OMPHALINA

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Newsletter of FORAY NEWFOUNDLAND AND LABRADOR

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Jul. 14, 2018

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.

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OMPHALINA, *newsletter of Foray Newfoundland & Labrador, has no fixed schedule of publication, and 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.*

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Centre for Newfoundland Studies, Queen Elizabeth II Library (printed copy also archived) <collections.mun.ca/cdm/search/collection/omphalina/>.

COVER

Otidea alutacea s.s., Humber Village, trail to Barry's Lookout, 9 Sep., 2006.

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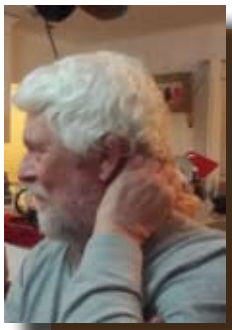
CONTENT



Message from the Editor

Happy Bastille Day! About two months to foray time! Please register early, to make life easier for the organizers. Read up on *Suilli* and remember to bring your own linen, pillow and blankets. See Foray Matters, next page.

Around a few speculative articles, this issue contains three reports by three different sets of investigators from three different parts of the world about new discoveries made by studying some of our foray collections. If you find that a bit technical, you need not read every word, but do peruse the stories a bit, to get an idea of the sorts of things that can be discovered from study of our collections: a beneficial spin-off beyond our own pleasant week-end, with significance well beyond our own borders.

I like the *Otidea* story, partly because here molecular studies confirm morphological identifications made with the help of a world monograph. We extend the range of sequence-identified *O. leporina* from Europe and western North America, *O. cantharella* from Europe, and *O. pseudoleporina* from Western North America, all to the Atlantic coast. Most unexpected (and therefore, interesting) is that the species of *O. alutacea* found in NL is the same as the species from Europe. *Otidea alutacea* is a complex of several phylogenetic species, and hitherto the original species was only known from Europe, while two other species were known from North America. Now molecular studies show ours to be the same as the original European species, not one of the North American ones.

Uncannily similar is the *Cudonia* review, also carried out with the help of a global study: it reveals a potential new species and the probable range extension of the European sensu stricto type species to NL.

We have discussed lilac inocybes before. Now we report the investigations of Matheny and Sweeney, which show that we have two species, difficult to tell apart. One is *I. sublilacina*, a new species, and the other is *I. pallidicremea*, the commoner of the two here. Both are distributed across the continent to the Pacific coast. *Inocybe lilacina* does not seem to grow in our province.

Erratum paginatum

Here's the routine red **Erratum**.

Last issue's page numbers were mixed up and did not match those in the Index. Troy McMullin notified me within minutes.

Our agreement with the libraries that archive our newsletter is that once archived, changes will not be made. However, this was so early in the morning that although sent out, the libraries were not open yet, so I sent them a corrected version, asking them to file it instead of the earlier. All were good enough to do so, without hitch. Thank you, librarians!

So, now you know why you have a lichen issue with funny page numbers. If this bothers you and you prefer a corrected issue, just go to our website and download the issue from there.

See you at the foray!

FORAY MATTERS…

SEP. 28–30, 2018

BURRY HEIGHTS, SALMONIER LINE

The Avalon Suillus Foray

There are places left, so please register while there still is room. It is much easier for the organizers to arrange things if final numbers are known, and it is definitely easier to pay our expenses once your cheques have been cashed!

The Burry Heights **CAMP…**

… really is a **CAMP**. Camping is a somewhat rustic activity, to which you bring some of your own resources. Please bring your own bedding (sheets, pillow, blankets or sleeping bag) and toiletries (towels, soap, etc.). Please do not forget, because Burry Heights no longer has spare bedding available for a separate fee, as it did in the past. This lowers cost, permitting us to keep costs down as well. A bed and mattress are provided.

Faculty from away: the organizers will provide bedding and toiletries from home for our invited guests, who travel from afar.

We have about 20 rooms at our disposal. With an anticipated registration of 60, there will be need to share rooms. Therefore, if you have some people in mind with whom you would like to share, please write this in the margin of your registration form. If you have already registered, but would like to choose your room mates, please send an e-mail to Registrar Thurlow, who will pass it on to the Accommodation Directorate.

