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May 26, 2014

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

ADDRESS
Foray Newfoundland & Labrador
21 Pond Rd.
Rocky Harbour NL
A0K 4N0
CANADA
E-mail: info AT nlmushrooms DOT ca

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COVER

Gymnopus eneficola, a new species of *Gymnopus*, on the Pasadena Ski and Nature Club ski trails, Sept. 26, 2009. Read the lead article—our first formal description of a nomenclatural novelty—to learn about this new species. "Eneficola" signifies "denizen of en-ef = NF = Newfoundland".

Then find out about other species in the genus in this province.

OMPHALINA

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CONTENT

Message from the Editor

Welcome to our *Gymnopus* issue!

A monograph to the genus in our province, based on a review of 57 collections by Karen Hughes and Ron Petersen—not an entirely negligible task. In the course of this review we learned two interesting things. First, we found a new species, hitherto unknown to science. Second, we discovered that phylogenetically our mushrooms that look like *Gymnopus dryophilus* divide into two clades. One matches the European concept of *G. dryophilus*, while the other falls in with the European *G. alpinus*. Very conveniently, once we were able to divide our finds into two groups, we saw retrospectively that they grew in entirely different habitats, making future field identification possible, despite their similarity (most of the time).

While the split into two clades is irrefragable, their identity is less clear. As you will see throughout this study, DNA matching can get a very good fit with a named species, but the accuracy of that identification depends on the original morphologic matching with the species description. This is difficult because many descriptions are very cursory and in many cases type specimens do not exist. As a result, the difficulty is to decide which of many matched species epithets is correct for the mushroom in your hand. If the match is with a single name only, the difficulty is to know the accuracy of the original morphologic identification. In other words, you have the same species, but is it really the species named?

(Advance warning: you will see more examples of this in our next issue.)

The lead article (as usual, following foray information) is the first formal report of a new species on the pages of OMPHALINA. This is a very exact process, where the format must follow the International Code of Nomenclature for algae, fungi, and plants in every detail, lest the name be declared invalid.

Given that OMPHALINA considers its prime audience the amateur mycophiles of Newfoundland and Labrador, in normal times it is very much a cap-and-stem type of journal. Using good English words can make even the most complex ideas accessible to the lay enthusiast, ideas which may become obscured by technical language. For us there is no advantage to pileus and stipe over cap and stem—dare we say, an affectation? However, when it comes to reporting a new species, the intended audience—in addition to mycophiles in our province—is the world, and, specifically, its mycologists. Therefore, the language is much more technical than is normal for OMPHALINA. If it wants to be a vehicle for such reports, this is the price. In our opinion the price is small. We believe that the mycophiles of Newfoundland and Labrador would much rather hear of new species in their province on the pages of their journal, even if it means reading some technical language.

Part of the you-read-it-here-first policy. Read the article, and tell us your opinion!

Often we complain about the skimpy descriptions for new species; we hope that this description contains sufficient information for future generations to know the characters of our species.

See you at the Foray!

andrus

Please note correct Foray dates:

September 12-14, 2014

FORAY MATTERS...

1. **INFORMATION, REGISTRATION FORM, HOW TO GET THERE, etc.** Please see Omphalina V, No 4 (April issue), as well as material stored on our website

   <nlmushrooms.ca>.

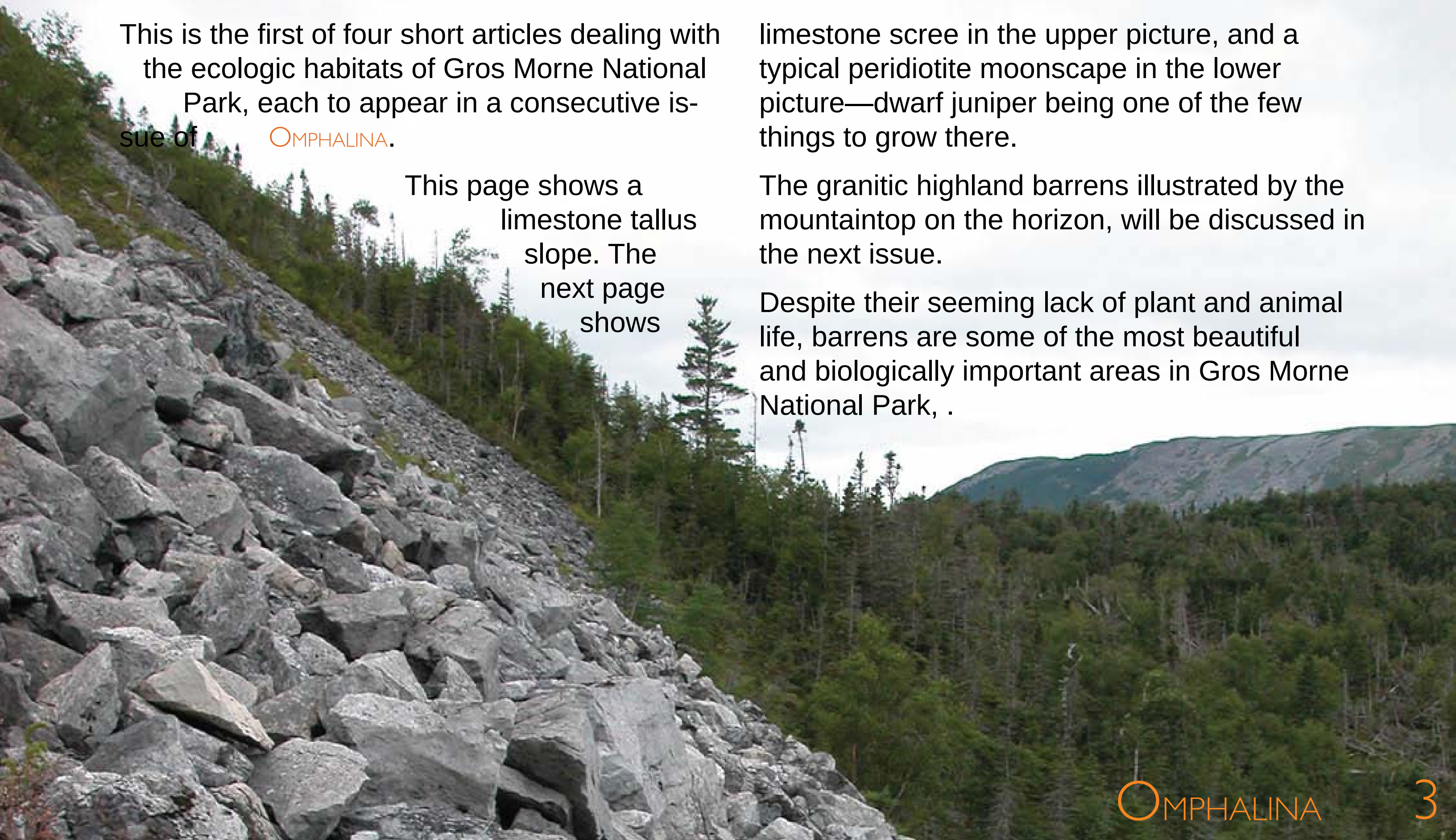
   Past issues of Omphalina may be downloaded from our website.

2. **MYCOBLITZ** For those able to make it, join us at Sir Richard Squires Memorial Provincial ark at 11:00 AM, Fri. Sep. 12, 2014. See the April Omphalina for details.

3. **SHOW & SELL ARTS & CRAFTS TABLE** Artists and craftspeople: Do not forget this. See last issue for more details. Please register with Glynn Bishop <fozmos AT gmail DOT com>, who is in charge of setting up the table.

THE BASIC BARRENS OF GROS MORNE

Michael Burzynski



This is the first of four short articles dealing with the ecologic habitats of Gros Morne National Park, each to appear in a consecutive issue of Omphalina.

This page shows a limestone tallus slope. The next page shows limestone scree in the upper picture, and a typical peridiotite moonscape in the lower picture—dwarf juniper being one of the few things to grow there.

The granitic highland barrens illustrated by the mountaintop on the horizon, will be discussed in the next issue.

Despite their seeming lack of plant and animal life, barrens are some of the most beautiful and biologically important areas in Gros Morne National Park, .

Soils are called *basic* (or alkaline) if they result from the breakdown of limestone, basalt, peridotite, or other rocks that have a high content of calcium or magnesium—giving them a pH greater than 7 (pure water has a pH around 7). The basic soils derived from the Green Gardens basalt are extremely rich, because of the other nutrients in the rock. However, soils associated with limestone and peridotite often support very little vegetation, earning them the name *barrens*. The park's barrens may look a bit like deserts, but that is not due to a lack of water.

Peridotite is a dark green ultramafic rock, originally from far below the ocean floor. It forms the Tablelands plateau in the south of the park. This rock is high in magnesium, iron, chromium, and nickel, and is chemically unstable in the presence of air and water. Groundwater has altered the rock into serpentinite, and the iron has oxidized (rusted), turning the outside of the rocks orange-brown. The high metal content, alkalinity, and lack of regular soil nutrients (nitrogen, potassium, and phosphorus) make it very difficult for most plants to grow. Without plants to feed on, it is similarly very difficult for most fungi to survive there. However, the difficult conditions also mean that what fungi grow there might be very unusual, so it is always worth looking!

Even lichens have a difficult time in the Tablelands because of the crumbly rock surfaces and metals, and only a handful are found there—most rocks are completely bare, even after over 10,000 years of growing time since the last glaciation. The exception is seen on erratics, rocks from elsewhere dropped by melting glaciers. Those are covered in bright lichens, showing how important substrate can be to growth.

Limestone bedrock forms a band in the southern and eastern parts of the park. For the most part, the limestone has been covered with a layer of soil, and lies beneath forest and wetland. However, in places it pops out of the soil as small outcrops, and along valleys, bays, and the outer coast there are steep cliffs with crumbling tallus (or scree) slopes, This is another extremely important habitat for rare specialized plants, often with arctic and alpine affinities. Because of the steepness of the cliffs, fieldwork is extremely difficult, and there is probably a lot left to learn about the plants, fungi, and lichens that grow there.

Because of the lack of vegetation and exposed locations of the barrens, climate also has a strong effect on the organisms that try to grow there. When you visit, be prepared for high winds and cooler conditions than elsewhere in the park. You will be rewarded by the raw beauty of the scenery, and the exotic nature of the life that you see.

Gymnopus eneficola—species nova from Newfoundland

Ron Petersen,[1] Karen Hughes,[1] Andrus Voitk[2]

Introduction

In the course of a survey of dried collections of *Gymnopus* collected over some years in Newfoundland by AV and Foray Newfoundland & Labrador, a taxon was discovered which did not conform to other known eastern North American or European taxa of the genus.[1,2] Occasional reports of taxa now placed in *Gymnopus* (formerly included in an expansive concept of *Collybia*) include those concerning Nova Scotia,[3] summarized by Gourley,[4] and Michigan,[5,6,7,8] none of which, nor those of the even older publication by Coker and Beardslee[9] circumscribed the proposed species from Newfoundland. In addition to morphological distinctions, DNA analysis also indicated that nuclear ribosomal LSU and ITS sequences from the new taxon did not match those deposited in GenBank <http://www.ncbi.nlm.nih.gov/nucleotide> or sequences in the *Gymnopus* files at TENN.[10] The new taxon is proposed, illustrated and described below.

