrophorus miniatus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Hard, Mushrooms, Fig. 171, p. 215.
Marshall, Mushroom Book, Pl. X, p. 60, 1903.
Peck, N. Y. State Mus. Rep. 48, Pl. 28, Fig. 1-10, 1894.
White, Conn. State Nat. Hist. Surv., Bull. 15, Pl. 18, 1910.
Cooke, Ill., Pl. 921 (A).
Ricken, Blätterpilze, Pl. 8, Fig. 9.

PILEUS 1-3 cm. broad, convex-subexpanded, at length *umbilicate,* never viscid, vermillion, reddish-yellow or yellow, fading, *minutely tomentose, at length minutely scaly, sometimes glabrous,* even, fragile. FLESH thin, yellowish to pale. GILLS adnate to subdecurrent, subdistant, orange-red or yellow, at length paler, thickish, trama of parallel hyphae. STEM 2-7 cm. long, 3-5 mm. thick, equal, almost cylindrical, orange-red or yellow, stuffed, at last hollow, *dry,* glabrous. SPORES *variable,* broadly elliptical, 7-9.5 x 5-6 micr. ODOR and TASTE mild.

Var. *Cantherellus* Schw. (*Hygrophorus Cantherellus* Schw.) Stem longer and more slender, pileus narrower, gills a little more decurrent, spores the same.

Illustrations of the variety:
Hard, Mushrooms, Fig. 165, p. 208, 1908.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 9.
Marshall, Mushroom Book, Pl. X. p. 60, 1903.
Peck, N. Y. State Mus. Rep. 54, Pl. 76, Fig. 8-20, 1901.

The var. *Cantherellus* is much more common with us than the type, but it intergrades so much that it is often difficult to decide on the identity. The characters usually given for its separation, viz., the decurrent gills, minutely scaly pileus and slender stem, do not always hold good, so that it can hardly be an autonomous species. Numerous collections show all possible combinations, although the commonest type in Michigan is the plant with narrow pileus and a stem 2-3 mm. thick and 5-7 cm. long. A number of *color forms* of both have been named as varieties: (a) with red or orange cap and yellow stem; (b) with yellow pileus and red stem; (c) with both stem and pileus pale yellow. Var. *sphagnophilus* Pk. is more marked, grows in sphagnum bogs, is very fragile and the white base of the stem is imbedded and attached to the moss. The spores of the whole series are rather variable, even in the same collection, but fall within the limits given above. Massee and Cooke give the spore lengths a little large for our plants. The color varies greatly and fades in age.

Gregarious or subcaespitose. On the ground in moist conifer or frondose woods or on mosses. Throughout the State. June-October. Quite common.

176. Hygrophorus coccineus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Swanton, Fungi, Pl. 9, Fig. 4-6.
Cooke, Ill., Pl. 920.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 7.
Plate XXX of this Report.

PILEUS 2-7 cm. broad, *campanulate* or sometimes convex, *scarcely expanded,* obtuse, subviscid, *cherry red or blood-red, fading,* glabrous, even. FLESH thin, *fragile, concolor.* GILLS *arcuate-adnate,* somtimes with decurrent tooth, *subdistant* to *distant,* orange-red to yellow, at length glaucous, thickish, intervenose, trama of parallel hyphae. STEM 4-7 cm. long, 3-9 mm. thick, varying much in thickness, subequal or tapering downward, often *compressed and furrowed,* hollow, blood or cherry-red, *orange or yellow at base,* often undulate-uneven, *naked.* SPORES *broadly elliptical,* 7-9 x 5-6 micr. BASIDIA 40-50 x 6-7 micr. ODOR and TASTE none.

Gregarious. On the ground, in low meadows or moist woods, thickets, clearings, etc., of conifer or hardwood regions. Marquette, Houghton, Detroit. Throughout the State. July-October. Infrequent; more frequent in the northern part of the State.

