OMPHALINA

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Newsletter of FORAY NEWFOUNDLAND AND LABRADOR

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OMPHALINA *is the lackadaisical newsletter of Foray Newfoundland & Labrador. There is no schedule of publications, no promise to appear again. Its primary purpose is to serve as a conduit of information to registrants of the upcoming foray and secondarily as a communications tool with members.*

The content is neither discussed nor approved by the Board of Directors. Therefore, opinions expressed do not represent the views of the Board, the Corporation, the partners, the sponsors, or the members. Opinions are solely those of the authors and uncredited opinions solely those of the Editor.

Please address comments, complaints and contributions to Andrus Voitk, self-appointed Editor:

foray AT nlmushrooms.ca

FORAY NEWFOUNDLAND AND LABRADOR

is an amateur, volunteer-run, community, not-for-profit organization with a mission to organize enjoyable and informative amateur mushroom forays in Newfoundland and Labrador and disseminate the knowledge gained.

***Webpage:* www.nlmushrooms.ca**

The Editor eagerly invites contributions to OMPHALINA*, dealing with any aspect even remotely related to mushrooms. Authors are guaranteed instant fame—fortune to follow. Authors retain copyright to published material, and submission indicates permission to publish, subject to the usual editorial decisions. Issues are freely available to the public on the FNL website. Because content is protected by copyright, editors of other publications wishing to use any material, should ask first.*

COVER

Trametes versicolor, turkey tail, by Henry Mann, photographed along the trails of the Pasadena Ski and Nature Park. Please see “Turkey Tail Tales” by Henry, inside, for a description of this most fascinating mushroom.

The blue mushroom on a blue cover is befitting the appearance of this issue on the National Day of Independence of Estonia. Estonia’s flag is blue-black-white, but the people identify the nation with the colour blue.

CONTENTS

Message from the Editor

The purpose of this issue is to notify you that Sunday, March 13, FNL will participate in the second **WINTER FORAY** at the Pasadena Ski and Nature Park in partnership with the Ski Park and Humber Natural History Society. **See Notice on p. 5.** Last year's was very successful (see Report <http://www.nlmushrooms.ca/index.php?page=foray-reports>, if you want to know what it is all about) and if it continues to be popular, perhaps it will become an annual event. The event is open to the public. There is no cost and no registration (this year!). Please note that we plan to leave the club house at 10:00 AM sharp. Participants are encouraged to buy lunch at the canteen on our return to support the club.

In the absence of other mushrooms, polypores are very obvious in the winter. This issue completes the review of our two major medicinal mushrooms, chaga in the last issue and turkey tail here. The effects of both have been confirmed by traditional medical science and extracts of turkey tail are undergoing trials in the United States in preparation for FDA approval. For medicinal benefit chaga can be collected at all times, but turkey tail should be collected during active growth (when poremouths are white). In our opinion everybody could benefit by including products from these mushrooms in their daily life.

To recognize some of the polypores you might encounter on the Winter Foray, we follow the notice with a key to some rather similar, light-coloured bracket fungi, all with more or less maze-like poremouths, as well as a key for Genus *Trichaptum*. These keys were made by combining our experience with information from several sources. We have not tried them in the field. See how they perform for you. Comments or corrections are solicited. Please let us know as soon as you notice something that does not work—do not wait, or you will forget. We need all the input we can get to get them right, particularly since our own experience is not overly extensive with some.

The focus on polypores continues with an introduction to *Fomitopsis ochracea*, a species new to the province—in fact, only the second report of it in the world, since its description in 2008. This demonstrates that new species are still found regularly, even of fairly obvious big fungi. Finding it on birch in our province extends both its known range and host. Conveniently, that is followed by Jim Cornish's description of the standard *Fomitopsis pinicola*, so that you can readily tell the two apart. The man must be psychic, to pick this mushroom for this issue!

We conclude with a taut and tense play, reprinted from the Wildflower Society of Newfoundland and Labrador's newsletter, **Sarracenia** [18(3&4):31-36;2011], and thank Editor Howard Clase for kind permission.

To our readers, who are also members of the Wildflower Society, we apologize for the repetition. Perhaps our clubs will exchange journals in the future, to avoid this. To our other readers we must offer a word of caution: if you require heart medication, please take an extra dose before reading, because of the tension and excitement characteristic of mycological dramaturgy.

And our son's chaga enterprise became front page news in the Western Star <http://www.thewesternstar.com/Living/Health/2011-02-17/article-2247424/Man-hopes-to-harvest-medicinal-birch-fungus/1>.

Did you notice the lack of recipes? If you have a favourite, please share.

Do not forget about our **WINTER FORAY** Mar 13. See notice p. 5.

Happy mushrooming!

andrus

TURKEY TAIL TALES

Henry Mann

Photo: Joe Blake / National Wild Turkey Federation

Turkeys and I go back a long ways. As a farm boy I sometimes initiated gobbling contests just for badness. In my best turkey talk I would gobble a challenge to a large tom who would invariably respond, and so back and forth until barnyard pandemonium would ensue with the whole red-faced flock strutting and gobbling, wings draped and tails fully fanned! So when initially introduced to the Turkey Tail mushroom, my immediate response was, "Of course, what else would you call it?" Despite the obvious resemblance to a tom gobbler's fanned-out backside, other common names have been used including Rainbow Brackets, Rainbow Conks, Multi-zoned Polypore, and Multi-color Polypore, possibly by individuals only familiar with the majestic bird from the platter on a Thanksgiving table.