Materials and methods

Collection of fresh specimens employed typical field techniques. In several cases, photographs were made in the field, and basidiomata were dried and preserved in the fungarium of AV. In situ observation of macroscopic characters by AV have been augmented by deductions from dried material, but chiefly from several photographs, some of which are reproduced here. Microscopic features were observed exclusively from dried basidiomata. Microscopy and "barcoding" (i.e. production of ITS sequences) took place using small bits of dried material. Microscopy was accomplished using an Olympus BX60 microscope under Phase Contrast Microscopy (PhC), using 3% KOH with no stains. Abbreviations: TENN = herbarium, University of Tennessee; Q = spore length divided by spore width; Q^m = mean Q value for all spores measured; L^m = mean length of all spores measured. Colours within quotation marks from Ridgway,[11] and those in parentheses from Kornerup and Wanscher.[12]

Methods for DNA extraction, PCR of the nuclear ribosomal LSU and ITS region and sequencing were carried out as described previously.[13] Sequences were aligned in GCG[14] and a blast search was used to query GenBank. GenBank accession numbers for *G. eneficola* ITS sequences are KJ128262-KJ128268; LSU sequences are KJ189586-189590, and all are listed individually under additional specimens examined. A preliminary analysis of our entire (TENN) LSU *Gymnopus* library showed that *G. eneficola* was most closely related to *G. menehune*, *G. confluens* and *G. biformis*. The closest outgroup was *Gymnopus ramealis*. LSU sequences from collections of these species were used for parsimony analysis to demonstrate placement of *G. eneficola* (Figure 10).

Results

Gymnopus eneficola R.H. Petersen, species nova

MycoBank no. 807536

Holotype: Canada, Newfoundland, Pasadena Ski and Nature Club ski trails, coll. A. Voitk, 49° 0' 6" N, 57° 35' 36" W, 41 m ASL, 26.IX.2009, coll no. 09.09.26av13 (TENN 69123) KJ128264, KJ189586.

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[1] Ecology & Evolutionary Biology, University of Tennessee, Knoxville, TN 37996-1100, USA. repete@utk.edu

[2] Box 2312, RR #1, Corner Brook, NL, A2H 2N2 CANADA

Figure 1. Gymnopus eneficola*, basidiomata. Type collection from The Pasadena Ski and Nature Park ski trails, Pasadena, NL, 09.09.26av13 (TENN 69128). Note: the camera angle makes stipes look shorter than they are.*

Figure 2. Gymnopus eneficola*, basidiomata. 06.08.19av01 (TENN 69126), Humber Village, Newfoundland and Labrador. Note: camera angle makes stipes of lying basiomata seem shorter than in real life.*

Etymology: En = "N;" ef = "F" (NF = abbreviation for Newfoundland); + -icola = dwelling in or preference for.

English diagnosis: Basidiomata collybioid or marasmioid. Pileus white when young, remaining so or mellowing to cream color; lamellae subdistant, adnate with slight tooth, white when young, mellowing to off-white by maturity; stipe terete when young becoming compressed or grooved by maturity, lightly vestured above, more strongly so downward, disappearing into a felty mycelial mass binding substrate. Pileipellis a modified dryophila structure with erect pileal hairs. Cheilocystidia 30-40 × 8-13 µm, variously contorted, lobed and roughly coralloid. Caulocystidia abundant, hyphal, downward long and branced. Basidiospores 7.5-9 × 3.5-5 µm (Q^m = 2.32; L^m = 8.30 µm), ellipsoid, slightly flattened adaxially, thin-walled, hyaline, smooth, inamyloid.

Description

MACROSCOPIC

Basidiomata collybioid (Fig. 4), marasmioid,

Figure 3. Gymnopus eneficola *basidiomata. 05.10.12av05 (TENN 69121), Humber Village, Newfoundland and Labrador.*

Figure 4. Gymnopus eneficola, *basidiomata. MR3-016 (TENN 69120), 2011 Faculty Foray, Main River, Deep Section. Photo: Roger Smith.*

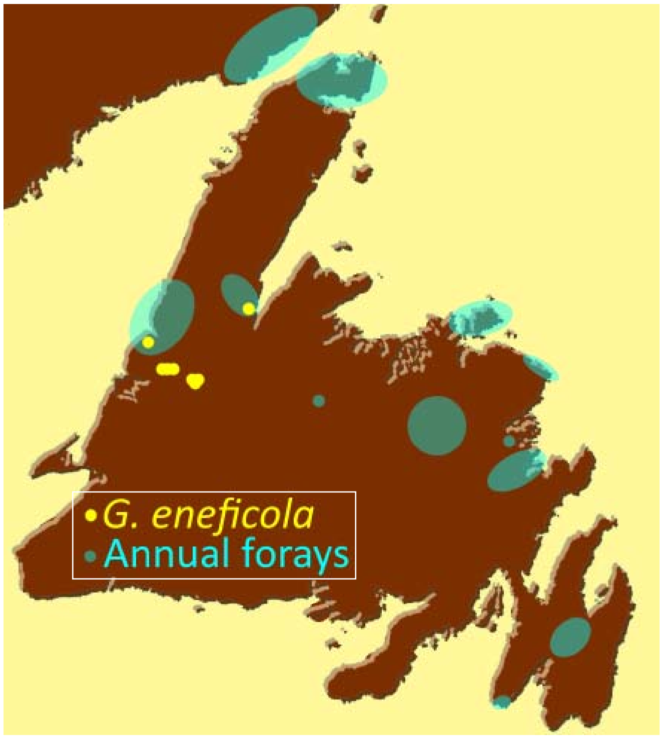

Figure 5. Known distribution of Gymnopus eneficola. *Limitation to the west coast region of the Island likely reflects the location of AV in that area. However, it is noteworthy that annual forays in other areas have not collected it.*

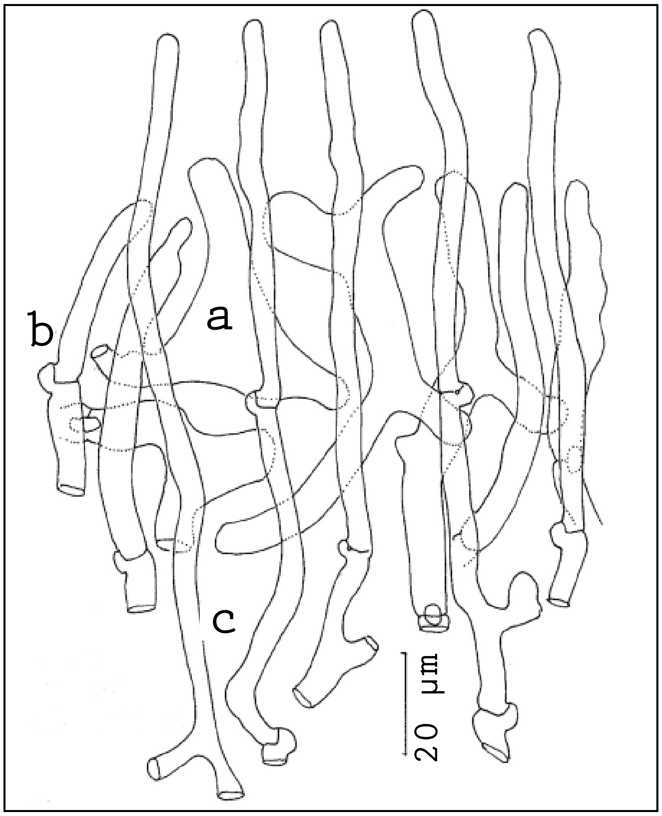

Figure 6. Gymnopus eneficola*: Cells of pileipellis.* ***a****) Cells of pileipellis surface [09.09.26av13 (TENN 69128)].* ***b****) Repent terminal cells of pileus surface [09.09.26av13 (TENN 69128)].* ***c****) Erect slender hyphal tips ("pileal hairs") [06.09.02av01 (TENN 69127)].*

especially sect. *Globulares*; (i.e. adult pileipellis smooth, with pileus diameter/stipe length 1:1-1:1.5; Figs. 1, 2), when young sometimes mycenoid (pileus diameter/ stipe length 1:4-1:2) or hygrophoroid (Fig. 3), solitary, gregarious or cespitose in small groups of 2-3 (Fig. 1), with obviously vestured stipe (Fig. 3) and stipe base disappearing into felty-arachnoid hyphal mass involving minute bits of substrate (Fig. 2, right; 4). **Pileus** (Figs. 1-3) 11-24 mm broad, thin, convex when young (Fig. 1) and then with suggestion of an umbo, expanding and flattening through development, finally nearly applanate with thin, downturned but not inrolled margin (Figs. 1, right; 2, left), sometimes with a suggestion of central depression, smooth under lens, matte or occasionally plushy as a peach (60×), appearing polished in small areas especially in age, not striate, not hygrophanous, white when fresh (Fig. 1, center; 3), sometimes with very slight blush of "pinkish buff" (6A3) over disc (Fig. 1, left), slowly mellowing to cream-colored in age (Figs. 2, 4) from margin inward. **Lamellae** subdistant, adnate with slight tooth, ventricose, seceding in drying, sinuate, thickish, white when young (Figs. 1, 3), discoloring slightly over time through "pale cinnamon pink" (5A2) or "tilleul buff" (7B2) to "cinnamon buff" (6B4) or "cinnamon" (6B5) in age and drying; lamellar edge entire or slightly eroded (Figs. 1, 2) or undulate but not serrate; lamellulae in three ranks. **Stipe** (Fig. 2) 30-55 × 1.5-5 mm broad, initially terete (Figs. 1, 3), often becoming grooved or compressed (Fig. 2, right; 4, right), equal through upper portion, slightly expanded in lowest portion and there covered with loosely felty to sublannose mycelium (Figs. 2, 3, 4) and disappearing into and binding superficial substrate (Fig. 2), white when fresh becoming pallid creamy gray on drying, perhaps tan where chafed; vesture of upper stipe appearing frosted or minutely granular (Figs. 2, 3), downward vesture becoming thinly felty, then substrigose and finally at base densely arachnoid to lannose, especially when young (Figs. 3, 4), vesture easily crushed or removed where chafed (Fig. 2, right; 4, left); 3% KOH applied to lower stipe surface (dry) with off-white sublannose vesture = dull orange-brown (no evidence of green or citrine).

Habitat, phenology and distribution

"Mixed woods," (*Betula, Abies balsamea, Picea, Larix*; sometimes dominated by *Betula*, and no record without *Betula*), fruiting mid-August through early November. At the moment, only known from a limited area of the Island of Newfoundland in the Canadian province of Newfoundland and Labrador (Fig. 5).