Among the largest of the bright-colored species of this group, approaching *H. puniceus* in size in spite of the notes of some authors that it is smaller. It is variable in size, has a firm appearance, but is rather brittle. This is one of our most beautiful mushrooms when well developed. It is easily confused with *H. puniceus,* from which it is to be separated by its *spores,* the yellow base of the stem, the more distinctly adnate gills and the entirely glabrous stem. European authors disagree as to the spore sizes of *H. coccineus* and *H. puniceus,* but two species which agree in the other characters with the published descriptions and figures, and the spores of which are consistently of the two types given under these two species, are found in Michigan. They vary somewhat in size in each case, but the narrower and longer spore of *H. puniceus* is well-marked.

177. Hygrophorus puniceus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Peck, N. Y. State Mus. Mem. 4, Pl. 52, Fig. 1-5, 1900.
Michael, Führer f. Pilzfreunde, Vol. I, No. 34.
Cooke, Ill., Pl. 922.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 5.
Ricken, Blätterpilze, Pl. 8, Fig. 2.

PILEUS 3-7 cm. broad, campanulate, obtuse, *expanded at length and then wavy or lobed,* bright red or scarlet, *viscid,* fading, glabrous. FLESH fragile, white, yellow under the thin separable pellicle. GILLS *narrowly adnexed,* thick, distant, yellow to scarlet, intervenose, trama of parallel hyphae. STEM 5-8 cm. long, 5-12 mm. thick, ventricose, unequal or tapering, hollow, yellow, or scarlet and yellow, *white at the base,* dry, *fibrillose-striate.* SPORES cylindrical-elliptical, smooth, 9-12 x 4-5 micr. BASIDIA 40-42 x 5-6 micr. ODOR none, TASTE mild.

Gregarious or solitary. On the ground, in moist places, bare ground, woods, thickets, etc. August-October. Ann Arbor, Detroit. Infrequent.

This species is similar to the preceding in general appearance. It is separable from it by its large spores, the slightly adnexed gills and the white base of the stem; it has also a more viscid cap and a somewhat fibrillose stem. It also differs from *H. chlorapanous* in its red colors and dry stem.

Var. *flavéscens* Kauff. (8th Rep. Mich. Acad. of Sci., 1906.)

PILEUS smaller, 2-6 cm. broad, "luteus" yellow, varying to orange tints in places, then citron yellow, fragile, convex-campanulate, expanded, glabrous, even, viscid, sometimes wavy. GILLS adnexed, rather broad, close to sub-distant, *pale yellow or white,* subveiny. STEM 4-7 cm. long, 3-6 mm. thick, hollow, compressed, sulphur or citron-yellow, *base white,* moist, *pellucid-shining, glabrous,* sometimes pellucid-striate. SPORES *smaller,* 6-7.5 x 4-5, elliptical.

Gregarious, in wet places, moss, etc., in cedar swamps or low woods, in northern Michigan. Rather frequent.

The viscidity of the pileus is not very marked. It has much the habit and coloring of *H. chlorophanous,* but the stem is never viscid and varies in color to a distinct citron-yellow with white base, and is usually compressed. It is a distinct species as shown by its spores.

178. Hygrophorus chlorophanus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Gillet, Champignons de France, No. 329.
Fries, Icones, Pl. 167, Fig. 4.
Cooke, Ill., Pl. 909.
Peck, N. Y. State Mus. Mem. 4, Pl. 51, Fig. 13-20, 1900.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 3.

PILEUS 2-5 cm. broad, convex or campanulate, then nearly plane, obtuse, *viscid,* citron, sulphur or golden yellow, glabrous, sometimes pellucid-striate on margin. FLESH *fragile,* not becoming black when bruised. GILLS *adnexed, ventricose, becoming emarginate, thin,* subdistant, rather broad, pale citron-yellow, trama of parallel hyphae. STEM 3-7 cm. long, 4-8 mm. or less in thickness, *equal* or nearly so, sulphur or pale citron-yellow, *unicolorous,* hollow, rarely compressed, *viscid,* glabrous, even. SPORES narrowly elliptical, 6-8 x 4-5 micr., smooth.