Turkey Tail (*Trametes versicolor*, synonym *Coriolus versicolor*) is the fruiting body of a world-wide common wood decay fungus usually found on stumps and logs of deciduous trees such as birch, willow and alder in Newfoundland, but also occasionally on conifers. It is a white-rot fungus decomposing the brown lignins in wood leaving the white stringy cellulose behind to be decayed by other fungi. *T. versicolor* appears as thin fan-shaped overlapping brackets or shelves, each fan about 4 – 5 cm, more or less, across. The upper surface is velvety with distinctly hairy and colourful concentric narrow bands. Color of the bands can be quite variable from specimen to specimen ranging from shades of beige, gold, rust, brown, maroon, to grays, blues, and black (cover photo and Figure 1). The underside of each shelf is whitish to pale grey/brown and is covered with tiny pores, about 3 – 8 per mm, best seen with a hand lens, indicating that it is a true

Figure 1. Partial colour spectrum of T. versicolor, *from steel blue (cover), through gray, to various shades of brown, some with no blue at all. Spectrum extends to paler versions of ochraceous beige to cream.*

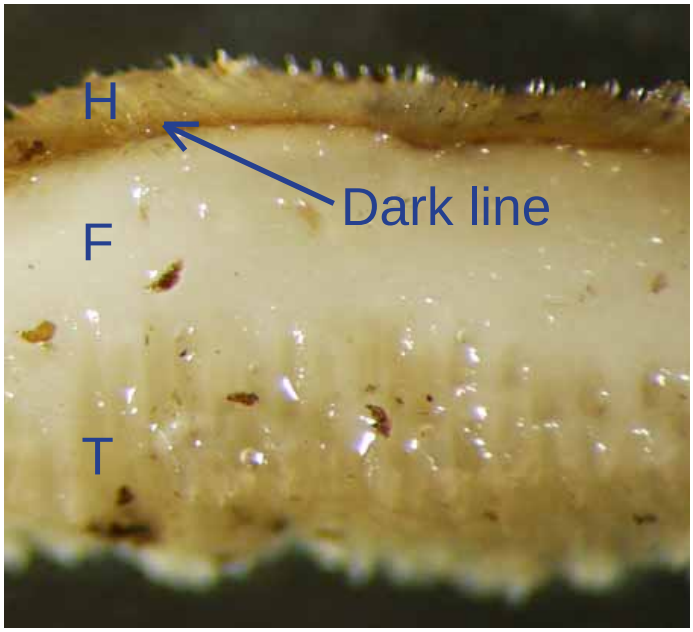


Figure 3. Dissecting microscope view of cross section of T. versicolor. *H = hairy layer (top), F = fleshy context, T = tube layer. Note dark line between hair layer and context, not found in the lookalikes* T. pubescens *and* T. ochracea.

polypore. Each shelf is only 1-3 mm thick and quite tough and leathery when fresh. When cut open the interior is white. Spores are also white. The nicest fresh specimens can often be seen in fall or early winter, but the species can be found year round.

Several species of Genus *Trametes* resemble each other. *T. ochracea* and *T. pubescens* are closest to *T. versicolor* in appearance. The steel-blue colour, if present, is diagnostic, as only *T. versicolor* has a blue cap (sometimes). Herbarium specimens of all three species change to ochraceous-cream over time, making macroscopic identification of dried specimens virtually impossible. Of the three species, *T. versicolor* is the only one with a thin dark line between the hairy upper layer and remaining white context on cross section (Figure 3). Specimens without blue colour are often difficult to separate from other bracket fungus genera also causing white rot of softwood. Many of these are also hairy and zonate, in tones of gray, brown and cream. However, these other genera all have pore mouths that vary from markedly elongated to maze-like to gill-like, and many eventually become toothed, whereas the pore mouths of *Trametes* are round to slightly angular and relatively uniform (Figure 4).

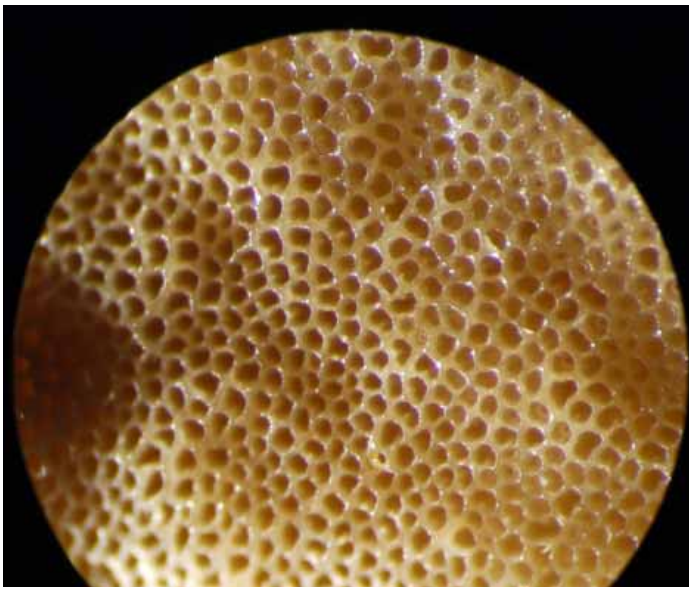


Figure 4. Dissecting microscope view of poremouths of T. versicolor *to show their uniformly round to slightly angular shape, serving to distinguish* T. versicolor *from the majority of similar gray-brown-beige bracket fungi on hardwood.*

This species has been used in Chinese and Japanese folk medicine for centuries if not millennia. In China it is known as Yun Zhi (the cloud mushroom) and in Japan as Kawaratake (mushroom by river). In traditional folk medicine *T. versicolor* has been used as a general strengthening and healing tonic and to bolster the immune system. More recent medical research appears to confirm some of the claims made by Chinese and Japanese healers. Apparently Turkey Tail compounds exhibit a variety of properties under investigation including antioxidant, antitumor, antiviral, anti-malarial, anti-infection, immune system enhancer, and diuretic. Anticancer polysaccharides from Turkey Tail have been studied extensively on laboratory animals and human cell cultures. It is the only mushroom to have its anti-cancer effect confirmed by double-blind clinical studies in humans, and a polysaccharide from it, PSK, is the second-commonest chemotherapeutic agent in Japan, used particularly for carcinoma of the gastrointestinal tract.