Microscopic

Pileipellis composed of generally repent, radially oriented hyphae 4-10 µm diam, often broadly "free-form" (i.e. individually resembling cells of a "dryophila structure;" Fig. 6a) firm- to thick-walled (wall -0.7 µm thick), not or hardly ornamented (ornamentation very vague bands under PhC but not raised or producing profile calluses, not visible in BF), frequently branched, conspicuously clamped, hyaline (PhC); terminal cells of pileipellis hyphae (Fig. 6b) 35-80 × 4-7 µm, single or in processes of 2-4 cells with clamp connections at septa, usually simple, occasionally tibiiform or substrangulate near terminus, firm-walled (wall -0.5 µm thick), hyaline (PhC). Occasional slender branches from pileipellis hyphae erect ("pileal hairs," Fig. 6c), -225 × 2-3(-4.5) µm, hyphal, unbranched, not necessarily arising at a clamp connection, usually internally clamped, firm-walled, hyaline. Hyphae of pileus trama 4-8 µm diam, firm-walled, frequently branched, frequently clamped, easily disarticulated, never sculptured. Lamellar trama generally longitudinal; tramal hyphae 4-7.5 µm diam, thin-walled, usually constricted at septa, clamped. **Subhymenium** a tight tissue of tortuous/branched hyphae 2-2.5 µm diam, bearing basidia on subsymbodial branches. **Basidioles** (Fig. 7a) 29-31 × 5-7 µm, digitate when young, becoming clavate/fusiform, clamped, thin-walled; contents homogeneous. **Basidia** (Fig. 7b, c) 23-30 × (7-)9-10 µm, broadly to bulbo-clavate, 2-4-sterigmate (sterigmata – 11 µm long when 2, -5 µm long when 4), clamped; contents homogeneous. **Pleurocystidia** not observed. **Cheilocystidia** (Fig. 7d,e) very locally common, overall occasional, (25-)30-40(-60) × 8-13(-17) µm, usually arising with basidia, hyaline, occasionally rising in subhymenium or outer trama, free-form with irregular lobes and curved branches, clamped. Stipe surface hyphae 4-11 µm diam, adherent, thick-walled (wall -1.5 µm thick), refringent (PhC), seldom but prominently clamped, hyaline. **Caulocystidia** from stipe apex (Fig. 8a) of two types: 1) a solid turf of short (-70 × 3-4 µm) hyphal tips arising as side branches and termini of stipe surface hyphae, firm- to thick-walled (wall -0.7 µm thick), internally clamped; and 2) a tangle of common longer (-175 µm long × 3-4 µm diam) hyphae, similar to shorter caulocystidia, branched 1-3 times at conspicuous clamp connections, hyaline, internally clamped

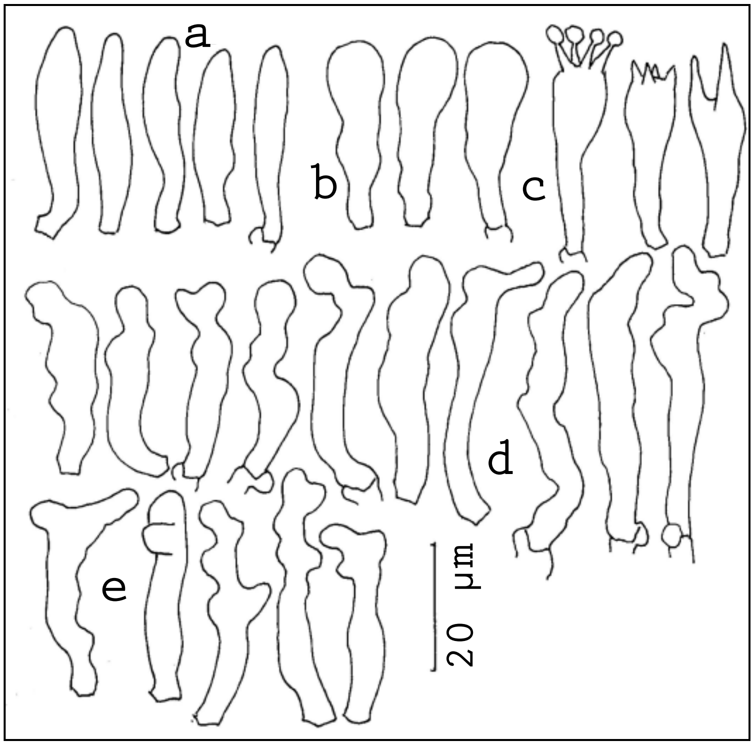

Figure 7. Line drawings of G. eneficola *hymenial structures.*

a*) Basidioles [09.09.26av13 (TENN 69128)].*
b*) Immature basidia [09.09.26av13 (TENN 69128)].*
c*) Mature basidia (note 4- and 2-sterigmate individuals) [09.09.26av13 (TENN 69128)].*
d*) Cheilocystidia [09.09.26av13 (TENN 69128)].*
e*) Cheilocystidia [07.11.07av01 (TENN 69125)].*

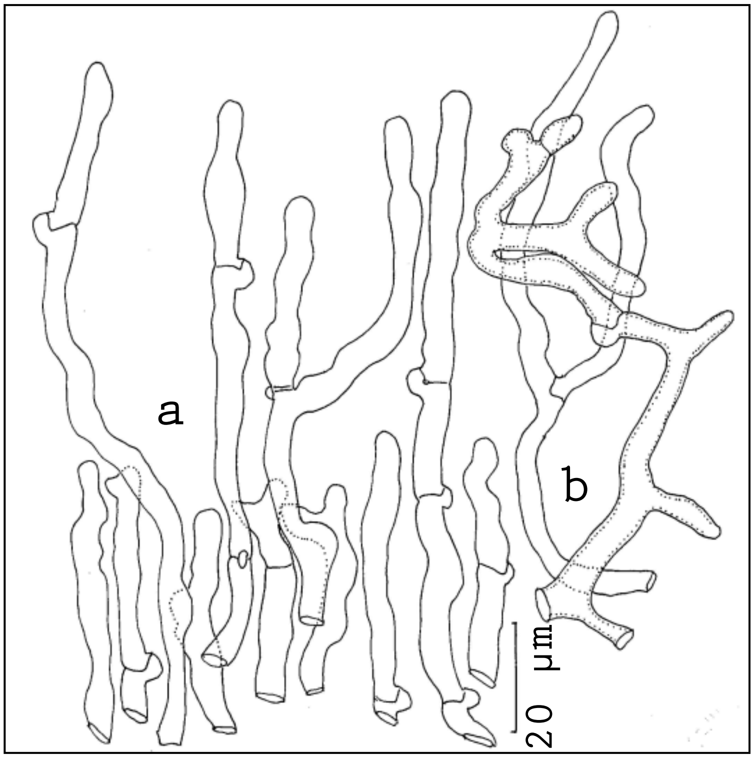

Figure 8. Line drawings of Gymnopus eneficola *caulocystidia.*

a*) Short caulocystidia with longer individuals from upper stipe [09.09.26av13 (TENN 69128)].*
b*) caulocystidia from lower portion of stipe [06.09.02av01 (TENN 69127)].*

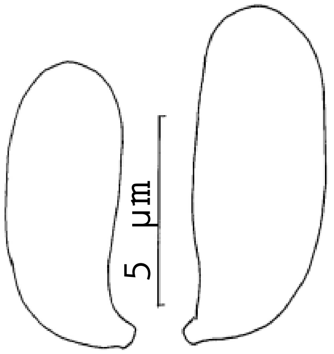

Figure 9. Line drawings of G. eneficola *basidiospores [06.09.02av01 (TENN 69127)].*

so terminal cells of long caulocystidia 17-27 µm long. Caulocystidia from stipe midsection (Fig. 8b) -240 × 3-4 µm, often branched near origin, hyphal, firm- to thick-walled (wall -0.7 µm thick), seldom clamped and almost never near cystidial apex; when branched, one branch consistently short and less developed; turf of shorter caulocystidia characteristic of upper stipe present only as scattered individuals. Basal mycelium inward organized into tissues of adherent hyphae 3-4 µm diam, firm- but not thick-walled, shearing into plates indicating adherent surfaces; outward hyphae disorganized, 3-5 µm diam, similar to caulocystidial hyphae, conspicuously clamped, firm-walled, hyaline, but macroscopically slightly discolored toward pinkish cinnamon, involving small bits of debris including well-decayed leaves, tiny twigs or petioles and occasionally flattened needles, probably of *Abies*. **Basidiospores** (Fig. 9) (7-)7.5-9 × (3-)3.5-5 µm (Q = 2.00-2.73; Q^m = 2.32; L^m = 8.30 µm), ellipsoid, somewhat flattened adaxially, thin-walled, hyaline, inamyloid; contents apparently homogeneous.

PHYLOGENY

LSU sequences place *G. eneficola* well within the *Gymnopus* clade (clade Omphalotaceae, not Marasmiaceae in the Agaricales). Neither LSU nor ITS sequences from collections of *G. eneficola* match any GenBank sequences more closely than 92%; the closest ITS blast match was to GenBank accession GU234141, *Gymnopus alkalivirens* from the Svalbard. An abbreviated LSU phylogram is shown in Figure 10.

Discussion

From notes and photos accompanying specimens, habitat might be inferred as decaying deciduous leaves and small twigs, favoring *Betula*. Most specimens were collected as *G. confluens*, also fruiting in such habitat, with which they are similar in vestured stipe, which is usually compressed or grooved, and presence of a basal mycelial mass which binds minute bits of litter and probable substrate. The extent of the basal mycelium is unknown at present (whether as widespread sheets as those of typical of *G. confluens*), but lamellar spacing (as a function of number), height and thickness and spore dimensions all differ substantially.

Basidiomata of *G. eneficola* might be mistaken for *Collybia tergina* (Fr.) Lundell if Halling[1] is used, because the stature of basidiomata and spore dimensions are similar. However, under *C. tergina*, Lundell and Nannfeldt[15] described an organism with smaller spores [5.5-7(-8) × 2.5-3.5 µm], "stem … especially lax and almost flabby," stipe "cylindrical and smooth, except for the base, which in some specimens is slightly villose," and "in almost perfect agreement with Fries's taxon" as illustrated in Fries. When Fries's[16] illustration and description are examined, his *Agaricus* (*Marasmius*) *terginus* exhibits a tan, striate pileus (in one individual quite pale but with tan disc) and tan stipe with no evidence of vesture. The sum of all these characters indicates an organism quite different from *G. eneficola*.