Gregarious. Low, moist places in woods. Throughout the state. June-September. Common.

Known by its unicolorous viscid stem, and the adnexed, rather broad gills. The stem often dries quickly when exposed to the wind. Var. *flavescens* of the preceding species is almost as closely allied to this species, but its stem is fundamentally distinct.

179. Hygrophorus marginatus Pk. (Suspected)

N. Y. State Mus. Rep. 28, 1876.

Illustrations: Hard, Mushrooms, Fig. 173, p. 217, 1908.
Plate XXXI of this Report.

PILEUS 1-4 cm. broad, *fragile,* irregularly convex or campanulate, gibbous at times, at length plane, obtuse or broadly umbonate, *hygrophanous,* glabrous, varying *golden yellow to orange or variegated with olivaceous (moist), fading* and pale yellowish (dry), striatulate or rimose on margin. FLESH thin, fragile, concolor. GILLS arcuate adnate, becoming emarginate, subdistant, ventricose, rather broad, deep yellow or orange, *color persisting,* intervenose. STEM 2-5 cm. long, 3-8 mm. thick, fragile, hollow, *dry,* often flexuous or irregularly compressed, glabrous, yellow or tinged orange, *fading* to straw-color. SPORES broadly elliptical, smooth, 7-8 x 4-5 micr. (rarely longer). ODOR and TASTE not marked.

Gregarious or subcaespitose. On the ground in low, moist places in swamps of conifers or in frondose woods. Ann Arbor, Sault Ste. Marie, Marquette, Houghton, Huron Mountains. July-August. Infrequent.

The striking characteristic of this species is the orange-yellow gills which retain their color even after drying, while the pileus and stem fade considerably; this is shown well in Hard's figure. The edge of the gills is sometimes more deeply colored. The whole plant is very fragile, and it is difficult to get good herbarium specimens. The plants found in the Northern Peninsula were mostly variegated with olive, while those in the frondose woods of the south lacked this character, which, however, soon disappears as the pileus fades. None of my specimens were viscid. It is a well-marked species. The stems are sometimes more elongated.

180. Hygrophorus conicus Fr. (Suspected)

Syst. Myc., 1821.

Illustrations: Hard, Mushrooms, Fig. 166, p. 209, 1908.
White, Conn. State Nat. Hist. Surv., Bull. 3, Pl. 13, p. 34, 1905.
Michael, Führer f. Pilzfreunde, Vol. II, No. 48.
Ricken, Blätterpilze, Pl. 8, Fig. 4.
Cooke, Ill., Pl. 908.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 8.
Gillet, Champignons de France, No. 332.

PILEUS 1-3 cm. broad and high, *conical,* unexpanded, subacute at apex, often splitting-expanded, or lobed on margin, viscid when moist, shining when dry, glabrous, yellow, orange or orange-red, subvirgate, *often stained black in age.* FLESH concolor, very thin, becoming black when bruised or old. GILLS almost *free,* ventricose, broad, almost triangular at times, thick, rather close to subdistant, pallid to sulphur-yellow, when old black stained, trama of parallel hyphae. STEM 3-9 cm. long, 2-6 mm. thick, subcylindrical, soft, *dry, fibrillose-striate,* usually *twisted,* hollow, citron to golden yellow, *becoming black stained with age,* splitting longitudinally. SPORES broadly elliptical, 8-10 x 5-6.5 micr., smooth. CYSTIDIA none. BASIDIA 35-38 x 8 micr., slender.

Gregarious or solitary. In low, moist, conifer or frondose woods, grassy places, etc. Throughout the State. May to October. (Earliest record May 8; latest October 15.) Very common.