Turkey Tails are firm and leathery and not considered edible, so constituents are often ingested as a tea by those using it as a self-prepared tonic. Apparently some individuals simply like to chew on the fresh rubbery fruiting bodies. Some dry the brackets and boil them with herbs such as ginger, licorice, ginseng, etc. to produce more pleasant tasting teas. Others may prepare a tincture or alcohol extract with vodka. Common sense dictates that those ingesting this or any other unfamiliar organism should consult some reputable sources initially. A mixture of scientific and commercial literature and claims for its effectiveness can be found on the internet. As always

when consulting internet sources one should put more credence on the primary scientific literature than on amateur enthusiasts or on sites selling preparations and concoctions for profit. One seemingly reliable source for information about medicinal plants is The Sloan-Kettering Memorial Institute's page on medicinal herbs <http://www.mskcc.org/mskcc/html/69194.cfm>.

Turkey Tail and chaga (*Inonotus obliquus*) are the two major medicinal mushrooms common in Newfoundland. Chaga is commoner and easier to prepare, while Turkey Tail is probably more potent. It is reported to have few, if any, side effects and no known potentiating effects or other interactions with medications.

Not only does this fungus show promising developments in the human health scene, it also has exciting industrial potential. *T. versicolor* is a white rot fungus producing powerful enzymes which can break down the lignin component of wood. It is presently being investigated for environmentally friendly use in the pulp and paper industry to de-lignin and bleach kraft pulp, and also to break down some of the pulping process effluents more safely. Further, it has the ability to biodegrade and detoxify some industrial textile dye effluents. As a practical spin-off process, its enzymes are being used to bleach new blue jean denim to produce that currently fashionable prewashed look. There is even some indication that Turkey Tail enzymes have catalytic ability potentially useful for future improved fuel cell production. In the home arts and crafts trade, *T. versicolor* has been used to prepare blue, green, and brown dyes for wool and other textiles. Because the fruiting bodies have a colourful and interesting appearance, dried Turkey Tails are useful for home-crafts and decorations.

WHAT A MUSHROOM!

For more on this and other medicinal mushrooms, read **Mushrooms for health** by Greg Marley (reviewed in FUNGI). It is brief, inexpensive, informative and simple. Unlike many health food gurus, Greg avoids voodoo medicine and hyperbolic snake oil enthusiasm. He limits the discussion to species for which reasonable scientific evidence exists, presented objectively. His instructions are easy to follow.

Greg will conduct
Medicinal Mushroom Workshops
at our 2011
Forest Foray.

Photo: Pennsylvania Game Commission, Public Photo Gallery

Photo: Malkowski / National Wild Turkey Federation

Photo: National Wild Turkey Federation

Celebrate the International Year of the Forests with

Nature in Winter

Talk

Henry Mann

Friday, Mar 11, 7:30 PM, Pasadena Ski and Nature Park Clubhouse

mushroom walk & winter foray

Sunday, March 13, 2011

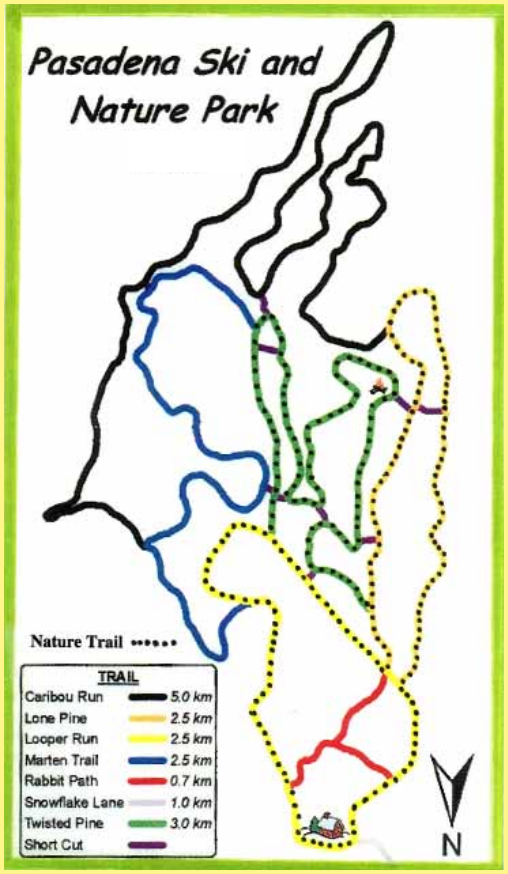
Walk leaves the clubhouse on snowshoes at 10:00 AM sharp!

Interpreters/identifiers:

Henry Mann, Andrus Voitk, Gary Warren

Talk & Walk open to the public—no charge, no registration

Organized by:



HUMBER NATURAL HISTORY SOCIETY

FORAY NEWFOUNDLAND AND LABRADOR

Return to clubhouse to sort and identify specimens about 12:15 post meridian.

