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B779: Ectomycorrhizae of Maine. 2 A Listing of Lactarius with the Associated Hosts (with Additional Information on Edibility)

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**ECTOMYCORRHIZAE OF MAINE
2. A LISTING OF LACTARIUS
WITH THE ASSOCIATED HOSTS
(with additional information on edibility)**

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CONTENTS

Introduction	1
Mycorrhizal Hosts	2
Summary	8
References Cited	8
Illustrations	10

INTRODUCTION

Lactarius Pers. ex S.F. Gray of the family Russulaceae are gilled mushrooms that are abundant in the soil of coniferous and deciduous Maine forests in late summer and fall. Most species are ectomycorrhiza and a number are edible.

Species of the genus *Lactarius* are fairly easy to recognize in the field by their robust but fragile basidiocarps. An additional character in identification is the latex which fresh *Lactarii* exude upon injury. The appearance of this latex, which may be brightly colored, milk-like or even colorless, is an important feature in the identification of species of *Lactarii*.

Lactarius deliciosus, which has a bright orange latex, is one of the best known of the edible species. Many other species that have orange, red-purple (*L. subpurpureus*), or blue (*L. indigo*) latex are reported to be edible. However, a few species of *Lactarii* (*L. chrysorheus* and *L. vinaceorufescens*) have a milk-like latex that turns yellow on exposure to air, and these are suspected of being poisonous. *Lactarius uvidus*, *L. repraesentaneus* and other species of *Lactarius*, which have a milk-like latex that becomes purple when bruised, are thought to be poisonous. Many species of *Lactarius* are strongly pungent and burn (acid) when eaten raw. Acid species of mushrooms are often suspected of causing stomach upsets. Yet, *L. piperatus* loses the acridness and is edible when cooked. See Lincoff & Mitchel, (5) for more information on toxic *Lactarii*.

With the present emphasis on forest products economics ectomycorrhizal research has increased dramatically in the last decade. The ectomycorrhizal fungus has the ability to accumulate ions from a very dilute soil source and to pass these ions into the tree's roots as needed. Also, the surface area of mycorrhizal roots is greatly increased over non-mycorrhizal roots and this also enhances mineral uptake, (9). The increase in growth of trees with mycorrhizal associations compared to trees without infection has been well established.

Ectomycorrhizae are common on roots of our forest trees in the temperate region. This association between fungus and root is established on actively growing roots in the humus layer. Some forest trees such as pine, fir, larch, spruce, beech, and oak are obligate mycorrhizal hosts and will fail to grow in the absence of mycorrhizal associates (7). Facultative ectomycorrhizal hosts such as maple, alder, birch, elm, willow, and juniper are the invaders of our wastelands and are pioneers in forest succession because they can become established without an ectomycorrhizal relationship (7). Knowing the ectomycorrhizal associate for a specific tree host should enable us artificially to establish ectomycorrhizal associations and thereby increase tree productivity in forest succession. Therefore, it

is important to understand these associations. The first report on the ectomycorrhizae of Maine was a listing of Boletaceae with the associate hosts (3). With the addition of comments on edibility, this paper follows the same format of the 1977 publication, in that mycorrhizal associations are compared with those of Trappe (14) and Hesler and Smith (2). Our comments on the edibility of the fungi rely upon the reports of Hesler (1), Krieger (4), McKenny (6), Miller (8), Phillips (10), Rinaldi and Tyndalo (11), Smith (12) and Smith *et al.* (13).

The format followed in reporting hosts and their associated fungal species is:

Host (Scientific Name: Common Name)

Fungus (Scientific Name; collector and collection number identifying specimens in the University of Maine Herbarium at Orono.)

Figure number. (Comments on the association and edibility follow).

Figure numbers refer to the color plates following the text. For convenience the listing is divided into coniferous hosts and deciduous hosts. The trees and the fungi are listed in alphabetical order according to scientific name.