Butter Pot Park Mycoblitz

Our tradition to open the foray with a quick census of mushrooms in an adjacent protected area continues this year with a mycoblitz of Butter Pot Provincial Park, which is almost next door to the camp headquarters. See the previous issue for a brief description of the Park.

Please be at the **Park's parking lot Fri., Sep. 28, 2018**, in time to join in a planned **departure at 11:00 AM SHARP**! It will be a three-hour event, leaving for Burry Heights at 2:00 PM to allow time to process your finds, register and get ready for the evening reception/meal and talks.

Registration

Registration begins on site Friday, from 4–6PM. A reception-supper will follow, with talks after.

How To Get There

Burry Heights Camp is on the Salmonier Line (Route 90 west from the TCH). For directions and a map, please go to the Burry Heights website: <www.burryheights.com/how-to-find-us.html>.

See you at the foray!

Michael Burzynski, President

Photo: Michael Burzynski

A phylogenetic review of *Otidea* in Newfoundland & Labrador

Kadri Pärtel, Heidi Tamm, Andrus Voitk

Do you feel that you have seen this title before? Give yourself full marks. It comes from the March, 2017, issue.[1] That was a morphological study, prompted by finding two collections of *Otidea*, a very uncommon genus for us, on our Goose Bay-Happy Valley foray in Labrador. The present report is a follow-up, bringing you the results of sequencing these same collections. We thought you might like to learn what we found and what we suspect this means, even though such conclusions must be considered very preliminary; definitive conclusions require study of more specimens from eastern North America, preferably using multilocus analysis. Because this report deals with phylogenetic studies, it is a bit technical. If all you want to do is identify the species of *Otidea* you have collected, skip this and turn to the 2017 article, which describes them macro- and microscopically. You will be glad to learn that phylogenetic analysis confirms the 2017 identifications, even down to the questionable areas—surely a tribute to the monograph by Olariaga et al.,[2] used for the identifications. Usually, when I try to identify a species in my hand that I do not know, even the best of descriptions make me more confused, rather than less.

Abstract

Specimens of the genus *Otidea* in herbaria associated with Foray Newfoundland & Labrador occurred once in every 1000 collections. In total, five collections representing four species were encountered. One, *Otidea pseudoleporina*, was lost in the process, and was identified only morphologically. If this identification can be confirmed by molecular studies, the known range of *O. pseudoleporina* in North America will have extended from the Pacific to the Atlantic Coast. Nuclear studies of the others extended the known distribution of sequence-confirmed *O. leporina* from Europe, Asia and western North America to include eastern North America; the distribution of sequence-confirmed *O. cantharella*, hitherto known only from Europe, to eastern North America; and the distribution of sequence-confirmed *O. alutacea* s.s. from Europe to eastern North America.