Canteen will be open for lunch

Paricipants encouraged to use services

Light coloured, zonate, bracket fungi on hardwood, causing white rot—spreadsheet key

		Cerrena unicolor	*Trichaptum biforme*	*Daedaleopsis confragosa*	*Lenzites betulinus*	*Trametes hirsuta*
CAP	**colour**	cream to brown-gray; edge white	dull cream white, edge purple	tan to reddish brown; edge white	white to gray-brown; edge white	cream to tan-brown; edge light
	hair	very hirsute	slightly hirsute	glabrous	very hirsute	very hirsute
	zonation	zonate	zonate	zonate	zonate	zonate
	surface	radially undulating	crinkly, uneven edge	base thick; radially ridged	radially undulating	radially wrinkled
	size mm	5-90 x 20-100 x 2-5	10-70- x 10-70 x 1-5	20-100 x 30-150 x 2-20	20-80 x 20-120 x 3-15	10-70 x 20-100 x 2-10
	algae	algae, often	some algae	none	algae, often	often algae
PORES	**colour early**	cream	violet to edges violet	cream, lilac tinge	white-gray	cream
	colour late	gray	brown	gray-brown to blackish	gray-black	gray
	mouth shape	non-directional maze; round at edge	non-directional maze, edges round	radial maze	radial gills	round
	teeth	toothy in age	markedly toothy	none	none	none
	staining	none	none	red-lilac	none	none
	density/ mm	1-3	2-4	1-2	1-1.5	2-4
CONTEXT	**colour & consistency**	white, fibrous, corky	pale buff	light tan, corky	white, corky	white, fibrous, flexible
	layering	thin black separation line	not layered	not layered	layered; line below hair	layered; line below hair

HOST	**species**	maple, birch, decid; rare conif	alder, birch, cherry, poplar, decid	alder, birch, willow, poplar, decid	birch, alder, maple, decid	birch, decid; rare conif
	live/dead	dead	dead	dead	dead	dead
	horiz/vert	horiz, stump; less comm standing	mostly fallen	both	horiz & stump; occ standing	mostly fallen
ROT		white	white	white	white	white
		facultative saprobe	saprobe, rare heartrot	saprobe	saprobe	saprobe, fac sap in wounds
		sapwood & heartwood		sapwood	sapwood	sapwood
SPOREPRINT		white-cream	white	white	cream-yellowish	white
GROWTH	**amount**	very many	troops	single to few	single to several	troops
	vertical surface	overlapping joined clusters	solitary to overlapping joined clusters	mostly separate, some overlapping	overlapping joined clusters	overlapping joined clusters
	horizontal surface	lower—resupinate	upper—rosette	upper—rosette	lower—resupinate	lower—resupinate
	duration	annual, renewing	1-2	annual, renewing	1-2 yrs	1-3 yrs
	separability	adherent	adherent	adherent	adherent	adherent

Light coloured, zonate, bracket fungi on hardwood, causing white rot—dichotomoid key

PORES	round	***Trametes*** or another round-pored polypore.		
	gill-like	cap	hirsute	***Lenzites betulinus***
			glabrous	***Daedalopsis confragosa***
	maze	radially arranged	***Daedalopsis confragosa***	
		non-directional	no black line on cross section	***Trichaptum biforme***
			black line on cross section	***Cerrena unicolor***

Note: *Trichaptum biforme* is violet when young, at least at the edge on the underside, but loses the colour with age. Only the black line on cross section enasbles you to tell *Cerrena unicolor* and fom an old *Trichaptum biforme*.

GENUS *TRICHAPTUM*—SPREADSHEET KEY

		T. abietinum	*T. fuscoviolaceum*	*T. laricinum*	*T. biforme*	*T. subchartaceum*
SIZE	**size mm**	5-50- x 10-50- x 1-3	5-50 x 10-80 x 1-3	1-40 x 10-70 x 1-5	10-60- x 10-60 x 1-5	10-50 x 10-80 x 5-10
HYME-NIUM	**pore mouth**	angular at edge, maze toward base	radial maze	radial gills	angular at edge, maze toward base	round
	tube walls	toothy toward base in age	very toothy	toothy	toothy toward base in age	none
	depth	<1mm	1-4	2	1-3	1-3
	no/mm	3-5 near edge		1-2	3-6	3-4
CONTEXT	**colour & consist.**	white above, gelati-nous brown below	white above, gelati-nous brown below	no gelatinous layer	no gelatinous layer	no gelatinous layer
HOST	**dead only**	conifers	conifers	conifers	alder, birch, cherry; rarely others	poplar; rarely ma-ple, others
GROWTH	**amount**	very many	very many	very many	very many	1-20
	vertical surface	overlapping joined clusters	overlapping joined clusters	overlapping joined clusters	solitary to overlap-ping joined clusters	solitary to overlap-ping joined clusters
	horiz. surf	resupinate	resupinate	resupinate	??? resupinate	??? resupinate

GENUS *TRICHAPTUM*—DICHOTOMOUS KEY

host deciduous
- poplar; maple & other — ***Trichaptum subchartaceum***
- alder, birch, cherry; other — ***Trichaptum biforme***

coniferous
- pores
  - gill-like — ***Trichaptum laricinum***
  - maze
    - radially arranged — ***Trichaptum fusco-violaceum***
    - non-directional — ***Trichaptum abietinum***

See p. 20 for a dramatic example of purple edged *Trichaptum biforme.*

REQUIEM FOR A CONK

Andrus Voitk

*Figure 1. Multiple conk buttons found on standing dead white birch (*Betula papyrifera*) trunk, April 10, 2006.*

Over ten years we have regularly walked to a hilltop behind our small community for a spectacular view of the Humber Valley. In the early years Barry May led weekly outings, rain or shine, all year round. After Barry's death his ashes were scattered there and the hilltop became known as Barry's Lookout. Our walks have continued: we mark birthdays and other events (like the Estonian Day of Independence) by going to Barry's Lookout.

During spring thaw in April, 2006, my eye was caught by a troop of small polypores beginning to grow on a dead birch off the trail about half-way up (Figure 1). At their button stage immature larger conks give very little hint of what they might be. Unable to guess its identity, I sent the picture to several mycologist friends. All reiterated that at this stage identification is nearly impossible, but offered their best guess. They confirmed their contention that identification of young conks is difficult, because no two mycologists proffered the same species name.