Easily recognized by its conical pileus and the blackening flesh. The whole plant usually turns black in drying. It is not unusual to find olive tints in the pileus, and the shades of yellow or orange to red vary much as the plant matures or ages. After having become rain-soaked, the whole plant is sometimes black.

181. Hygrophorus nitidus B. & C. (Non. Fr.)

Centuries of N. Amer. Fungi (Exsicatti), see also Peck, N. Y. State Mus. Rep. 23, 1870.

Illustrations: Peck, N. Y. State Mus. Bull. 94, Pl. 88, Fig. 1-7, 1905.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 6.

PILEUS 1-2.5 cm. broad, fragile, convex, *umbilicate,* viscid when moist, *wax-yellow to lemon-yellow, whitish when dry, pellucid-striatulate* and shining when moist, glabrous. GILLS arcuate, decurrent, distant, pale yellow, intervenose. STEM 3-7 cm. long, 2-4 mm. thick, *slender,* fragile, hollow, equal or narrowed downwards, sometimes flexuous, *viscid* at first, wax-yellow, at length whitish. SPORES elliptical, 6-7 x 3-4 micr. ODOR and TASTE not marked.

Gregarious or subcaespitose. On the ground in swamps or low woods in the conifer regions of the State. Marquette, Houghton, Huron Mountains, New Richmond. July to September. Frequent locally.

A slender Hygrophorus whose cap and often also the stem, fade considerably on drying. This characteristic distinguishes it from *H. ceraceus.* It has hitherto been found only in mixed woods of hemlock, birch and maple or of maple and oak in the northern and western parts of the state. The gills are usually quite decurrent, narrowed to a point on the stem, and their persistent color contrasts markedly with that of the stem and pileus as the plant dries. There is no universal viscous veil as in the plant of the same name described by Fries. The latter plant is now called *H. friesii* Sacc.

182. Hygrophorus laetus Fr. (Edible)

Syst. Myc., 1821.

Illustrations: Ricken, Blätterpilze, Pl. 8, Fig. 8.
Fries, Icones, Pl. 167, Fig. 2.
Cooke, Ill., Pl. 938.
Gillet, Champignons de France, No. 338.

"PILEUS 1.5-3 cm. broad, convex-plane, *subobtuse,* viscid when moist, shining, *tawny, not fading,* pellucid-striate. FLESH concolor or paler, *tough,* thin. GILLS subdecurrent, broadly adnate, subtriangular, distant, thin, yellow, greenish-yellow, grayish-yellow or at length pale orange. STEM slender, 3-5 cm. long, 3-6 mm. thick, *tough,* glabrous, *very viscid,* equal, *tawny,* undulate-uneven. SPORES elliptical, 6-7 x 4 micr. BASIDIA 30 x 5-6 micr. ODOR and TASTE not marked."

Gregarious. In meadows, pastures, cedar swamps, etc. Lewiston, Houghton. July-August. I have given Ricken's description. Doubtless it is often confused with *H. peckii.* The dry state of the latter seems to imitate it, and differs only in its fragility, the subumbilicate pileus, and gills which are at first whitish.

183. Hygrophorus peckii Atk.

Jour. of Mycol., Vol. 8, 1902.

PILEUS 1-2 cm. broad, fragile, convex-plane, *broadly umbilicate* or depressed, glutinous when moist, color varying pale yellowish-flesh color, *pinkish or vinaceous-buff*, rarely tinged greenish, glabrous, pellucid-striatulate when moist, fading somewhat on drying. GILLS arcuate-decurrent, distant, rather broad, whitish to pale flesh color, trama of parallel hyphae. STEM 3-8 cm. long, 2-4 mm. thick, slender, equal, *very viscid*, shining, concolor, rarely greenish at apex, hollow, terete, even. SPORES broadly elliptical, 6-8 x 5 micr. ODOR present or absent; taste mild.