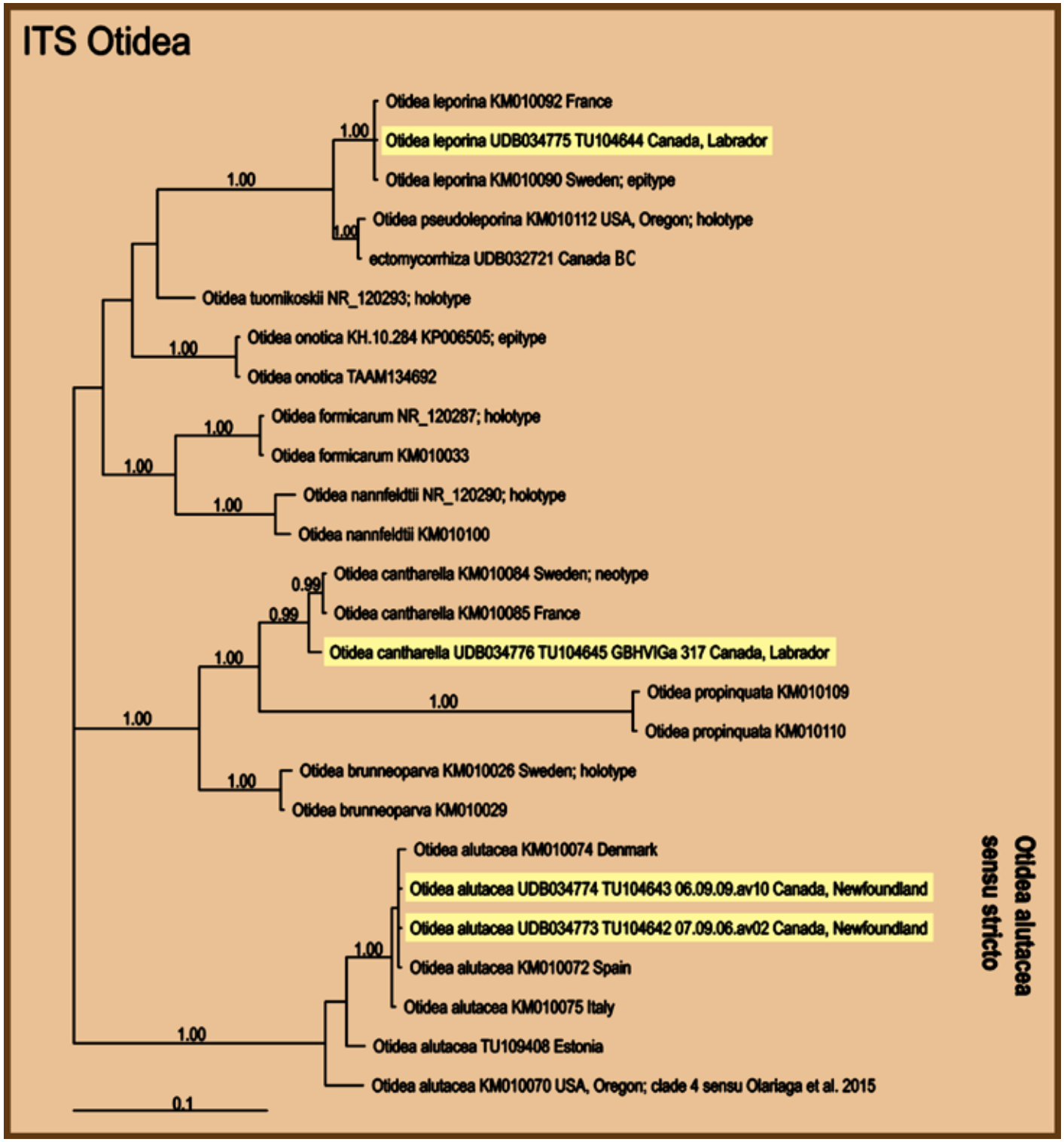


Figure 1. *Bayesian tree, showing three of the four NL species on yellow panels. See text for interpretation.*

Otidea is not a common species in Newfoundland and Labrador (NL): only six collections referred to that genus were made over 16 years, combining both AV's collections throughout the season, and the annual week-long foray collections (Table 1). As reported last year,[1] these collections were reviewed both macro- and microscopically and identified with the aid of a recent global monograph,[2] yielding four species of *Otidea* in NL. In view of the lack of experience with this genus among local mycophiles due to its scarcity, the reported difficulty identifying the species,[2, 3] accounting for high unreliability of field identification, the present study was undertaken to confirm these identifications with molecular studies.

Unfortunately the specimen of *O. pseudoleporina* was lost en route to sequencing, but a specimen exists in

Table 1. NL specimens studied. Herbarium: Main herbarium (majority of collection) above, secondary herbarium in brackets below. Sequence number: GenBank above, UNITE below.