This made it interesting! Every time we walked up the hill, I looked in on my conk in hopes that it would give me a clue, but was no wiser at the end of that season, or the next few. I photographed it every April (Figure 2). By the end of the third season I thought that it was beginning to look a bit like *Phellinus igniarius*, a gray birch dweller. By now it had become a personal friend and a personal challenge; I looked forward to seeing it each time, curious for change. After Christmas, 2010, somehow I missed the tree. On the way down we searched the woods a bit more, and there, to my surprise, was the tree, fallen to the ground, broken into several pieces. Even more surprising was how the tree had broken—snapped transversely, as is seen with brown rot. A quick check of the breakage confirmed that the tree had indeed been weakened by cubical brown rot, essentially held together by the bark alone. The top had a woodpecker nest (Figure 3).

The only common larger conk in our area causing brown rot is *Fomitopsis pinicola*, usually found on balsam fir and other conifers, infrequently on birch. Apparently woodpeckers prefer brown rot to white for nest building, and *F. pinicola* is associated with a high incidence of woodpecker nests. Inoculating trees with *F. pinicola* is a tactic used for woodpecker recovery. Nothing about my conk's appearance had suggested *F. pinicola* to me over four and one-half years of observation. However, you can't argue with rot—brown is brown and white is white. And this was brown. I collected an accessible specimen and went home. Two things became evident at home.

Figure 2. Photograph taken every April, 2006-2010. The last photo, from 2011, was taken in January, after the tree had fallen down. The conks are unh

Looking at my old pictures critically, the young specimens were not dissimilar from "normal" *F. pinicola* on its usual host (Figure 4). The reason that I had failed to see any similarity was that I did not expect it, not because it was not there. The second discovery was that on cross section (Figure 5) the conk had the classical appearance of *Fomitopsis*. Cross sections of many conk species are unique, therefore helpful for identification. I had not looked at cross section or microscopic appearance. So it came about that only when its days were over, its job done, did my companion on the trail to Barry's Lookout reveal its identity. Rest in peace, my friend.

Two primary components give wood rigidity, cellulose and lignin. Cellulose is made up of long white fibers and lignin of brittle brown material between these fibers. Some fungi digest one, some the other. Rot is classified by the colour of the residual component, which has its own physical shape: white rot consists of long strips of light material, whereas brown rot crumbles into small cubical pieces. Thus, fungi that digest the brown lignin leave behind white cellulose and are said to cause white rot. Fungi that digest the white cellulose, leave behind brown lignin and are said to cause brown rot. Most of our large conks cause white rot, but *Fomitopsis* causes brown.

Fomitopsis pinicola is a circumboreal fungus. Closer examination has revealed that there are at least three strains of *F. pinicola*, one in Europe and two in North America. On the basis of what I have seen in Newfoundland and Labrador it is my guess that only one of the North American strains grows here. It is also quite possible that fungi growing on softwood are a different strain or species. Thus, "classical" *Fomitopsis pinicola* growing on birch may, on further investigation, turn out to be a separate species.

In 2005 Jogeir Stockland collected a light ocher *Fomitopsis* from poplar in northern Alberta. He brought back samples to his Norwegian colleague, Leif

Figure 3. Left: Fallen tree, showing characteristic transverse fracture of brown rot. Middle: Closer view of broken end, showing cubical brown rot. Only bark kept the tree up. Right: Woodpecker nest hole, nicely revealing cubical brown rot preferred by woodpeckers for nesting trees.

ealthy and covered by algae. On this last picture the red-brown parts of the band came with handling; the entire band was ochraceous when found.

Ryvarden, a world-renowned polypore expert. Ryvarden concluded that this was indeed a new undescribed species, which he reported as *Fomitopsis ochracea* in 2008. Greg Thorn suspected that our conk was the same species, in a new location, on a new host. Ryvarden examined them and concurred. Now that we recognize it, perhaps it is not as uncommon as we think. After completing this story, we have found several similar conks on birch (Figure 6), including on yellow birch, *Betula lutea*, another new host. Leif Ryvarden will be part of our faculty at the 2011 foray, an excellent opportunity to learn more about polypores.

Figure 4. Young F. pinicola *on its more usual conifer host. Note similarity to the conk on birch, Figure 2.*

Figure 5. Cross section of the Fomitopsis *on birch. The light colour, whorls and layering are typical for the genus.*

Figure 6. Another F. ochracea *on birch, one of several found after completing this elegy.*

My Favourite Mushroom: *Fomitopsis pinicola*

Jim Cornish

When I showed a bracket fungus or polypore to my fifth grade class a few years ago, a student commented that it didn't look anything like a "real mushroom." But as we all know, in nature looks are often deceiving. While a bracket fungus is what Tom Volk calls "non-mushroom-shaped", it does, nonetheless, have all the features and behaviours required for inclusion in the fifth kingdom. (You can read Volk's primer on polypores at http://botit.botany.wisc.edu/toms_fungi/polypore.html). Of the half dozen or so species of bracket fungi that I have found in the Gander area, *Fomitopsis pinicola* (Swartz ex Fr.) Karsten is one of my favourites. It is very common in our forest and easy to spot and identify. Being perennial, it can be found and photographed year round.