MYCORRHIZAL HOSTS

Coniferous Hosts:

Picea glauca (Moench) Voss: White Spruce; Cat Spruce

Lactarius repraesentaneus Britz. sensu Neuhoff; Homola 5741, 5756 (Fig. 16). Hesler and Smith (2) report *L. repraesentaneus* in spruce-fir woods. We find it in a mixed woods. Fir and white spruce are present.

Miller (8) cites *L. repraesentaneus* as poisonous.

Smith (12) cites it as not edible.

Lactarius scrobiculatus var. *canadensis* Smith; Homola 6312, 7190 (Fig. 15). Hesler and Smith (2) report *L. scrobiculatus* var. *canadensis* in coniferous woods. Trappe (14) reports *L. scrobiculatus* associated with *Picea abies* (L.) Krast. and *Fagus sylvatica* L.

We find *L. scrobiculatus* var. *canadensis* in mixed conifer forest. White spruce is present.

Lactarius scrobiculatus is considered poisonous by Miller (8) and to be avoided by McKenny (6).

Picea mariana (Mill.) BSP.: Black Spruce.

Lactarius rufus (Fr.) Fries; Homola 2841 (Fig. 37). Hesler and Smith (2) cite a number of variants of *L. rufus* under various species of pine. One variant is found in *Sphagnum* under spruce. We found our collection on the edge of a *Sphagnum* bog near black spruce.

Lactarius rufus is reported poisonous by Miller (8), McKenny (6), and Smith (12).

Pinus resinosa Ait.: Red Pine.

Lactarius vinaceorufescens A.H. Smith; Homola 5069, 5591 (Fig. 22).

Hesler and Smith (2) report *L. vinaceorufescens* under pine. *Lactarius vinaceorufescens* has been found in a red pine plantation at the University of Maine at Orono. *Lactarius vinaceorufescens* is probably cited incorrectly as *Lactarius chrysorheus* in most North American mushroom guides.

Lactarius chrysorheus is considered poisonous by Miller (8) and suspected by Smith (12).

Pinus strobus L.: Eastern White Pine; Pumpkin Pine; Soft Pine.

Lactarius deliciosus (Fr.) S.F.Gray; Homola 5590, 5755 (Fig. 4).

Hesler and Smith (2) report *L. deliciosus* under conifers, especially pine. We find *L. deliciosus* abundant in mixed softwoods, with an occasional white pine and some red pine. It is edible and probably the most often eaten species of *Lactarius*.

Lactarius indigo (Schw.) Fries var. *indigo*; Homola 2474 (Fig. 1).

Hesler and Smith (2) report *L. indigo* under pines. We have not found *L. indigo* in Maine but have reports of it being in the Waterville area. When we have found *L. indigo* in other eastern states, it was under white pine.

Lactarius indigo is edible according to Smith (12), Miller (8) and Hesler (1).

Lactarius sordidus Peck; Homola 6090 (Fig. 34). Hesler and Smith

(2) report *L. sordidus* on soil under conifers. In Hesler and Smith (2), Peck's type material was found under spruce and balsam fir. In Maine we find *L. sordidus* under white pine on the campus of the University of Maine at Orono.

It is cited as *Lactarius necator* by Miller (8) with its edibility unknown. Smith, Smith, and Weber (13) do not recommend *Lactarius sordidus* for table use.

Tsuga canadensis (L.) Carr.: Eastern Hemlock.

Lactarius affinis var. *viridilactis* (Kauffman) Hesler & Smith; Homola 3983, 5701, 7274 (Fig. 29). Hesler and Smith (2) report *L. affinis* var. *viridilactis* in mixed conifer woods. We find it also in mixed coniferous woods. Hemlock is the predominant tree.

Miller (8) reports *L. affinis* as non-poisonous.

We would be cautious in selecting this mushroom for the table.