Collecting nr	Herbarium	Sequence nr	ID	Date	Location	Coordinates	Habitat	Trees
MS2-087	DAOM744419	–	***Otidea pseudo-leporina***	13-Sep-08	NEWFOUNDLAND Notre Dame Provincial Park Ski trails	49.11391°N 55.07774°W 832 m asl	Mixed woods, loamy soil	Birch, spruce
GBHV16A-297	DAOM744420 (TU104644)	UDB034775	***Otidea leporina***	08-Sep-16	LABRADOR Mud Lake	53.30591°N 60.17218°W 0 m asl	Mixed woods, soil, moss	Alder, birch, balsam fir, willow, spruce
GBHV16A-317	DAOM744421 (TU104635)	UDB034776	***Otidea cantharella***	06-Sep-16	LABRADOR Near Goose Bay	53.11568°N 60.50510°W 273 m asl	Conif. woods, moss	Alder, birch, larch spruce
06.09.09.av10	DAOM744422 (TU104643)	UDB034774	***Otidea alutacea***	09-Sep-06	NEWFOUNDLAND Humber Village woods	48.98784°N 57.78934°W 106 m asl	Descid. woods, soil	Birch
07.09.06.av02	DAOM744423 (TU104642)	UDB034773	***Otidea alutacea***	06-Sep-07	NEWFOUNDLAND GMNP Western Brook Pond	49.78602°N 57.83908W 25 m asl	Mixed woods, duff, conif. & decid.	Birch, balsam fir, larch, spruce

DAOM. If the identification can be confirmed with sequencing, the range of this hitherto western North American species can be considered transcontinental.

Figure 1 shows the Bayesian tree placing our remaining specimens among some of their relatives, using the primary barcoding locus (ITS). It shows three things.

1. The cosmopolitan *O. leporina*, hitherto confirmed from Asia, Europe and western North America, is now also sequence-confirmed from eastern North America.
2. Our *O. cantharella* nestles with its European relatives, but a small distance away. Although the node is well supported, this distance is too small to make a case for a separate species, especially with a singleton collection. However, because the spore size also differed from *O. cantharella* s.s., it is worthwhile to study additional specimens from North America, using multilocus analysis, to examine this possibility.
3. Olariaga et al. showed that *O. alutacea* was a complex of at least three clades from Europe and two from western North America, all but the sensu stricto type awaiting description and circumscription as novel species. The spore size of ours most closely matched that of the European *O. alutacea* s.s., not either North American clade. Nuclear studies agree: ITS of our collections completely matched that of the European *O. alutacea* s.s. If this is a true finding, then past experience suggests that the same species should also grow on the northeastern mainland.

Because the number of specimens was small and only ITS was analysed, our interpretations need confirmation with more detailed investigations. However, these preliminary results raise sufficiently interesting questions to warrant such more definitive investigations. The specimens are available from public herbaria and sequences from public genetic depositories.

For photos and descriptions of these species, please see last years' report.[1]

References

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2. Olariaga I, Van Vooren N, Carbone M, Hansen K: A monograph of *Otidea* (Pyronemataceae, Pezizomycetes). Persoonia 35: 166 – 229. 2015.
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Aleuria aurantia, orange fall cup

Andrus Voitk

This species has been treated before on these pages.[1] The appeal of fungi is that you can pursue your interest as far as you wish, without running out of fresh areas of enquiry. For example, the first thing that draws most people to mushrooms is the wish to find something edible for the table. Texts describe *Aleuria aurantia* as edible, even if not choice. That said, its vivid colour gives it undeniable visual appeal as a salad garnish. The proliferation of digital cameras draws photographers to learning mushrooms in order to identify what they photograph. Suppose that you have encountered the species for several years and satisfied your curiosity about it as an edible as well as an alluring subject for photography. This may be enough for you, but if you are still curious, there remains much for you to discover. It would not surprise most of us to learn that we can discover many things about this mushroom that we did not know before. But would it surprise you to learn that you may even discover things about it that nobody knew, not even after significant scientific study in the laboratory?

For example, how does this species makes its living? Unexpectedly, the answer is not clear. It has been discovered that saprobic and mycorrhizal fungi have different ratios of Nitrogen and Carbon in their tissues.[2] However, an isotopic study of the N:C ratio of several fungi found the results from *A. aurantia* to be sufficiently unclear that the investigators were hesitant to designate it as unequivocally mycorrhizal.[3]

The curious naturalist can turn to our favourite text, the woods, for an answer that had eluded the laboratory bench. The substrate in the title banner is obvious: sand and gravel, with a minimum of organic matter. Intuitively, one would assume that this substrate does not contain sufficient nutrition to support a saprobic lifestyle. Needless to say, the vigilant naturalist always checks for cheating, because some lignicolous saprobes feed on a rotten piece of wood hidden under the surface. None was found here, and a similar check of other fruitings produced the same result, suggesting that buried wood is not a substrate for this species.