The images are of progressively older conks found in the Gander area. The last one is likely dead. Note that the one on the top of the next page grows on birch. All others grow on conifer. Also compare to Fomitopsis *pictures in previous article.*

Nomenclature

The genus name "Fomitopsis" means "having the appearance of *Fomes*", a genus of perennial woody fungi in the family Polyporaceae. A Latin word, "fomes" translates to mean "tinder", i.e. substances that can be used to start a fire easily. The specific name "pinicola" means "inhabiting pines", often meant to include various conifer species, not only those in the genus *Pinus.*

Appearance

Fomitopsis pinicola is stalkless and broadly attached to its host tree. Initially knob-like, it becomes irregularly convex to hoofed-shaped with age. The banded upper surface varies in colour from ochre, orange, red, gray to black, depending on wetness, age and speed of growth. A distinctive feature of *F. pinicola* is a rust-red coloured belt from which the mushroom derives its common name, the red belted polypore. This waxy layer melts when heated with a flame.

The lower surface (poremouths, hymenium or reproductive layer) is cream, usually turning yellow to buff when bruised. Pores are even, round, 3-4/mm. Since *F. pinicola* is a perennial, it adds a new tube layer each year, covering the previous year's growth. The context is woody, with a characteristic whorled and layered appearance in cross-section.

Habitat and Ecological Importance

Fomitopsis pinicola is common in old growth forests throughout temperature zones across the northern hemisphere. While it prefers softwoods, *F. pinicola* can also be found on hardwoods such as birch and aspen. Being a saprophyte, it plays an important role in the carbon cycle and hence the health of the forest biome. A primary decomposer, it causes brown rot in logs, stumps and dead trees as well as living trees weakened by other pathogens or windshake. A live tree sporting *F. pinicola* has its day numbered.

A Sub-Species in Newfoundland?

If you google images of *Fomitopsis pinicola*, you will invariably find ones covered in drops of clear liquid, often mistaken as drops of rain or dew. Chances are that such pictures were taken in Europe or parts of continental North America, not Newfoundland. In an article titled "Why Mushrooms Weep" (download the article at http://www.nlmushrooms.ca/uploads/weeps.pdf), Erast Parmasto and Andrus Voitk explain that these drops are a result of guttation, a process by which some mushrooms excrete excess water during increased metabolic activity. They state that in Newfoundland "guttation by growing *F. pinicola* is uncommon." They also state that breeding studies suggest that "*F. pinicola* is a species complex of at least three morphologically similar species, one in Europe and two in North America" and wonder if it is possible that the genetic programming for guttation is present in the European and one of the North American species, but not in the other, the only one found in Newfoundland. Over the spring, summer and fall, watch for guttation on our *F. pinicola*. If you find any, take photographs, record the location, date and time and make some general observations on the temperature and humidity. Then, become famous by sharing your rare find with Newfoundland and Labrador Foray members on our Facebook page!

The Ties That Bind Us.

A terse and exciting drama in one three-scene act, where Moose, Vixen and Crow make some observations on mycorrhizal restrictions placed on orchids and other flowers.

by Andrus Voitk

Scene 1: Late summer, somewhere in Western Newfoundland.

CROW (in the distance): Caw, caw, caw.

MOOSE: Hear that, Vixen? That's Crow cawing. Let's invite him along for a little morning walk.

VIXEN: I thought you, Moose, had poor eyesight, but good hearing. Sounds like your hearing is also bad. Listen again to Crow. There is no "k" (or "c") sound at the beginning of his vocalization and no "w" sound at the end.

MOOSE: Indeed, I do have genetically acquired acute hearing, but it's tempered by my English upbringing, which causes me to say "caw" when I hear Crow say "a". Funny, eh? How many times, as a bullock, did I swear to be different from my elders? How many times, now as an old bull, do I catch myself being exactly like my parents? Uncanny! The ties that bind us are much stronger than I appreciated and in many ways I seem to have remained stuck in the same mold, whether it be a mannerism, an expression, a certain smile, or the way I organize my life and the tenets I hold dear. I am the product of both my genes and my upbringing, and often the distinction between nature and nurture becomes moot.

VIXEN: Hang on there, Moose! Don't go all philosophical or introspective on me so early in the morning. But keep that thought, for you may be onto something. Let's invite Crow along and see if we can explore the concept of the ties that bind us, as you so poetically, albeit not entirely originally, put it. Crow knows a lot and may explain these things to us.

MOOSE: Yes, let's. Here he is. Good morning, Crow. We heard you cawing, which set off a discussion of the ties that bind us. Would you care to join us to look for examples of this phenomenon?

CROW: Why, thank you, lady and gentleman, for inviting me. Your subject is enthralling. I suggest we begin our exploration over in yonder fen.

Stomp, stomp, stomp; pad, pad, pad; flap, flap, flap.

Curtain.

Scene 2: A nearby fen surrounded by various trees.

CROW (a little later): Here we are, here's the fen. As we enter the fen from the forest, what do you notice?

VIXEN: Why, there's a whole bunch of showy lady's slippers (*Cypripedium reginae)* right here at the forest-fen border. Is that what you mean?

CROW: Yes. Although they have finished blooming, they are big and easy to recognize. Why do you think they are at the border and not everywhere?

MOOSE: Guess because they don't like full sun.

CROW: Many books state exactly that, based on the very same observation. However, while the observation is correct, the conclusion is not. What other reason could there be?

VIXEN: Let's see… if the conclusion is wrong, it means that they like sun. But we do not see them alone in the middle of the fen. Since we are speaking of the ties that bind us, could it be that they are tied to the edge of the forest in some way?

CROW: Very good, Vixen, very good. Let me explain. Orchids are among a group of plants with very, very tiny seeds—essentially only a microscopic capsule of genetic material borne aloft on thin wings. Unlike peas and beans, the seeds contain no nutrition to provide succor for the germinating plant. Thus, in order to grow, orchid seeds need an external source of energy in a usable form. For orchids, this is provided by fungi in the soil:

specific fungi form a relationship with specific orchid seeds, providing them the energy required to germinate, grow and develop. The process to produce a flowering plant may take as long as 15 years or more and most of this time the orchid is dependent on its fungal partner for its energy needs.