Lactarius deceptivus Peck; Homola 5588, 7264 (Fig. 9). Hesler and Smith (2) report *L. deceptivus* in hemlock woods, in spruce-fir woods, and under oak. Some pine, spruce and fir are present.

It is cited as edible by Krieger (4) and edible but not recommended by Smith (12). *Lactarius deceptivus* flesh is very acrid when eaten raw. This acridness supposedly disappears upon cooking.

Lactarius hibbardae Peck var. *hibbardae*; Homola 5740 (Fig. 33).

Hesler and Smith (2) report *L. hibbardae* var. *hibbardae* on soil, sometimes among *Sphagnum* in coniferous and mixed woods. We find it in the open next to conifers. Cedar and hemlock are the predominant trees.

Edibility is unknown.

Lactarius lignyotus var. *marginatus* Smith & Hesler; Homola 5587; A5617, 5640 (Fig. 6). We find *L. lignyotus* var. *marginatus* in a predominantly hemlock woods.

Hesler (1) lists *L. lignyotus* as poisonous, but indicates there are reports of its being edible. Miller (8) lists *L. lignyotus* as non-poisonous.

Lactarius mucidus Burlingham; Homola A5623; 6128 (Fig. 32).

Hesler and Smith (2) report *L. mucidus* under conifers. We find it in mixed coniferous woods, with hemlock the dominant species. According to McKenny (6) the edibility of *L. mucidus* is unknown; Miller (8) reports it as non-poisonous.

Lactarius subpurpureus Peck; Homola 4011, 7665 (Fig. 2). Hesler and Smith (2) report *L. subpurpureus* is most often found under hemlock. We also find it under hemlock.

Lactarius subpurpureus is reported as edible by Hesler (1) and Krieger (4).

Lactarius subvellereus Peck; var. *subvellereus*; Homola 5589 (Fig.

10). Hesler and Smith (2) report *L. subvellereus* var. *subvellereus* in mixed woods. We find it in mixed coniferous woods. Hemlock is the dominant species.

Smith, Smith and Weber (13) report *L. subvellereus* var. *subdistans* as not edible. There is much confusion over the identity of *L. vellereus* (Fries) Fr. and *L. subvellereus* and its varieties.

Thuja occidentalis L.: Northern White Cedar; Eastern Arbor-Vitae.

Lactarius aquifluus Peck; Homola 4982 (Fig. 36). Hesler and Smith (2) report *L. aquifluus* in coniferous or mixed conifer-hardwoods. We find it in *Sphagnum* in a cedar swamp.

Lactarius aquifluus is probably cited as *L. helvus* in most mushroom guides. Miller (8) cites *L. helvus* edibility as unknown and Smith (12) lists *L. helvus* as suspected.

Lactarius aspideoides Burlingham; Homola A5797 (Fig. 17). Hesler and Smith (2) find it in conifer and hardwoods. We find it among mossy hummocks in a *Thuja* swamp.

We could find no reports on the edibility of *L. aspideoides*.

Lactarius griseus Peck; Homola 3918, 5719 (Fig. 38). Smith, Smith and Weber (13) report *L. griseus* on or adjacent to very much decayed logs. We also find it commonly on decayed logs in a cedar swamp.

Miller (8) reports *L. griseus* as non-poisonous.

Lactarius splendens Smith & Hesler; Homola 5796, 6120 (Fig. 24).

We find *L. splendens* in a *Thuja* swamp in *Sphagnum*.

The edibility is not known.

Lactarius thynos Smith; Homola 5229 (Fig. 3). Hesler and Smith (2) report *L. thynos* in woods of *Thuja* and in cold *Thuja* bogs.

We find it in cold *Thuja* bogs.

Smith (12) reports *L. thynos* as edible.

Deciduous Hosts

Alnus rugosa (Du Roi) Spreng.: Speckled Alder.