Gregarious or solitary. On the ground, moss, etc., of low, wet woods or swamps of cedar and balsam in northern Michigan, maple and oak woods of the southern part of the State. Isle Royale, Marquette, New Richmond, Ann Arbor, etc. July-August, rarely September. Frequent.

This is much more common apparently than *H. laetus*, and may represent an American variety of that species. It differs from *H. psitticinus* by the form of the pileus; in that species it is obtuse or umbonate, and the green color persists longer and is practically always present in the young plant, while in *H. peckii* the green tinge is rare. Both these species are very slippery on the stem and cap when fresh or young.

184. Hygrophorus psitticinus Fr.

Syst. Myc., 1821.

Illustrations: Ricken, Blätterpilze, Pl. 8, Fig. 6.
Michael, Führer f. Pilzfreunde, No. 65.
Swanton, Fungi, Pl. 9, Fig. 7-8, 1909.
Cooke, Ill., Pl. 910.
Gillet, Champignons de France, No. 346.
Murrill, Mycologia, Vol. 2, Pl. 27, Fig. 4.

PILEUS 1-3 cm. broad, *campanulate*, then convex-expanded or plane, *umbonate or obtuse*, glutinous and slippery, *at first parrot-green*, at length varying livid-reddish, pinkish-flesh color or dingy citron-yellowish, pellucid-striate. FLESH thin, subconcolor. GILLS adnate, ventricose, thick, subdistant, greenish or incarnate-reddish to yellowish, intervenose, trama of parallel hyphae. STEM

4-7 cm. long, 2-5 mm. thick, equal, *toughish*, even, *very viscid* when fresh, glabrous, undulate-uneven, subpellucid, *green above*, usually tinged reddish-orange, flesh-colored or yellowish elsewhere, hollow. SPORES short elliptical, smooth 6-7.5 x 4-5 micr. BASIDIA slender, 36-40 x 5-6 micr.

Gregarious or subcaespitose. On the ground in low, mossy woods or swamps, or in grassy places. Marquette, Houghton, New Richmond, Detroit, Ann Arbor. Throughout the State. July-October. Rather frequent.

This striking species is one of the few bright green mushrooms. As in the case of *Stropharia aeruginosa* and *Pholiota aeruginosa*, it is always a delight to come across this beautiful little plant. The green color soon fades out when exposed to the wind and light, whereas those individuals which are protected by leaves, etc., retain this color for some time. There is no cortina in the young stage, and the gluten is derived from the cuticle of the pileus and stem; otherwise, except for the structure of the gill-trama, it might be confused with the subgenus Limacium. Its colors are sufficiently characteristic in the early stage to prevent anyone from confusing it with other Hygrophori.

185. Hygrophorus unquinosus Fr.

Syst. Myc., 1821.

Illustrations: Cooke, Ill., Pl. 924.
Gillet, Champignons de France, No. 350.

PILEUS 2-5 cm. broad, fragile, hemispherical-campanulate, then subexpanded, obtuse, *gray or smoky brown, glabrous*, pellucid striate, *very viscid*, radiate-wrinkled in age. FLESH pallid, thin, very fragile. GILLS broadly adnate, subventricose, *pure white*, thickish, subdistant. STEM 3-8 cm. long, 3-8 mm. thick, subequal or variously thickened, hollow, compressed, *viscid-slippery*, glabrous, *lead-gray*. SPORES elliptical, 7-8 x 4-5 micr. BASIDIA 30-35 x 5-6 micr. Trama of gills parallel. ODOR none when young. TASTE mild.

Gregarious or subcaespitose. On the ground or moss of low woods or swamps. Detroit, Marquette, Houghton. July-September. Rather rare.

This species must not be confused with *H. fuligineus* which belongs to the subgenus Limacium, and has a solid stem and a veil.