MOOSE: So, what are you saying? That the fungus ties the orchids to the forest edge? Why should it do that?

VIXEN: I have heard that some fungi are mycorrhizal, which means that they have a physical relationship with the roots of plants. They give the plants water and minerals from the ground in exchange for sugars. Could it be that the fungi that help the orchid seed grow are also connected to the trees?

CROW: Right again, Vixen! These fungi do not extend much beyond the roots of the trees with which they are associated. Therefore, only those orchid seeds get fed that land where the fungi are—at the forest border.

MOOSE: If that's true, why are there no showy lady's slippers in the forest? It is full of trees with their fungus partnership.

VIXEN: Ahaa, that's where we began: these orchids need sun to thrive. That's why we seldom see them in the forest, even if the required fungus is there, but rather on the clearing side of the forest edge, near trees. When we do encounter them in the forest, it is in places the forest is somewhat thinner, letting some sunlight in.

CROW: Good show, Vixen! Once they are grown, of course, they have leaves of their own with which they can photosynthesize food of their own, and no longer need to be fed by the fungus. But they stay where the seed grew, tied by the ties that bind them.

MOOSE: But what's to stop them seeking out more sun then, if that's what they like, now that they are free?

CROW: Ha-ha, but aren't you forgetting something? They are not mobile like you. So even if they no longer need the fungus, they are stuck where they grew up, unable to move away, even when they no longer need those ties.

MOOSE: How do you know that that's true, that they are free to leave and no longer need those ties?

VIXEN: Guess you haven't been trampling too many people's gardens lately, Moose. If you had, you'd notice clumps of showy lady's slippers all over the place. They seem to do well in full sun. Guess that shows that they stick to the forest edge because they are tied to it, not because they do not like full sun.

CROW: Yes, its "freedom" is working against the orchid's interests in human-orchid interactions. If orchids invariably died after transplantation, humans would learn to leave them be. But, because many of the prettier orchids lose the dependence on their fungal ties at maturity, they become prey for transplanters. Many eventually succumb due to lack of other requirements or change of human plans, but enough survive to encourage the practice.

MOOSE: OK, so that's why showy lady's slippers grow at the edge of the fen. But from where I stand, even with my poor eyesight I can see groups of them throughout the fen as well. How do we explain that?

VIXEN: If you look at those clumps carefully, you will note that each one is associated with a tree or shrub, even if small. If the tree grows and finds the required fungal partner, then orchid seeds can germinate beside it. Therefore, we see orchids growing all around that solitary spruce *(Picea sp.)*, for example, in the middle of the fen.

They seem to be particularly fond of black ash *(Fraxinus nigra)*, because it is rare to see even the smallest ash in an orchid fen without several orchid plants around it .

CROW: Spot on, Vixen! Perhaps it would be more correct to say that the orchid seed's obligatory fungal partner seems to be fond of ash, not the orchid. Along these lines, look at that maple shrub *(Acer sp.)* over there in the fen. What do you see?

MOOSE: Unlike other trees and shrubs, it has no orchids around it. Why not?

VIXEN: From the previous discussion, one might guess that the orchid-feeding fungus does not like maple.

CROW: Right again, Vixen. In fact, the maple is one of the few trees that does not form mycorrhizal relationships with any fungi. No fungi, no lady's slippers.

MOOSE: Wow! So these ties that bind us are a very complicated affair. To grow, the orchid seed needs to meet the right fungus. But it also needs sun, so fungus alone is not enough. And for the fungus to thrive, it needs a specific tree. So the orchid, who doesn't care about the tree, is still dependent on it, invisibly bound to it, even fed by it through the fungus. No wonder wild things don't transplant well. And by the time they gain independence, they are tied down where they grew up, unable to move.

VIXEN: Yes, and when they are moved by others, they may actually become worse off or die. Freedom is a dangerous and risky condition.

CROW: They also need moisture, calcium-containing bedrock and many other things. If these are not provided, they will not thrive, even when they no longer need their fungal partner. Well, it seems we are gaining some insight into these ties that bind us. Look at the pretty flowers around these young spruce *(Picea sp.)*. More of what we were talking about.

MOOSE: What kind of orchids are they?

CROW: If I told you that they are not orchids, but wintergreen *(Pyrola americana)*, what would that tell you about them?

MOOSE: That they behave just like lady's slippers?

CROW: OK, but why? What similarity must they share with lady's slippers?

VIXEN: If they are bound to a tree by a fungus, either they are unable to make their own food or they have seeds with no food stored in them, like the orchid. And since they have nice green leaves with lots of chlorophyll, the matter must rest with their seeds.

CROW: Good deduction! That's exactly the situation. The seed of wintergreen is also almost microscopic, with no food, just some wings for flight. Therefore, to germinate, it also must meet a succoring fungus willing to feed it. And this fungus must, in turn, be tied to a tree partner. And the tree to some different fungi, that need different plant partners, and so on. The more dependent we are, the more difficult to break the ties supplying that dependency. Let's see if we can find some examples of that in yonder birch forest.

Stomp, stomp, stomp; pad, pad, pad; flap, flap, flap.

Curtain.

Scene 3: A darker part of a mixed forest.

VIXEN (a little later): What is that pretty white plant-like thing, growing all over the place here? It looks like a flower, but has no leaves and no green colouring.

CROW: Full marks for both parts! It is indeed a flower, Indian pipe *(Monotropa uniflora)*, which begins to bloom after the showy lady's slipper has finished. Indian pipe has no chlorophyll. Since chlorophyll is primarily stored in the leaves, it has no need of leaves. All you can see are rudimentary stubs, called bracts, of what would have been leaves.