Lactarius obscuratus (Lasch) Fries; Homola 7713 (Fig. 39). Trappe (14) reports *L. obscuratus* associated with *Alnus*. We find *L. obscuratus* in a deciduous woods, near a wet area under alder. Our collection (Homola 7713) may be misidentified and be a closely related species *L. occidentalis* A.H. Smith [Hesler and Smith, (2)].

Phillips (10) reports *L. obscuratus* as not edible.

Betula papyrifera Marsh.: White Birch; Paper Birch; Canoe Birch.

Lactarius pubescens var. *betulae* Smith; Homola 7507 (Fig. 19). Hesler and Smith (2) report *L. pubescens* var. *betulae* primarily under birch. We find it in *Sphagnum* near alder with birch nearby.

Rinaldi and Tyndalo (11) report *L. pubescens* as equally as poisonous as *Lactarius torminosus*.

Lactarius torminosus (Fr.) S.F. Gray var. *torminosus*; Homola 5790 (Fig. 18). Hesler and Smith (2) report *L. torminosus* var. *torminosus* on soil in coniferous hardwood stands, but with birch almost always nearby. Trappe (14) associates it with a number of species of *Betula* and with *Carpinus betulus*. We find *L. torminosus* in a predominately beech-maple woods with some birch.

Lactarius torminosus is reported poisonous by Miller (8).

Smith (12) reports that in the U.S.S.R. it is preserved with oil and vinegar and is considered a delicacy.

Lactarius uvidus (Fr.) Fries var. *uvidus*; Homola 5022, 5707 (Fig. 27).

Hesler and Smith (2) report it under aspen and birch with pine. We find it on the edge of a cedar swamp with a birch stand nearby.

Lactarius uvidus is reported poisonous by Miller (8).

Lactarius vietus (Fr.) Fries; Homola 3977, 5637, 5810 (Fig. 30). Hesler and Smith (2) report *L. vietus* on decaying wood of conifer

and hardwood. We find it often on rotting logs in a cedar swamp and also on soil in a nearby beech-maple woods.

Rinaldi and Tyndalo (11) list *L. vietus* as not edible and slightly toxic.

Fagus grandifolia Ehrh.: American Beech.

Lactarius camphoratus (Fr.) Fries; Homola 5655 (Fig. 35). For discussion see *L. camphoratus* under *Quercus rubra*.

Lactarius cinereus var. *fagetorum* Hesler & Smith; Homola 7489 (Fig. 31). Hesler and Smith (2) associate it with *Fagus grandifolia*. In Maine *L. cinereus* var. *fagetorum* is found in a beech-maple woods.

The edibility is not known.

Lactarius croceus Burlingham; Homola 7185 (Fig. 23). Hesler and Smith (2) find it in deciduous woods. We find *L. croceus* on the edge of beech woods with birch and cedar nearby.

The edibility of *L. croceus* is not known.

Lactarius fumosus Peck var. *fumosus*; Homola 5158 (Fig. 7). We find *L. fumosus* var. *fumosus* in deciduous woods. Beech was the predominant tree.

The edibility of *L. fumosus* is not known.

Lactarius hygrophoroides Berk. & Curt. var. *hygrophoroides*; Homola 5676 (Fig. 13). Hesler and Smith (2) report it on soil in deciduous woods. We find *L. hygrophoroides* var. *hygrophoroides* also in deciduous woods, mainly beech-maple with occasional birch and oak.

Miller (8) reports *L. hygrophoroides* as edible.

Populus grandidentata Michx.: Big-tooth Aspen.

Lactarius controversus (Fr.) Fries; Homola 5332 (Fig. 11). Hesler and Smith (2) report *L. controversus* clearly associated with *Populus*. In Maine we have found *L. controversus* in only one location where *Populus* predominates.

Rinaldi and Tyndalo (11) report *L. controversus* edible with caution.