When the key to European *Gymnopus* species by Antonin & Noordeloos[2] is followed, a pivotal couplet concerns strong odor of basidiomata, a feature not observed for the new species. Choices which follow the strong odor lead to mismatched character fields, but if the choice of little or no odor is followed, the key permits several more choices until finally *G. oreadoides* is reached. Because basidiomata of *G. eneficola* resemble those of the *Globulares* section of *Marasmius, G. oreadoides* is a tempting choice. Numerous discrepancies are found, however, when characters of *G. eneficola* are compared to those of *G. oreadoides*, as follows: 1. the pileus of *G. oreadoides* is described as "probably hygrophanous" (the accompanying photo clearly shows this); 2. pileus "pale cream color when young" (the accompanying photo shows strongly convex, neutral brown pileus of young basidiomata and distinctly ochraceous disc when mature); 3. stipe "fistulose, elastic, twisted… turning orange-ochraceous, finely pubescent, glabrescent; 4. spores "5.5-7.5(8.5) × 3.0-4.0 µm … Q = 1.9-2.1;" 5. caulocystidia… "20-50 × 3.5-7.5 µm, forming a dense layer all over the stipe surface." The line drawing accompanying the description illustrates these characters, with only short caulocystidia shown, together with encrusted pielpellis hyphae. Finally, "*Gymnopus strictipes* (Peck) Halling" is reported as similar to *G. oreadoides,* but Peck's species is a member of *Marasmius* sect. *Globulares*.

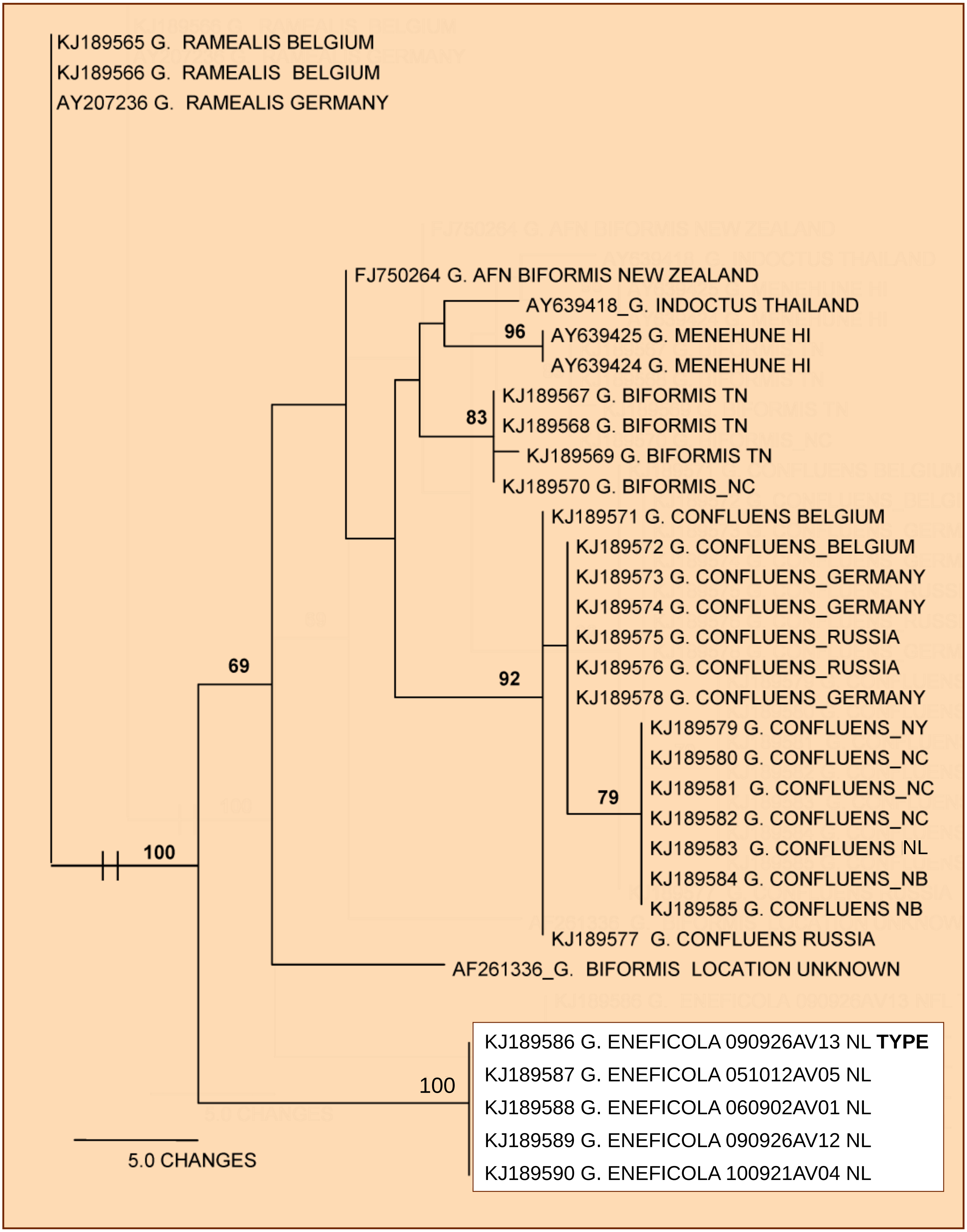

Figure 10. Parsimony analysis of nuclear ribosomal LSU sequences for Gymnopus *collections related to* G. eneficola. *The figure represents one of 1000 most parsimonious trees of length 74. Origin of collections indicated by country name in full or abbreviation for state/province if from the USA or Canada, appearing after the species name. Bootstrap support greater than 50% is given to the left of the supported node.*

Superficially, basidiomata are reminiscent of members of *Marasmius* sect. *Globulares* (i.e. *M. cystidiosus*, *M. nigrodiscus*, *M. oreades*) in general stature, lamellar morphology and attachment and pileus shape. Pileipellis construction of *Gymnopus eneficola* is not hymeniform, however, and DNA sequences place the Newfoundland taxon well within the *Gymnopus* clade. Moreover, basidiomata of *Gymnopus eneficola* are macromorpholigally more diminutive, have a greater stipe:pileus ratio and exhibit a vestured stipe at all ages.

At first, ventricose-rostrate immature basidia were thought to be cheilocystidia, being present consistently and abundantly, but they are present on lamellar faces (i.e. among basidia covering the lamellar surfaces) and seem to disappear near the lamellar edge. Once true cheilocystidia were observed, they could be compared to other hymenial structures for shape and size (see Fig. 7). Future caution is recommended. Caulocystidia (Fig. 8) are somewhat unique in distribution, dimensions and structure. The upper stipe appears only "frosted" without magnification, but magnification (750×) reveals a solid turf of short caulocystidia with some long indivduals present. Downward on the stipe, the turf remains but long caulocystidia become more numerous to give a somewhat more hirsute appearance to the naked eye. Both types of caulocystidia are consistently internally clamped so that the terminal cell is considerably shorter than expected. Clamp connections, especially those of basal mycelium, vary from papillate to medallion shapes to individuals with the "hook cell" elongated over the parent hyphae.

At the time of this writing (Jan. 2014), GenBank does not report any nucleotide sequences under the name *Gymnopus oreadoides*. Just as important, ITS sequences from collections of *G. eneficola* do not match any GenBank sequences more closely than 92%. However, with a blast match of 92% percent to a specimen from Svalbard, collections of *G. eneficola* from Newfoundland would be considered a distinct species by any criteria. LSU and ITS sequences of *G. eneficola* have been deposited in GenBank and are listed under additional specimens examined.

Additional specimens examined (all Canada, all Newfoundland, all collected as *G. confluens*): Humber Village, 13 Balsam, 48° 59' 21" N, 57° 45' 18" W, 12.X.2005, coll. A. Voitk, no. 05.10.12av05 (TENN 69121) KJ128263, KJ189567; same location, 7.XI.2007, coll. A. Voitk, no. 07.11.07av01 (TENN 69125) KJ128266; Humber Village, Weldon's Road, 48° 59' 43" N, 57° 44' 15" W, 19.VIII.2006, coll. A. Voitk, no. 06.08.19av01 (TENN 69126); Pasadena Ski Trails, 49° 0' 6" N, 57° 35' 36" W, 26.IX.2009, coll. A. Voitk, no. 09.09.26av12 (TENN 69128) KJ128268, KJ189589; Pasadena Stream Trail, 49° 00' 39" N, 57° 36' 38" W, 21.IX.2010, coll. A. Voitk, no. 10.09.21av04 (TENN 69122) KJ128265, KJ189590; Gros Morne Nat. Park, Stuckless Pond Trail, 49° 25' 55" N, 57° 43' 38" W, 1.XI.2005, coll. A. Voitk, no. 05.11.01av08 (TENN 69124); same location, 2.IX.2006, coll. A. Voitk, no. 06.09.02av01 (TENN 69127) KJ128267, KJ189588; Lower Main River (deep section), Trail 1, 49° 46' 40" N, 57° 53' 03" W, 6.IX.2011, coll. Foray Newfoundland and Labrador, no. MR3-016 (TENN 69120) KJ128262.

Acknowledgments

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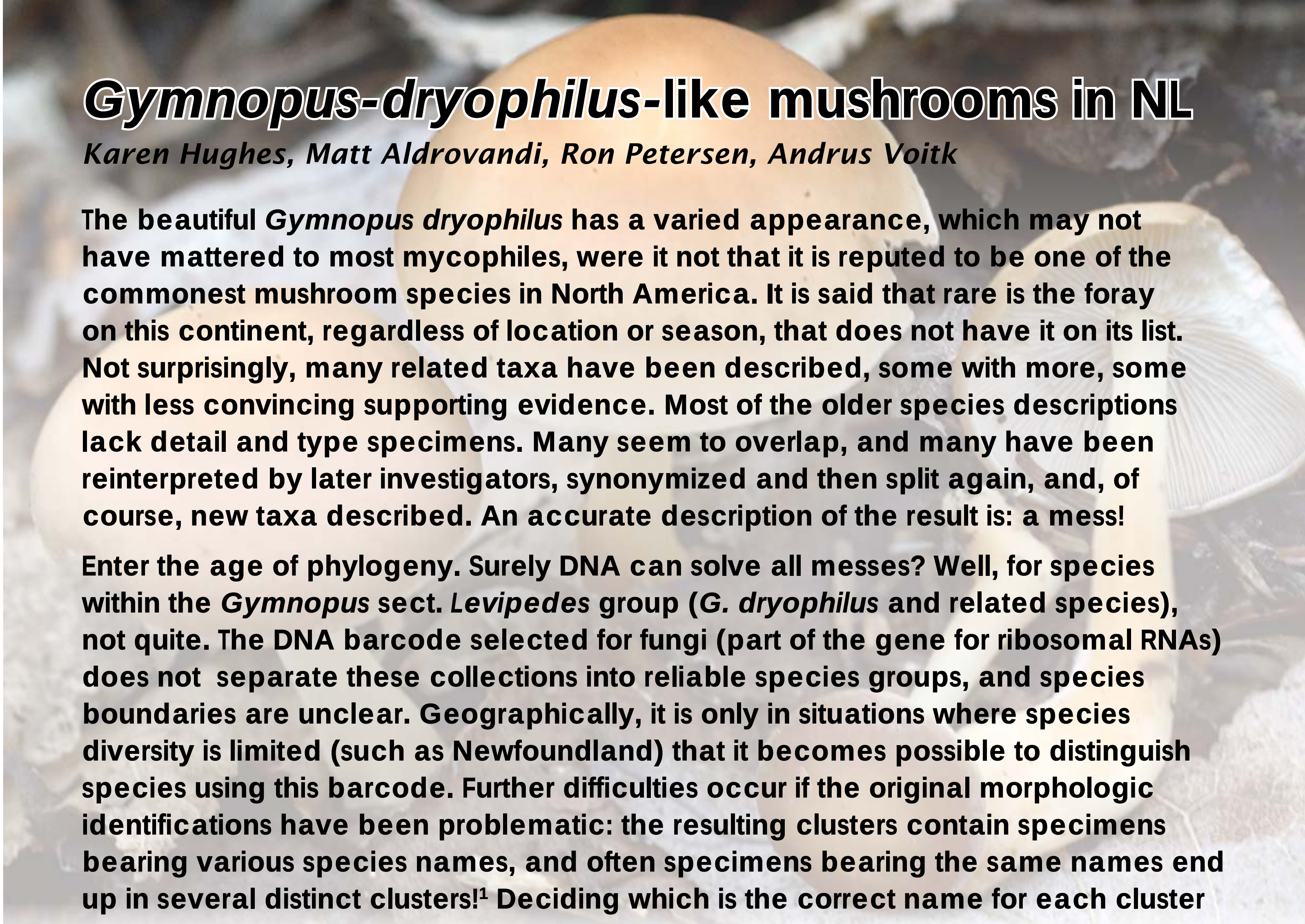