AGARICEÆ

Context of fruit-body fleshy, putrescent, that of pileus sometimes membranous, of stem sometimes cartilaginous or horny; neither leathery, nor vesiculose. Stem central, eccentric, lateral or lacking. Gills well-developed, acute on edge. Spores with a hyaline or colored epispore; their deposit in mass on white paper yields a series of "prints" of various shades of white, pink, ochraceous, brown, purple or black. This series is arbitrarily divided into five artificial groups as follows:

(a) Black-spored. (*Melanosporae*): Spore-print black.
(b) Purple-brown-spored. (*Amaurosporae*): Spore-print dark purple or purple-brown.
(c) Rusty-spored or ochre-spored. *(Ochrosporae):* Spore-print rusty-yellow, rusty-brown, ochraceous or cinnamon-brown.
(d) Pink-spored. *(Rhodosporae):* Spore-print flesh-colored, rosy or pale pink.
(e) White-spored. *(Leucosporae):* Spore-print white.

The spore-print is in many cases indispensable in determining the proper group to which the mushroom belongs. It is obtained easily by cutting off the stem just below the gills and laying the cap, with gills down, on a piece of white paper and covering it over night with a dish to prevent premature drying. Mushrooms which have been kept on ice do not seem to deposit spores thereafter, nevertheless it is well to avoid too warm a place, else the specimen may putrefy. The color of the spores may often be detected at the time of collecting by the deposit already made on the ground beneath it or on other mushrooms when growing in a cluster. In mature specimens the gills usually become colored by the color of the spores, but when young the gills are generally white; in some species, however, the gills are themselves colored, e. g., *Clitocybe illudens* and *Mycena leijana*. After some experience, it is usually possible to determine the group to which a species belongs by means of the microscope. The delicate tint of the color for each group is then discernible in the epispore of each mature spore. This method is especially useful in cases where it is a question of the presence of the purple tint of the purple-brown-spored plants; the spore-mass or gills often appear entirely dark brown to the naked eye in species whose separate spores have a purple tint under the microscope.

MELANOSPORAE

Coprinus Pers.

(PROF. L. H. PENNINGTON)

(From the Greek, *kopros*, dung.)

Spores dark brown or black; gills free or slightly attached, *at first closely in contact laterally*, separated in many cases by projecting cystidia, soon deliquescing, or drying quickly to a black line upon the lower side of pileus. Many small species develop at night and almost entirely disappear by morning. The flesh of the pileus is thin, in the smaller species often membranaceous or apparently lacking entirely. A universal veil is present in a majority of the species. The stem is fleshy to fibrous. Most of the species grow upon dung or richly manured ground, several upon wood or vegetable debris, and a few upon lawns, sand, or even upon walls in cellars.

The spores of the dung inhabiting species usually germinate readily to produce a fine white or colorless mycelium upon which sporophores will often appear within 7-10 days after the spores are sown. *C. radiatus*, various forms of *C. ephemerus*, *C. patouillardi*, *C. semilanatus*, *C. narcoticus* and several similar kinds are readily grown in pure cultures in the laboratory. *C. sclerotigenous* grows from rather small black sclerotia in dung or in a mixture of soil and dung. Some of the wood inhabiting species, *C. laniger* and *C. radians* are often found growing from dense masses of fine yellow mycelial threads, called *ozonium*. Others, e. g. *C. quadrifidus*, grow from tough coarse black fibres, termed *rhizomorphs*. The pileus is scaly from the breaking up of the cuticle into rather large squamose scales in the Comati; into fine innate fibrils in the Atramentarii; smooth but covered at first with floccose, mealy or granular scales, which wholly or partly disappear in the Picacei and Tomentosi; or pruinose with minute hairs in forms of *C. ephemerus* and *C. radiatus*. The stem is stuffed or hollow, fleshy or fleshy-fibrous, often very fragile. It differs in texture from the trama of the pileus and usually separates easily from it. The gills are white at first. In some species they become purplish then black, in others they become brown or smoky, then black. They are free or slightly attached, or adnate in a few species.