Lactarius resimus var. *regalis* Pk.; Homola A5739, 6577 (Fig. 20). Hesler and Smith (2) report *L. resimus* var. *regalis* scattered under hardwoods, including aspen. In Maine *L. resimus* var. *regalis* has been collected in hardwood forest. Aspen was present.

The edibility of *L. resimus* var. *regalis* is unknown.

Quercus rubra L.: Northern Red Oak.

Lactarius argillaceifolius Hesler & Smith var. *argillaceifolius*; Homola 4971 (Fig. 28). Hesler and Smith (2) find *L. argillaceifolius* var. *argillaceifolius* in a low hardwood forest. We find it in a beech

woods. Occasionally an oak is present. In many mushroom guides *L. argillaceifolius* is probably cited as *Lactarius trivalis*.

L. trivalis is doubtful in its edibility, and hence not recommended [Smith, (12)].

Lactarius camphoratus (Fr.) Fries; Homola 5655 (Fig. 35). Hesler and Smith (2) report *L. camphoratus* from coniferous and mixed forests. Trappe (14) reports *L. camphoratus* under *Fagus sylvatica* L. and *Quercus* spp. We find it in a beech-maple woods with oak present.

Lactarius camphoratus is edible according to Miller (8).

Lactarius chrysorheus Fries; Homola 5682, 6407 (Fig. 21). Hesler and Smith (2) report *L. chrysorheus* in hardwood and mixed woods. We find it in an area which is always under water in spring. The trees are predominately oak.

Rinaldi and Tyndalo (11) report *L. chrysorheus* as not edible.

Lactarius gerardii Peck var. *gerardii*; Homola A5632 (Fig. 8). Hesler and Smith (2) report *L. gerardii* var. *gerardii* in deciduous and coniferous woods. We find *L. gerardii* var. *gerardii* in mainly beech-maple woods. Some oak is present.

Hesler (1) reports it as edible.

Lactarius louisii Homola; Homola 5973 (Fig. 5). *Lactarius louisii* was found and named in Pennsylvania in a predominantly oak woods with some beech. It is known only from the type locality. We suspect that it could occur here and for that reason include it.

Its edibility is unknown.

Lactarius peckii Burlingham var. *peckii*; Homola 7216 (Fig. 12). Hesler and Smith (2) reported *L. peckii* in grassy open oak woods, along roads, trails, and streams and in the mountains in the "Pink Beds". We found it in an open grassy area associated with red oak in Pennsylvania. It has not been reported in Maine.

Its edibility is unknown.

Lactarius pseudoflexuosus Hesler and Smith; Homola A5666, 5677 (Fig. 25). Hesler and Smith (2) report *L. pseudoflexuosus* in mixed coniferous-hardwoods. It may be associated with oak.

Its edibility is unknown.

Lactarius pyrogalus (Fr.) Fries; Homola 7460 (Fig. 26). Hesler and Smith (2) report *L. pyrogalus* in deciduous or mixed woods. In Pennsylvania we find it in deciduous woods, mainly oak. Hesler and Smith (2) cite a collection (Bigelow 4581) from Maine.

No report of its edibility could be found.

Lactarius volemus (Fr.) Fries; Homola 6002 (Fig. 14). Hesler and Smith (2) report *L. volemus* from deciduous woods and more rarely

in coniferous woods. We find *L. volemus* under oak in Pennsylvania. Hesler and Smith (2) cite a collection (Bigelow 12177) from New Hampshire and a collection (Harrison 12139) from Nova Scotia. It has not been recorded for certain in Maine, but it should be here.

Hesler (1) and Kreiger (4) list *L. volemus* as edible.

SUMMARY

Thirty-nine Lactarii have been collected and identified with their possible ectomycorrhizal associates for Maine. Many of the *Lactarius* are new reports for Maine. Most of the ectomycorrhizal relationships reported from Maine are confirmed by the work of others. The edibility comments are those of the authors from the popular mushroom guides mentioned. Colored photos of thirty-nine Lactarii are included.