Gymnopus-dryophilus-like mushrooms in NL

Karen Hughes, Matt Aldrovandi, Ron Petersen, Andrus Voitk

The beautiful *Gymnopus dryophilus* has a varied appearance, which may not have mattered to most mycophiles, were it not that it is reputed to be one of the commonest mushroom species in North America. It is said that rare is the foray on this continent, regardless of location or season, that does not have it on its list. Not surprisingly, many related taxa have been described, some with more, some with less convincing supporting evidence. Most of the older species descriptions lack detail and type specimens. Many seem to overlap, and many have been reinterpreted by later investigators, synonymized and then split again, and, of course, new taxa described. An accurate description of the result is: a mess!

Enter the age of phylogeny. Surely DNA can solve all messes? Well, for species within the *Gymnopus* sect. *Levipedes* group (*G. dryophilus* and related species), not quite. The DNA barcode selected for fungi (part of the gene for ribosomal RNAs) does not separate these collections into reliable species groups, and species boundaries are unclear. Geographically, it is only in situations where species diversity is limited (such as Newfoundland) that it becomes possible to distinguish species using this barcode. Further difficulties occur if the original morphologic identifications have been problematic: the resulting clusters contain specimens bearing various species names, and often specimens bearing the same names end up in several distinct clusters![1] Deciding which is the correct name for each cluster becomes more difficult than defining the phylogenetic groups. How did the NL mushrooms that look like *G. dryophilus* negotiate this abyss?

Over a decade, Foray Newfoundland & Labrador and AV together had accumulated 57 collections of mushrooms that look like *Gymnopus dryophilus*. These were examined morphologically and phylogenetically, with more than their share of difficulties because of mould contamination and relative paucity of material in many collections.

	Group 1	Group 2	Total
Gymnopus alpinus	1		1
Gymnopus aquosus		2	2
Gymnopus dryophilus	13	4	17
Gymnopus earlei	1	1	2
Gymnopus loiseleurietorum		7	7
Gymnopus ocior		3	3
Gymnopus subsulphureus	2	1	3
Gymnopus terginus		1	1
Rhodocollybia butyracea	1		1
TOTAL	18	19	37

Table 1. Original identifications of the collections in Groups 1 & 2. Nine taxa divided between two clades. Three taxa are found in both clades.

Good DNA was obtained from 37 collections of *Gymnopus-dryophilus*-like mushrooms. On nuclear phyleogenetic analysis they fell into two distinct clades, **Group 1** and **Group 2**. Original identifications are listed in Table 1. As can be seen, our experience was the same as described above: two groups contained nine putative species, three of which fell into both.

Morphologically, **Group 1** fit with the current concept of *Gymnopus dryophilus*, and its DNA was 99.4% homologous with *G. dryophilus*, as defined by Antonin and co-workers.[2] **Group 2** matched a species complex in the University of Tennessee database that extends across Northern Europe and North America, with a diverse morphological expression. It grouped together with *G. alpinus* of Antonin,[2] but also with collections with different names. Hybrids between the two groups were not detected. Figure 1 shows the phylogram for the two groups.

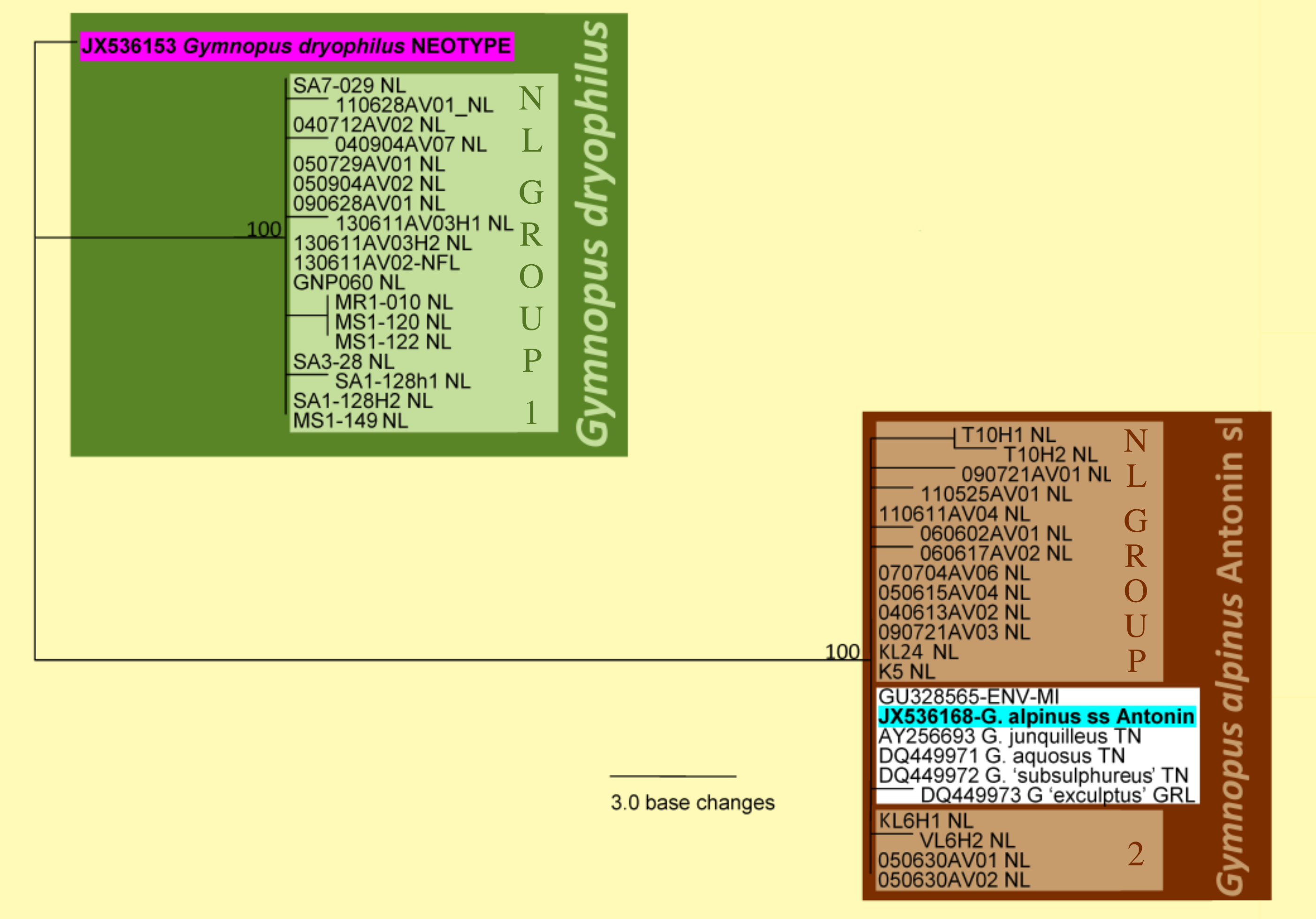

Figure 1. Phylogeny of the Gymnopus-dryophilus-*like mushrooms in NL.*

This is an unrooted tree (branches connecting the studied groups to their other relatives and common ancestors are omitted), which allows clear focus on the derived groups. Origin of the collections is indicated after the collection number: NL=Newfoundland and Labrador, GRL=Greenland, TN=Tennessee, MI=Michigan, ENV= environmental sample (soil or litter); h1 & h2= haplotypes of the same fruitbody; bootstrap values noted above the branch, left of the node.

Our collections cluster in two very distinct clades, NL ***Group 1*** *(light green panel) and NL* ***Group 2*** *(light brown panels).*

The DNA sequence in the selected ITS site of the DNA should be similar for each species. A small difference is considered normal, attributed to geographic and individual variation. A difference over 2% has been shown to indicate sufficient divergence of the evolutionary DNA pathway to represent a different species 97% of the time.[3] *In this analysis, the difference was 0.53% between the European neotype of* G. dryophilus *(pink panel) and our* ***Group 1****. This makes it highly likely that all collections on the dark green panel are the same species. The difference between the neotype of* G. dryophilus *and* ***Group 2****, was much greater, 2.64%, clearly indicating that they are not the same species. Therefore, it should not be surprising that* ***Group 2*** *also differed from* ***Group 1*** *(3.31%), confirming that they are two different species. The second group aligns with European* Gymnopus alpinus *(teal panel), along with North American collections given different names (white panel). The present analysis, limited to ITS sequences only, does not permit us to determine whether* **Group 2** *is* G. alpinus *or another species with a nearly identical ITS sequence but it is likely that the Newfoundland* ***Group 2*** *is, itself, a single species.*

Bootstrap values measure the probability (as per cent) that the node is "real" and not a chance observation. The values are determined by random sampling of sites in a set of sequences a set number of times, generating a series of trees. High bootstrap values (>70%) indicate that the tree shown appears at high frequency regardless of which sites were sampled. Since both ***Group 1*** *and* ***Group 2*** *have bootstrap values of 100%, this indicates that alternate arrangements of taxa (trees) were not found by this process, and the tree is an extremely reliable representation of the "true" relationship of these taxa.*

Group 1 and **Group 2** both contained collections with varied morphology, and no characters could be identified that separated them consistently. Specifically, both dark and light coloured caps, as well as yellow gills were seen in both groups. Size varied within but not between groups. Fruiting times were similar for both (Figure 2). The only difference noted for the groups was in habitat. **Group 1** was a woodland species (1 of 18 from barrens) and **Group 2** was a species of open areas like heaths, bogs, coastal and mountain barrens (3 of 19 from wooded areas) (Figure 3). Chi squared analysis of the difference in habitat was extremely significant ($p<0.0001$).