The universal veil is usually seen as scales, fibrils or granules at

the base of the stem or upon the pileus. In a few instances it forms a movable ring upon the stem in *C. comatus*, *C. bulbilosus* and frequently in *C. sterquilinus;* in the last named species the veil may form a distinct volva at the base of the stem. The taste is mild and the odor is usually pleasant. A few species, as *C. quadrifidus* and *C. narcoticus*, have a strong disagreeable odor. None of the species of Coprinus are considered poisonous and many are highly esteemed by the mycophagist.

The spores are very dark brown or sooty black in mass. By transmitted light they vary from light brown to very dark brown or smoky black. There is a wide variation in the size and shape of the spores. Some species may be identified by the spores alone as *C. insignis*, *C. boudieri* and some forms of *C. ephemerus*, etc.

The genus can be divided into two fairly distinct groups (see Massee, Ann. Bot., Vol. 10, p. 123, 1896) according to the size of the plant and the thickness of flesh or cuticle covering the gills; these groups can be further subdivided into sections as follows:

A. Pelliculosi:
- I. Comati
- II. Atramentarii
- III. Picacei
- IV. Tomentosi
- V. Micacei
- VI. Glabrati (No species reported)

B. Veliformes:
- VII. Cyclodei
- VIII. Lanulati
- IX. Furfurelli
- X. Hemerobii

Key to the Species

(A) Plants large, usually over 3 cm. broad; pileus fleshy or sub-fleshy.
- (a) Pileus with cuticle torn into distinct scales or almost smooth.
  - (b) Cuticle torn into distinct scales; ring or volva present.
    - (c) Spores over 20 micr. long; volva usually evident. 188. *C. sterquilinus* Fr.
    - (cc) Spores less than 20 micr. long; movable ring usually present upon stem.
      - (d) Pileus cylindrical; spores 15-17 micr. long. 186. *C. comatus* Fr.
      - (dd) Pileus ovate; spores less than 15 micr. long. 187. *C. ovatus* Fr.
  - (bb) Pileus smooth or with innate fibrils.
    - (c) Spores smooth, plants usually densely caespitose. 189. *C. atramentarius* Fr.
    - (cc) Spores distinctly warted. 190. *C. insignis* Pk.
- (aa) Cuticle not torn into scales; veil breaking up into superficial patches, scales, or granules.