MOOSE: Since it has no chlorophyll, it can't make its own sugars, so it needs to get them from elsewhere. Is this one fed by a fungus as well?

CROW: Good guess, Moose, you're catching on. Yes, a fungus is the mediator, but indirectly it is fed by the birches all around. The fungus has a normal mycorrhizal relationship with birch roots, giving the birch water and minerals in exchange for some of its sugars. Indian pipe makes a relationship with the fungus as well, and drains off sugars for its needs.

VIXEN: I bet that its seeds are also unable to support germination on their own.

CROW: Exactly. The seeds of Indian pipe are exceedingly small, with no innate nutrition to aid germination. Thus, the seed will only grow where a suitable feeding fungus can be found. And, as we said, this fungus needs a birch association, so Indian pipe is found under birches.

MOOSE: What do you mean, when you say the seeds are exceedingly small? How small are they?

CROW: They are like dust, each only a few cells borne on the currents by thin wings. Even my good vision needs the help of a microscope to actually see them. Maybe we can look at them in Mr Mann's lab.

VIXEN: Indian pipe differs from the orchid or wintergreen in that when the latter become mature plants, they can supply their own needs, whereas Indian pipe must remain dependent on its feeding fungus forever.

CROW: Yes, that is the situation. Once orchids mature, they can give sugars to the fungus, which now collects on its earlier investment. The way Indian pipe is made, its ties bind it in a one-way relationship, just take, take, take. No give.

MOOSE: What a sweet deal! Free lunch all the way. Must be nice.

CROW: Well, it is and it's not. This makes Indian pipe much more dependent on its partners. It has very little leeway. It will not survive transplantation and if somebody chops down the birch, the plant dies.

VIXEN: You wonder how it ever got into such a relationship, why it developed to be this way. Looks to me like

it's painted itself into a corner with very few options left. If anything alters the ecosystem, its days could be numbered.

CROW: Indeed. Most organisms that depend on each other evolve together. However, it would indeed seem that in the case of Indian pipe, with no resources of its own for survival, fully dependent on very specific relationships with very specific organisms, organisms that have very specific relationships of their own, any small change anywhere in the system might make it unworkable. Indian pipe is probably at the end of the line of its evolutionary path. This is not a plant that should tinker with the ties that bind it.

MOOSE: Oh, look, there is some more in that dark balsam fir tuckamore.

VIXEN: No, it looks very similar, but not quite the same. This one is yellowish, has a good smell and has many flowers per stalk.

CROW: Yes, that's pinesap *(Hypopitys monotropa)*, another closely related flower. It behaves exactly like

Indian pipe, except that the fungus that feeds its seeds forms associations with the roots of balsam fir. Again, the ties that bind it determine where it grows—under balsam fir. And because it has no chlorophyll, it can grow quite happily on the near-dark floor of a tuckamore forest, a place devoid of any green plants.

VIXEN: Just as in our life, most of the ties we have discussed are not visible. What is this mysterious fungus that we have been referring to all along?

CROW: Well, it's not just one single fungus. Different species are at play in different situations, but as our walk has suggested, each plant seems to pair up with a very specific fungus. For lady's slippers, these come from the genus *Tulasnella*, a thin skin-like mushroom found on moist vegetative matter. Wintergreens are associated with *Cortinarius*, *Hebeloma*, *Russula* and *Tomentella*. Indian pipe is usually associated with *Russula* and pine sap with *Tricholoma*. Some of the recent work on the orchid-fungus association has been done by a Canadian, Randy Currah in Alberta.

MOOSE: Wow, that's a lot of information to assimilate! Thank you very much, Crow, for the informative walk. Much food for thought about the ties that bind us. Quite clearly, what we do and how we act are not only limited by our genes, but also by our environment, to such an extent that the lines between the two become blurred. It seems that we are all linked and, to coin a phrase, no moose is an island. Freedom seems to be inversely related to the ties that bind us, but directly related to danger. What we in our rebellious years may perceive as shackles to be cast off, might in some way be the very lifelines that feed us. Funny, though. We spend a lot of energy at rebelling to be different from our parents and view being like them as a negative. Yet, when our kids act and behave like us, we view this as a positive. Guess it's alcine to be inconsistent.

VIXEN: Not alcine alone - vulpine too, and perhaps even avian. Guess all us animals are the same. Only man with his great intellect has risen above that and is consistently logical. To be unerringly and logically consistent is human, to coin another phrase. Yes, thank you, Crow, for giving us stuff to ponder.

CROW: Caw, caw.

Curtain.

During a stage performance the photographs - all by Maria Voitk except the wintergreen and pinesap (A. Voitk) and the seeds (H. Mann) - should be projected onto a screen behind the actors.

Epilogue: In the laboratory of Mr Henry Mann.

CROW: Here is a is a composite photo taken through a microscope by Mr Henry Mann, showing the seeds of all three flowers we have talked about. The showy lady's slipper has the largest seed, 1.25 mm long on the average; wintergreen has the smallest at one-half mm long.

Final Curtain.

t h e m a i l b a g

o r w h y t h e p a s s e n g e r p i g e o n s a s s i g n e d t o s e r v e t h e
l a v i s h C o r p o r a t e a n d E d i t o r i a l o f f i c e s o f OMPHALINA **g e t h e r n i a s**

Again, a lot of mail. We shall not bore you with yet more tedious praise for the journal—but keep it coming! Praise that would be embarrassing and uncomfortable for the sensitive, cultured, refined or civilized, feels like it is barely getting warm to us, so have no worry about overdoing it. Do not hold back.

Greetings from NS. How's your foray planning coming? Thought you might enjoy this picture: Trichaptum biforme *on yellow birch near Sydney, NS.*

Bruce Stewart
President
NS Mycological Association

LICHENS added this year!

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