Discussion

To find nine putative species reduced to two is in keeping with observations of other genera, where the diversity of Newfoundland and Labrador mycota is much less than on the continent, presumably related to our low diversity of vascular plants. Our experience confirms that correct morphologic identification of species in this complex is difficult.

We have not identified useful foolproof morphologic characters to differentiate **Groups 1** & **2**, but the distinct difference in habitat, readily confirmed in retrospect on in situ photographs (Figure 3), separated them well. To our knowledge, such difference has not been documented before. As seen in Figure 1, nuclear sequence studies show the two groups to be clearly distinct. In regions with more diversity, such clear separation into clades is not found, due to many phylogenetically overlapping taxa. The evidence suggests that **Group 1**, the woodland species, likely is *Gymnopus dryophylus*. The exact identity of **Group 2** is not sufficiently clear. It is likely a single species, and fits well with *G. alpinus*. However, more analyses using different marker sites or multigene studies, may show a better fit with a closely related species. For now, we leave the resolution of these questions to future investigations and investigators.

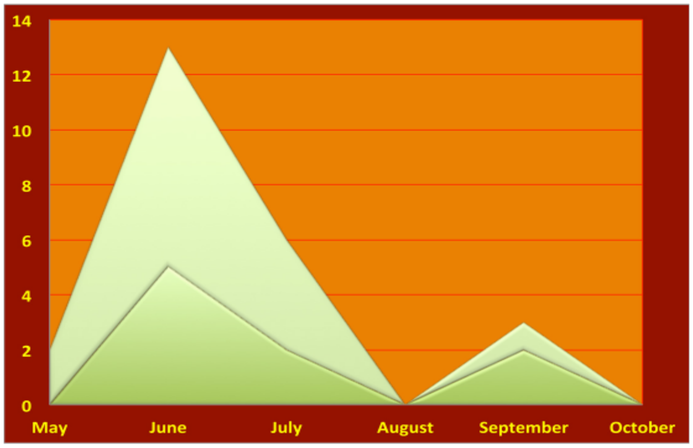

Figure 2. The phenology (seasonality) of the G. dryophilus *complex in NL. First fruitbodies in May, peak in June, none in August. Smaller 2nd peak in September, none in October. Dark green represents* ***Group 1*** *and lighter green* ***Group 2****. Both show similar pattern. Because forays are only in September, only AV collections were used here, to avoid skewing the results in favour of a September peak.*

Figure 3. Above, ***Group 1*** *in its typical woodland habitat, with characteristic leaf and needle litter substrate readily visible. Below* ***Group 2*** *collection from a treeless habitat. No tree litter, but each photo showed a characteristic background of* Sphagnum, Empetrum, Vaccinium, Loiseleuria, Dryas, *or other heathland species. The mat of* Salix uva-ursi *(bearberry willow) in this photo is as close to a real tree as most of them got.*

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The Bishop's Sketchbook

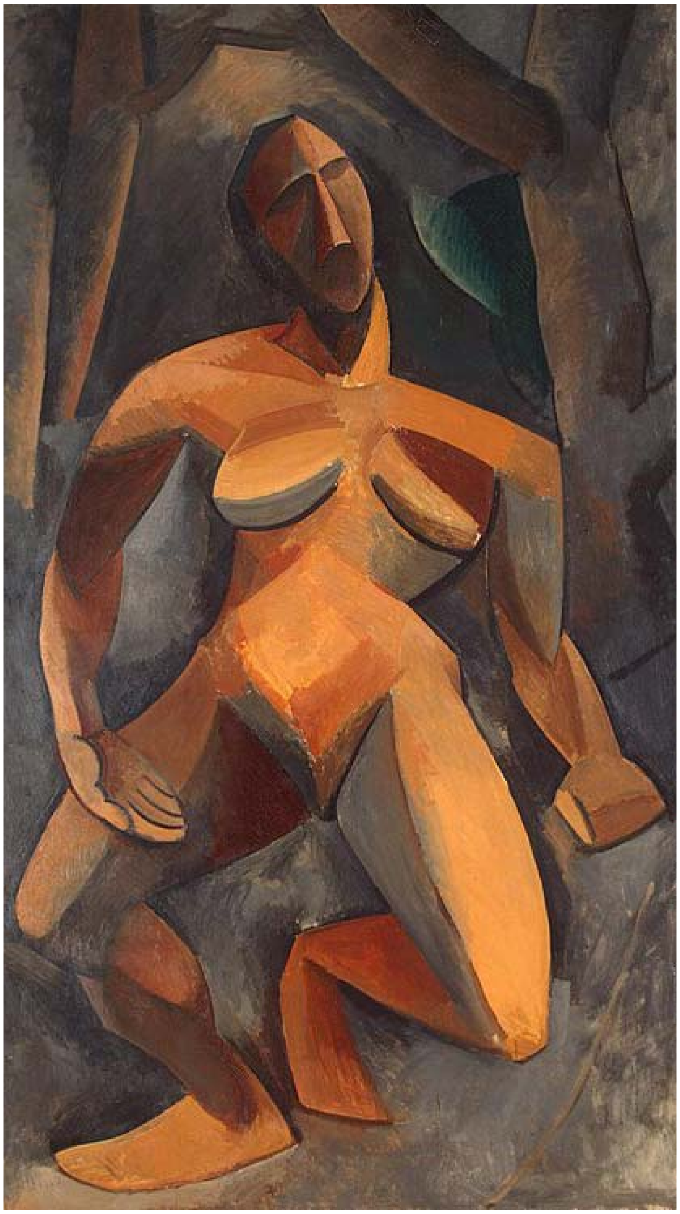
Dryophilic and dryophobic clade clusters

Andrus Voitk, Karen Hughes, Matt Aldrovandi

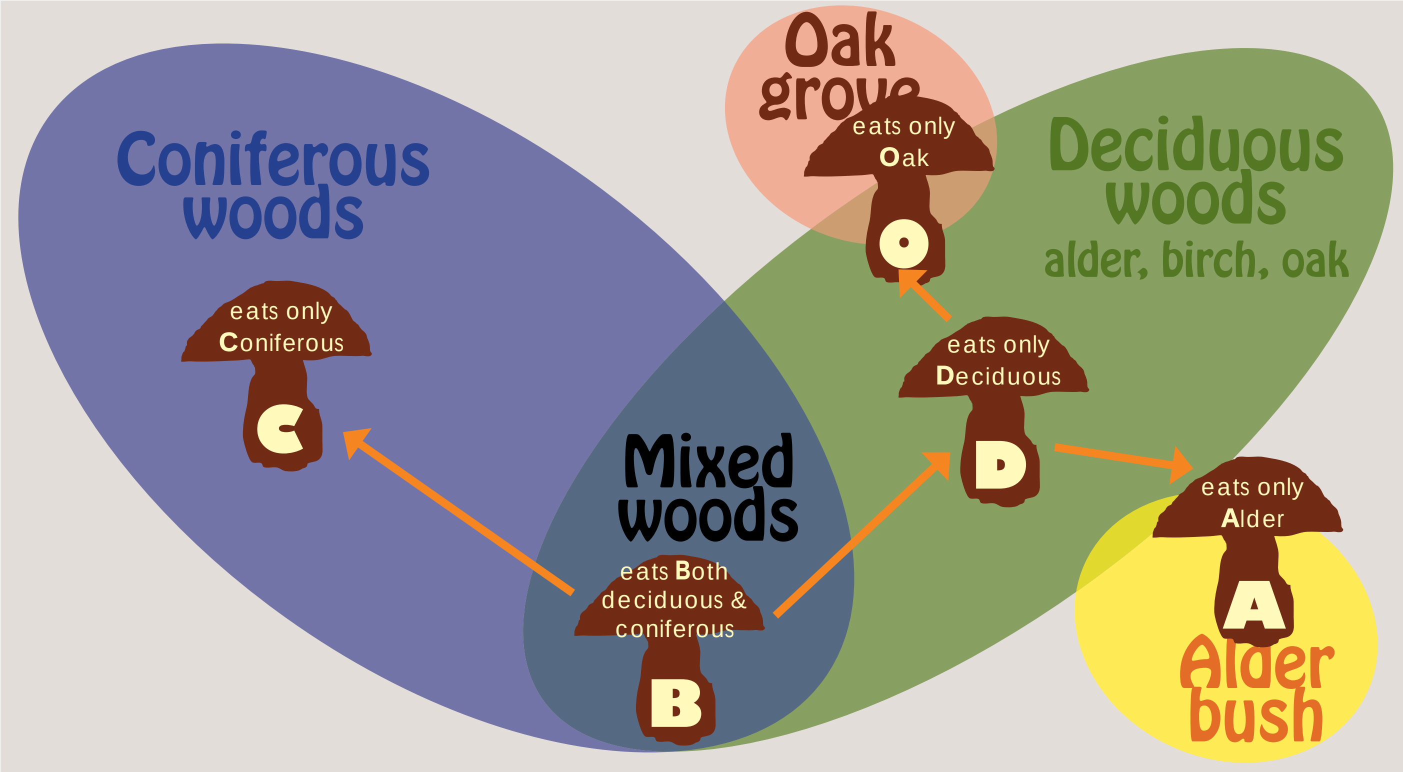
Dryophilus is usually given as oak-loving. The name comes from Dryad, the Greek wood nymph. The title banner depicts a stunning scene from the Royal Ballet's 2013 Dance of the Dryads from the ballet Don Quixote. Although particularly fond of oaks, Dryads occupy all trees and only very specialized nymphs have an especial relationship with oak. For a few, like the Hamadryads, it is obligatory; they die if their oak dies. We know that *G. dryophilus* does not have an obligatory relationship with oak: we have no oak in Newfoundland and Labrador, but lots of *G. dryophilus*. A more accurate translation of dryophilus, in keeping with both its behaviour in our woods and the original meaning of name, is tree-loving.

G. dryophilus is a saprobe, a decomposer of forest litter. Saprobes excrete digestive compounds to break down organic matter so that it can be absorbed by its hyphae. The chemical structure of all organic matter is not the same, and different digestive compounds break down different organic matter. The production of such compounds is genetically determined, and, as all genetic processes, subject to evolutionary change.

Let us assume that species **B** lives in a mixed forest, happily digesting **B**oth conifer and deciduous debris. Either it secretes two compounds, one to digest conifers and one to digest deciduous wood, or a multipurpose compound to digest both. How much more efficient to specialize, make chemicals to digest only one? Just as some individuals are taller, others shorter, so, more than likely, some are slightly better at digesting coniferous, others deciduous wood. On leafy debris, individuals better able to digest hardwood are able to outcompete their fellows: more likely to produce fruiting bodies emitting spores with their genetic program for enhanced deciduous wood digestion. A similar story plays out on coniferous duff: individuals better able to digest softwood perpetuate



Dryads are hotly pursued by Satyrs, a relationship variously depicted in art as romantic love or brutalization. Wags observe that nobody brutalized Dryads more than Pablo Picasso in his 1908 cubistic painting, The Dryad. This may be more apt than it seems, because Picasso often used the goat symbol for himself.