(b) Veil felt-like, breaking up into areolate patches.
(c) Rhizomorph or ozonium not evident; plants densely caespitose. 192. *C. ebulbosus* Pk.
(cc) Rhizomorph or ozonium present.
(d) Plants growing from rhizomorph; 5-8 cm. broad. 191. *C. quadrifidus* Pk.
(dd) Plants growing from fine yellow ozonium; 1-3 cm. broad. 193. *C. laniger* Pk.
(bb) Veil not as above.
(c) Veil of fibrillose scales or a dense coat of white mealy vesicles.
(d) Spores less than 10 micr. long.
(e) Gills broad; growing upon sand. 199. *C. arenatus* Pk.
(ee) Gills narrow.
(f) Disk livid; upon rotten wood in forest. 197. *C. lagopides* Karst.
(ff) Disk buff; upon cellar walls. 198. *C. jonesii* Pk.
(dd) Spores more than 10 micr. long.
(e) Gills attached.
(f) Disk obtuse; reddish or reddish brown. 202. *C. domesticus* Fr.
(ff) Disk narrow, not colored; veil often composed of mealy vesicles. 200. *C. niveus* Fr.
(ee) Gills free.
(f) Pileus at first cylindrical. 196. *C. tomentosus* Fr.
(ff) Pileus not cylindrical.
(g) Veil more or less mealy; plants small, not in troops.
(h) Spores 11-13 micr. long. 201. *C. semilanatus* Pk.
(hh) Spores 15-17 micr. long. 200. *C. niveus* Fr.
(gg) Veil never mealy; plants large; in troops upon dung heaps.
(h) Stem not rooting. 194. *C. fimetarius* Fr.
(hh) Stem rooting. 195. *C. fimetarius* var. *macrorhizus* Fr.
(cc) Veil of small granules or micaceus particles.
(d) Spores less than 10 micr. long.
(e) Plants not growing from ozonium; densely caespitose. 203. *C. micaceus* Fr.
(ee) Plants from ozonium or at least with radiating mycelium at base of stem, single or caespitose. 204. *C. radians* Fr.
(dd) Spores 10-12 micr. long. 209. *C. micaceus* var. *conicus* Pk.
(AA) Pileus thin, plicate; if subfleshy then less than 3 cm. broad when expanded.
(a) Veil present as superficial scales or granules.
(b) Ring present upon the stem. 205. *C. bulbilosus* Pat.
(bb) Ring absent.
(c) Pileus covered with a dense white floccose or mealy coat.
(d) Spores 12 micr. or more long.
(e) Spores 12-13 micr. long. 201. *C. semilanatus* Pk.
(ee) Spores 15-16 micr. long. 200. *C. niveus* Fr.
(dd) Spores less than 12 micr. long.
(e) Plants growing from black sclerotia in dung. 207. *C. sclerotigenous* E. & E.
(ee) Not growing from sclerotia.
(f) Plants growing upon plant stems. 209. *C. brassicae* Pk.
(ff) Plants growing upon dung or soil.
(g) Odor strong; spores 10-11 micr. long. 208. *C. narcoticus* Fr.
(gg) Little or no odor; spores 6-8 micr. long. 206. *C. stercorarius.*
(cc) Pileus with a few micaceus particles or granules.
(d) Spores ovate triangular or pentagonal, compressed. 210. *C. patouillardi* Quel.
(dd) Spores elliptical. 211. *C. radiatus* Fr.

(aa) No veil present.
(b) Spores angular.
(c) Spores key-stone shaped; plants growing upon ground in woods. 214. *C. boudieri* Quel.
(cc) Spores not key-stone shaped; plants upon dung. 213. *C. ephemerus* Fr. form.
(bb) Spores not angular.
(c) Plants growing upon dung or recently manured ground. 213. *C. ephemerus* Fr.
(cc) Not growing upon dung.
(d) Growing among grass; spores broadly ovate, compressed. 215. *C. plicatilis* Fr.
(dd) Growing in woods; spores gibbous-ovate. 213. *C. silvaticus* Pk.

PELLICULOSI. Pileus covered with a distinct fleshy or membranous cuticle, not splitting along the lines of the gills but becoming lacerate and revolute. Plants usually large.

Section I. *Comati.* Ring formed from the free margin of the volva; cuticle torn into scales.

186. Coprinus comatus Fr. (Edible)

(The Shaggy Mane)

Fries, Epicr., p. 242.

Illustrations: Cooke, Ill., Pl. 658.
Murrill, Mycologia, Vol. 1, Pl. 3, Fig. 3.
Atkinson, Mushrooms, Fig. 31-38.
Hard, Mushrooms, Figs. 269, 270.
Gillet, Champignons de France, No. 174.
Patouillard, Tab. Analyt., No. 448.

PILEUS 7-10 cm. high, cylindrical, then more or less expanded, at first even, the cuticle becoming torn into broad adpressed scales, pale ochraceous, becoming darker in age, interstices whitish. GILLS up to 12 mm. broad, almost free, white, crowded, then pinkish, at length black. STEM 10-15 cm. long, 12-17 mm. thick, subequal, slightly attenuated upwards, white, even, hollow, more or less bulbous, bulb solid, ring movable. SPORES almost black, elliptical, 13-18 x 7-8 micr.

Gregarious. In lawns and fields, very common in autumn, occasional in spring.

The Shaggy Mane is probably more generally used for food than any other Coprinus. By many people, however, it is not considered equal in quality to *Coprinus micaceus.*