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Fig. 1 *Lactarius indigo* var. *indigo* (No collection number cited).



Fig. 2 *Lactarius subpurpureus* (Homola 7765).



Fig. 3 *Lactarius thynos* (Homola 5229).



Fig. 4 *Lactarius deliciosus* (Homola 5755).



Fig. 5 *Lactarius louisii* (Homola 5973).



Fig. 6 *Lactarius lignyotus* var. *marginatus* (Homola 5640).



Fig. 7 *Lactarius fumosus* var. *fumosus* (Homola 5158).



Fig. 8 *Lactarius gerardii* var. *gerardii* (Homola A5632).



Fig. 9 *Lactarius deceptivus* (Homola 7264).



Fig. 10 *Lactarius subvellereus* var. *subvellereus* (Homola 5589).



Fig. 11 *Lactarius controversus* (Homola 5332).



Fig. 12 *Lactarius peckii* (Homola 7216).



Fig. 13 *Lactarius hygrophoroides* var. *hygrophoroides* (Homola 5676).



Fig. 14 *Lactarius volemus* (Homola 6002).



Fig. 15 *Lactarius scrobiculatus* var. *canadensis* (Homola 7190).



Fig. 16 *Lactarius repraesentaneus* (Homola 5756).



Fig. 17 *Lactarius aspideoides* (Homola A5797).



Fig. 18 *Lactarius torminosus* var. *torminosus* (Homola 5790).



Fig. 19 *Lactarius pubescens* var. *betulae* (Homola 7507).



Fig. 20 *Lactarius resimus* var. *regalis* (Homola 6577).



Fig. 21 *Lactarius chrysorheus* (Homola 5682).



Fig. 22 *Lactarius vinaceorufescens* (Homola 5069).



Fig. 23 *Lactarius croceus* (Homola 7185).



Fig. 24 *Lactarius splendens* (Homola 5796).



Fig. 25 *Lactarius pseudoflexuosus* (Homola 5677).



Fig. 26 *Lactarius pyrogalus* (Homola 7460).



Fig. 27 *Lactarius uvidus* var. *uvidus* (Homola 5022).



Fig. 28 *Lactarius argillaceifolius* var. *argillaceifolius* (Homola 4971).



Fig. 29 *Lactarius affinis* var. *viridilactis* (Homola 7274).



Fig. 30 *Lactarius vietus* (Homola 5810).



Fig. 31 *Lactarius cinereus* var. *fagetorum* (Homola 7489).



Fig. 32 *Lactarius mucidus* (Homola 6128).



Fig. 33 *Lactarius hibbardae* var. *hibbardae* (Homola 5740).



Fig. 34 *Lactarius sordidus* (Homola 6090).

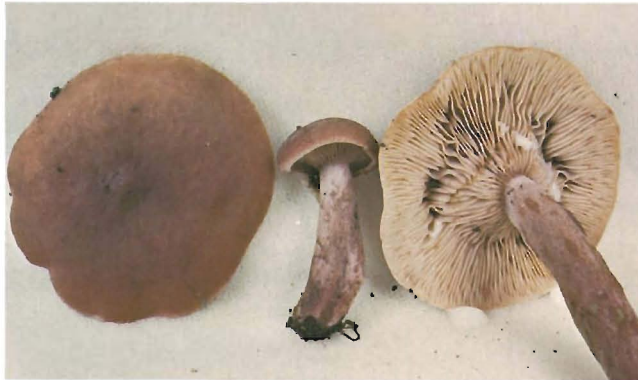


Fig. 35 *Lactarius camphoratus* (Homola 5655).



Fig. 36 *Lactarius aquifluus* (Homola 4982).



Fig. 38 *Lactarius griseus* (Homola 3918).



Fig. 37 *Lactarius rufus* (Homola 2841).



Fig. 39 *Lactarius obscuratus* (Homola 7713).