Adaptation and evolution. Species B, a generalist saprobe in a mixed forest, may move into deciduous and coniferous woods and evolve into specialist digesters of their respective substrate only, species D and C. Species C may travel further, into pure oak and alder woods, and there evolve into an obligatory oak or alder digester, species O and A. If some natural event, like an advancing polar ice cap, forced vegetation and its associated fungi to retreat to the original mixed woods, these derived species would exist together without hybridization, exposing the more specialized species to much greater risk of extinction from stochastic events to their obligatory nutritional substrate.

their genetic traits.

These strains are sympatric (sym = same, patria = homeland, i.e. growing in the same region). Proximity allows for mixing of genetic material. So long as they can interbreed (i.e. before full speciation has evolved, when they can no longer mate to produce fertile spores), there is a continuous intermixing of their genetic material. The result will cancel any advantage in either direction. Strains mate backwards and forwards, left and right, maintaining a homogeneous population of species **B**, thwarting all effort at specialization.

Now, let us suppose that spores of species **B** get carried to pure coniferous or deciduous woods. A meaningless variation in digestive enzyme composition suddenly becomes significant. If you can only digest two kinds of food, but only one is available, your survival depends on your ability to thrive on it. In the coniferous forest those individuals of species **B**, who are more adept at digesting coniferous wood, easily outcompete their kin, producing individuals with continuously increasing ability to digest coniferous wood. In time, through a natural selection process, a new and genetically distinct species, **C**, evolves, able to digest only **C**oniferous wood. By the same process, in the deciduous woods a new species, **D**, evolves, able to digest only **D**eciduous wood.

Some individuals among species **D** immediately grasp the benefits of specialization: the more effort they can spare from needless digestion of varied substrates, the more time and energy they have to devote to the pleasurable pursuit of procreation. The deciduous trees in their forest are alder, birch and oak. Those with a natural proclivity for alder digestion hie themselves off to a remote alderwoods, where they soon enough (say, in a thousand years) evolve as species **A**, a unique **A**lder-digesting species. Their oak loving kin do the same in a far-away oak grove, ending up with species **O**, an **O**ak-digesting fungus.

Should all these species now get carried back to the original mixed woods and meet up with species **B**, all would live side by side: **B** eating **B**oth coniferous and deciduous wood, **C** eating **C**oniferous only, **D** eating **D**eciduous only, **A** eating **A**lder only and **O** eating **O**ak only. They would be sympatric, each in its own niche, but would not hybridize, because at this stage speciation for each has gone so far that they no longer can mate with each other or their progenitor.

A steady state ensues, until Janelle Smythe-Williams, cabinetmaker to Her Majesty, discovers this great source of heritage oak. She fells all alder for easy access and chops down all the oak. After the last debris is gone, there is nothing for species **A** or **O** to eat. Together with the Hamadryas, they die out, because evolution is not quick enough to respond to such stochastic events. Species **D**, not being a specialist, was able to survive on a birch diet until new deciduous trees moved in. Lesson: specialization is more efficient, but riskier. Which is why, at the early age of three, AV made a conscious decision to become an omnivore.

Our *Gymnopus-dryophilus*-like mushrooms separated into two intersterile, yet morphologically very similar groups. The most obvious difference between them is that the first is a woodland species, while the second has established a niche on barrens, bogs, moors and heaths—in other words, anywhere that there are no trees. Fittingly, the woodland group was the one whose DNA matched the European (and North American) *G, dryophilus*.[1] If Dryads are tree nymphs and a species that grows in the forest is called dryophilic, then it would be appropriate to call our second group, which grows in regions without trees, a shunner of Dryads, or dryophobic.

Much as the dryophilic species has seeming host associations with several trees while remaining the same species, so the dryophobic group also seems to have several host associations. For example, an association with *Loiseleuria procumbens*, the beautiful mountain azalea, has led to the description of a *Gymnopus* species that grows with this plant: *G. loiseleurietorum*. There are locations where group after group of dryophobic *Gymnopus* fruit among *Salix uva-ursi*, the dwarf bearberry willow. Elsewhere clumps of similar *Gymnopus* fruit among *Dryas* (mountain aven, also named for the nymphs), and on the barren Erin Mountain behind Barachois Pond Provincial Park this same mushroom fruits profusely around every ecologically dwarfed mountain alder (*Alnus viridis* ssp. *crispa*) bush lucky enough to find a toehold.

Do these associations indicate obligatory relationships, i.e. different species? Unlikely. Narrowly specialized obligatory host relationships are very risky, and in this hostile environment such species are unlikely to survive. Fungi may seek out vascular plants for other reasons than a "host" relationship. For example, it may be desirable to be near alder to get the Nitrogen it produces. In most cases the reasons for association are even more general. Barrens have far less choice of good organic debris, so whichever larger perennial vascular plant is common in an area is likely to be selected as a good food source for a saprobe. An apparent association may occur between

Gymnopus dryophilus *in a deciduous woods (top), on sole rotten birch log in a primarily coniferous woods (middle), and in a coniferous woods (bottom). Did Picasso get his inspiration from a broken, clubfooted, slug-eaten and angular dryad like the top photo?*

Middle photo: Maria Voitk

Our dryophobic Gymnopus alpinus *s.l. with a variety of "hosts", top down:* Loiseleurium procumbens, Salix uva-ursi, Empetrum hermaphroditum, Vaccinium uliginosum. *In all likelihood, none of these are true hosts and the association is opportunistic, not obligatory. This is the same species, growing near whatever plant is available at the time and place, as a source of organic debris to satisfy its saprobic lifestyle.*

totally unrelated organisms because both require the same environmental conditions to survive. The barrenlands have very limited areas with sufficient soil to keep roots or mycelium alive during the cold season. In the growing season these places also hold the most moisture for the longest time. Both plant and fungus seek them out for the same reason. Likely, associations with plants for our dryophobic group are fortuitous—opportunistic rather than obligatory. This explanation fits best with a single dryophobic species of *Gymnopus*.

It is important to understand what our findings tell us and what they do not. We have two groups of fungi, one which falls into a clade with *G. dyrophilus*, and one which falls into a clade with *G. alpinus*. There is a difference between belonging to a group that contains *G. alpinus*, and being *G. alpinus*. In the case of *G. dryophilus*, we are dealing with an established species, relatively well worked out and defined. All our collections were phylogenetically close and produced a good match with the known single species. The likelihood is high that ours is that same species, minor differences being due to geographic variation. In the case of *G. alpinus*, the species is not that well defined, and many similar species have been described, only some of which have been defined phylogenetically. Our dryophobic mushrooms are definitely in the group around *G. alpinus*, but also with four other species, all equally close. Our present results do not allow us declare with certainty which of these five names is "correct".

How should we identify and record our finds? It is for this situation that the qualifier s.l. (sensu lato = in the broad sense) has been developed. The opposite is s.s. (sensu stricto = in the strict sense). "*Gymnopus alpinus* s.s." means the species defined as *Gymnopus alpinus*, and nothing else. "*Gymnopus alpinus* s.l." means either *G. alpinus* or a species close to it. Pending new information, it would probably be reasonable for us to identify our woodland species as *G. dryophilus*, and our barrenland species as *G. alpinus* s.l. Further investigation may reveal this name to be close, but not exact, and our species may require reassignment in the future. The choice of *G. alpinus* was influenced by finding that it, as described by Antonin[2], fell into the same clade, matching ours with a 92% similarity., and base pair divergence under 0.3%.

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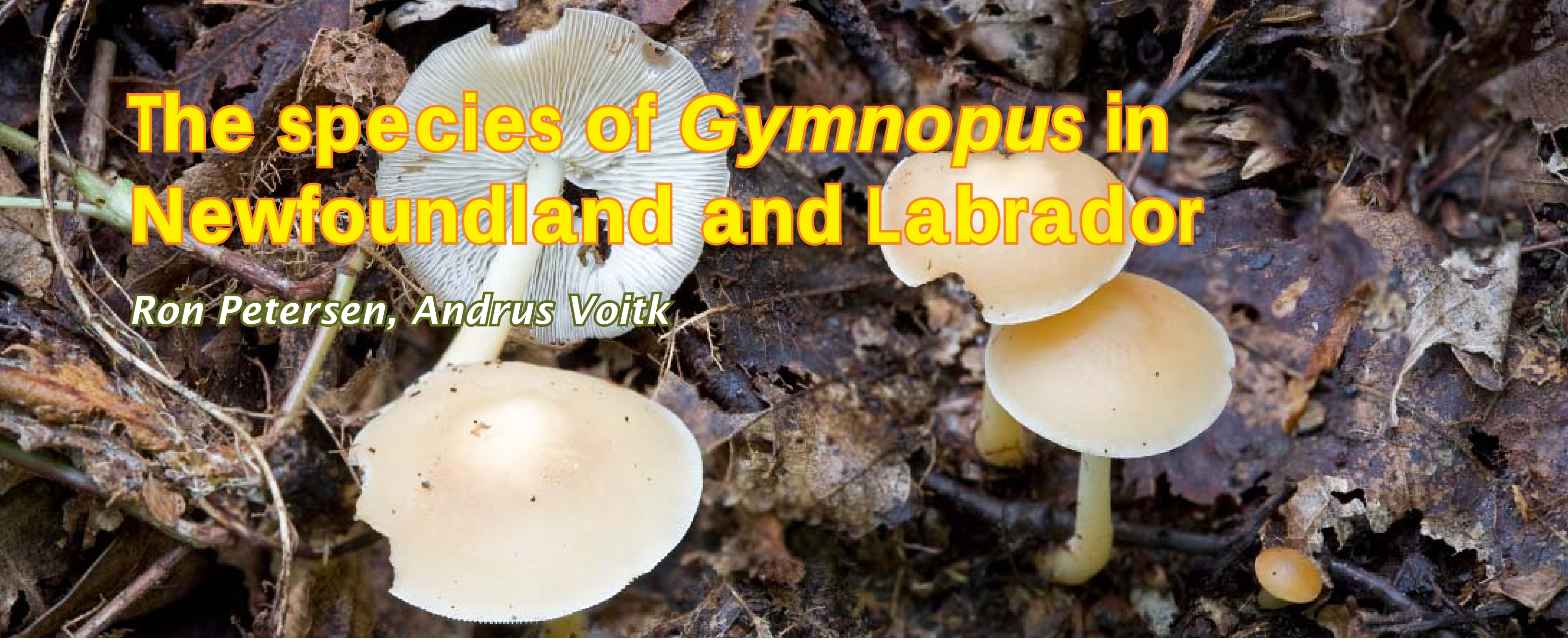

The species of *Gymnopus* in Newfoundland and Labrador

Ron Petersen, Andrus Voitk

The review of *Gymnopus* species collected over a decade from Newfoundland and Labrador revealed seven species:

Gymnopus dryophilus
***Gymnopus alpinus* s.l.**
Gymnopus confluens
Gymnopus eneficola
Gymnopus alkalivirens
Gymnopus subnudus
***Gymnopus* sp. K22 (**a single collection only, not identified, and not discussed further here**)**

This list is neither exhaustive nor exclusive. All collected material could not be studied, so that the presence of additional species cannot be excluded. Further collecting may uncover additional species, so uncommon as to be encountered less than once a decade. The species identified as *Gymnopus alpinus*, and to a lesser extent *G. dryophilus*, may be reassigned with more study, and both may contain cryptic species, to be uncovered by future analysis. A similar situation exists around the species identified as *G. alkalivirens*, where further analysis may be able to resolve several closely related cryptic species, so that this limestone barrens species could be reassigned to a new epithet in the complex. And for the mycodetectives, the mysterious K22 still remains.

We are indebted to Karen Hughes, who contributed sequences which facilitated morphological identifications. Her work has made this descriptive article possible, but its errors should not be laid at her feet.

Gymnopus dryophilus ▼ ▲

Cap 20-50 mm diameter, opaque, hygrophanous, slightly greasy-waxy feel domed, becoming plane in age, wide range of colour from very light (bottom photo & title banner) to dark (upper photo—note that camera lightens the cap more than in real life), in various shades of orange-yellow tan to brown.

Gills close, free or almost so, white, cream, yellow or tan.

Stem 3-6 x 30-60 mm (slightly longer than mature flat cap diameter), even or club shaped, radicating if in rotten wood, smooth, no ring, white to cream rhizoids at base, white, cream, yellow or tan, lighter than cap.

Flesh white to cream, "mushroomy" smell, mild taste.

Ecology in forest on duff, primarily hardwood, but occasionally on seemingly "pure" conifer duff; at times on rotten wood. May to September.

Gymnopus alpinus s.l. ▼ ▲

S.l. = sensu lato = in the broad sense, i.e. may encompass other similar species.

Cap 20-50 mm diameter, opaque, hygrophanous, slightly greasy-waxy feel domed, becoming plane in age, wide range of colour from pale beige to dark, in various shades of yellow-tan to brown.

Gills close, free or almost so, white, cream, yellow or tan.

Stem 3-6 x 30-60 mm (slightly longer than mature flat cap diameter), even or club shaped, smooth, no ring, white to cream rhizoids at base, white, cream, yellow or tan, but lighter than cap.

Flesh white to cream, "mushroomy" smell, mild taste.

Ecology outside tree zone, either in bogs, moors, heaths or barrens with some organic matter; usually with some vascular plants. May to September.

Gymnopus confluens ▼ ▲

Cap 20-50 mm diameter, opaque, hygrophanous, dry, fibrillose (loupe), bell to dome shaped, becoming plane, tan, beige, fading to cream or whitish.

Gills very close, free or almost so, cream to tan.

Stem 3-6 x 30-90 mm (equal to or longer than twice mature flat cap diameter), even or slightly widened at base, entirely coverd with dense fuzzy white hairs, no ring, white, cream, or tan.

Flesh white to cream, smell & taste unremarkable.

Ecology on leaf litter in coniferous or mixed woods. Known elsewhere to decompose coniferous debris as well. Only collected in September, although season likely longer.

Differences from *G. dryophilus* and *G. ocior*: hairy stem, stem-cap proportion greater, colours consistently paler, dry cap.

Photos this page: Roger Smith

Gymnopus eneficola ▼

Photo below. To give an idea of relative size, this photo scaled to match that of *G. confluens*, beside it, left. Full description and more photos on p 4.

Differences from G. *confluens*: smaller size, greater stem/cap ratio, paler colour, wider gill spacing.

Gymnopus subnudus ▼ ▲

Cap 10-35 mm diameter, opaque, hygrophanous, dry, fibrillose (loupe), domed with inrolled margin, becoming wrinkled, eventually plane, cinnamon to dark brown, fading to pinkish tan, margin lighter.

Gills distant to subdistant, free or almost so, whitish to pink buff, edges lighter, finely sawtoothed (loupe).

Stem 3-4 x 20-70 mm, even, often flares at top, pruinose at the top, becoming hairy toward bottom, hairs white; stem tan to pinkish buff.

Flesh cream, smell & taste unremarkable.

Ecology saprobic on leaf litter. Only collected in coastal barrens of Labrador Straits in August, although season likely longer.

Note: Only a single collection to date, morphological and DNA identification. Description largely based on outside sources.


Photo: Maria Voitk

Gymnopus alkalivriens ◀ ▼

Cap 8-28 mm diameter, opaque, hygrophanous, may have slight greasy feel, domed, becoming plane in age, very dark to mid-brown.

Gills close to subdistant, free or almost so, brown with lighter edge.

Stem 1-3 x 30-80 mm, even or slight basal enlargement, smooth with brown downy hairs near base, no ring, hollow, brown, dark purplish brown to nearly black brown.

Flesh beige, smell & taste unremarkable.

Ecology saprobic on plant litter. Only found in *Dryas* patches on the limestone barrens of Watt's Point in June, although season likely longer. Plentiful in the area at the time.

Note: To date only known from one small area. Morphologic identification only; did not yield DNA for confirmation. Description augmented by outside sources.

KEYS

Both the keys and descriptions work because the number of species is small in Newfoundland and Labrador. In regions with greater mycodiversity these same keys and descriptions may be misleading; microscopic examination and other studies may be needed for accurate identification. Should our species harbour additional species, not found so far, the keys may also become less reliable. However, given that this review is based on a decade of collection, the likelihood of additional species is so low, that these keys should prove accurate for field identification the vast majority of the time. Lighter background or gray print indicates less experience, less certainty.

		***GYMNOPUS*—SPREAD SHEET KEY**					
		dryophilus	***alpinus***	***eneficola***	***confluens***	***alkalivirens****	***subnudus****
CAP	**diameter**	20-50	20-50	6-36	20-50	8-38	10-35
	texture	greasy	greasy	dry, mealy	dry, mealy	dry to greasy	silky, wrinkled
	colour	light to dark browns	light to dark browns	light beige to white	beige to light tan	dark brown	brown to cream, often pinkish
GILLS	**spacing**	close	close	distant	very close	close to medium	medium to distant
	colour	white, cream, yellow, beige	white, cream, yellow, beige	whitish	beige to tan	brown	beige to tan
STEM	**height**	30-60	30-60	12-75	30-90	30-80	20-70
	texture	smooth	smooth	hairy (white)	hairy (white)	smooth with brown hairs at bottom	hairy (white)
Stem/cap diam		1.0-1.5	1.0-1.5	1.8-2.2	1.7-2.0	1.5-2.4	1.7-2.0
HABITAT		forest	open areas	forest	forest	open areas?	open areas?
SEASON		May-Sept	May-Sept	Sept-Nov	Sept (range unknown)*	June (range unknown)*	Aug (range unknown)*

Gymnopus—Dichotomous key

1. a) Resembles *G. dryophilus*** 2
   b) Does not resemble *G. dryophilus* 3
2. a) Grows in the forest .... ***G. dryophilus***
   b) Grows on bogs, barrens or heaths .... ***G. alpinus*** **s.l.**
3. a) Mature fruitbody cream to white (may be beige in youth) 4
   b) Mature fruitbodies some shade of tan to brown 5
4. a) Gills close, gill edges smooth .... ***G. confluens***
   b) Gills distant, edges finely sawtoothed (loupe)........................ ***G. eneficola***
5. a) Stem smooth (may be wooly at the very bottom) .... ***G. alkalivirens***
   b) Stem definitely hairy (upper part may be smooth with age)... ***G. subnudus***

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*insufficient experience with the species in NL; characters from outside sources may not be reliable for the province.

**variously brown, slightly greasy cap, about 35 mm diameter; near-free to free, close, white, cream or yellow gills; smooth stem same length as cap diameter or little more.

THE MAIL BAG

OR WHY THE PASSENGER PIGEONS ASSIGNED TO SERVE THE LAVISH CORPORATE AND EDITORIAL OFFICES OF OMPHALINA GET HERNIAS

Congratulations for a fine issue (O-V-2) on morels, particularly those of Newfoundland and Labrador. I especially enjoyed Kerry O'Donnell's overview of morels and morel study in North America. As an outsider (from that green province in O'Donnell's Figure 6), and for readers who might collect morels in parts of Canada beyond NL, a few comments:

1) Figure 6 encapsulates a huge amount of work by Kerry O'Donnell (et al. 2011), Michael Kuo (2005, 2008, Kuo et al. 2012) and many collaborators, but might give some the impression that the work is done. I don't think any of the authors would say that themselves, but the next two points list a couple of examples.

2) George Barron, referring to the "old name" Armillaria mellea, in contrast to the "newer name" Armillariella mellea that was in vogue in the 1980s, said "Don't worry about too many of these new names - we will be using the old ones again soon." (He was right, at least as far as the generic name is concerned.) At that time we had just learned to use the name Morchella elata for what we had once identified as *Morchella angusticeps*. Now, the correct name for the "classic black morel" of eastern North America is again Morchella angusticeps. But wait—it is not reported from Canada in any of the publications I mentioned above, and it is not reported in the map in Figure 6 of your hallowed journal. What's up?

3) *Morchella septentrionalis*, its nearly look-a-like sister with slightly smaller fruiting bodies and spores, is known "from roughly 44 N latitude northward" (Kuo et al. 2012), but is also not reported from Canada, nor indicated in any of the Canadian provinces north of 44 N in Figure 6. Canadian morel-hunters—we have work to do!

Greg Thorn

Comment by Kerry O'Donnell:

Hopefully the OMPHALINA issue will stimulate more research on morels in Canada. Clearly Fig 6 shows how little is known. Like you, I was surprised that *Morchella angusticeps* and *M. septentrionalis* weren't found, but I am 100% sure that they are present in Canada. Fortunately, types exist for most of the morels in NA and Europe. More work is needed to find out what is the real *M. elata*. Hopefully collections near where Fries collected it will resolve this issue. Maybe you can use your newsletter to stimulate people to collect morels throughout Canada and find someone [maybe a MS student] who is interested in identifying them molecularly.

Ed comment: There you have it, folks. It took the current workers over a decade to collect representative samples, and most came from the US. If we could get all mushroom clubs, all herbaria and all Mycology departments in Canada involved, collection of representative samples could be done in one season (say, spring, 2015). A great project for some Department to take on and follow up with the sequencing the same year. And, bingo!, we'd have a much more complete picture of what morels grow in Canada. If our insular province, famed for its low diversity, yielded two new species, who knows what unknown species lurk in the Canadian woods?

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