Of five previous conscious encounters with the species elsewhere, four were on gravelly paths and one in a grassland with poor, sandy soil. The grassland specimen may be open to doubt, but there was no doubt about the specimens from the path. All came from sandy-gravelly soil, with little to no organic matter to support a saprobic lifestyle. What is the experience of others in this regard? Texts that describe habitat, often mention a preference for disturbed soil. Google Images offers hundreds of photos of *Aleuria aurantia*. The vast majority seem to grow on gravel or sandy soil. Of the first 30 photos (excluding three obvious misidentifications and one microscopic image), none grow on humus or duff, two grow close to wood, and 28 grow on sandy-gravelly soil, just like those we have seen here.

The specimen shown in the title banner comes from the trail to Mt Ignoble, a snowmobile/ATV trail made in the woods over five years ago with the aid of a bulldozer, removing all soil, plants and trees, and kept

Inocybe lacera, Mt Ignoble trail, Jul 29, 2014; photo: Maria Voitk

Laccaria bicolor, Mt Ignoble trail, Sep 17, 2017; photo: Maria Voitk

clear by repeated use. Fruitings of *A. aurantia* began appearing along this trail two years after the trail was in place. Over the same time only two other species have been found consistently growing in the middle of the trail: *Inocybe lacera* and *Laccaria bicolor*. Both species are well-known mycorrhizal mushrooms, whom no woman or man of probity would dream to accuse of saprobity. While we have found both mycorrhizal species and saprobes along the side of the trail, we have not found any sparobes in the middle.

Summary

This species is described as a denizen of ground devoid of organic material, and similar habitat can be seen on the vast majority of photos of the species. Over five years it has been observed repeatedly on a substrate devoid of significant organic material. The two species encountered on the same substrate in the last five years are both mycorrhizal. Maximal likelihood is that *A. aurantia* is a mycorrhizal mushroom. The naturalist's textbook, the woods, has something to offer our colleagues in the laboratory: if not conclusive proof, at least encouragement to pursue their enquiries

BTW, for the spring orange cup, see the Apr. 1 issue.[4]

References

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2. Hobbie EA: Insights into N dynamics during succession: linking isotopic evidence and modeling. PhD thesis, University of Virginia, VA. 1997.
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Melastiza sp, orange small fall cup

Photo: Urve Manuel

Andrus Voitk

This article is a companion to the previous one, not so much because it also deals with an orange cup, but more because once you begin to look at the environment an organism chooses for clues to its lifestyle, this small cup seems to echo—at least partly—what we saw with *Aleuria*. This photo came to me just after I had finished writing the previous article, and the parallelism was unavoidable: another orange cup, seemingly alone in the middle of a gravel road in the woods. The only difference seemed to be one of size: these cups were under 4 mm in diameter. The title banner surely is a testament to the cell phone: even magnified beyond its limits, the photo adequately reveals the pertinent details of the mushroom.

First question: what is it? Here you can give your imagination free rein, because a specimen was not collected at the time. When a return trip was made to collect the specimen, repairs had been done to the road, with destruction of the surface at that site. So, feel free to guess and nobody can prove you wrong. This said, the common small orange disc with a hairy margin is a species of *Scutellinia*, the commonest being *S. scutellata*. However, the hairs of *Scutellinia* are black or very dark and usually long, so this does not fit. A genus with short, brown or light hairs is *Melastiza*.

Which brings us to lifestyle. *Melastiza* is dsecribed as growing on sandy or gravelly soil. This one, from the middle of the road, on a compact sand and gravel mixture, certainly qualifies. There is nothing in this "soil" that would satisfy a decomposer of organic matter. However, some species of *Melistiza* have been suspected of being moss parasites, and others of having ectomycorrhizal relationships.[1] As you can see on the photo, the fungus grows with some small moss buds. They do not seem to be dead or parasitized and there does not seem to be much moss (this is a road travelled by cars), making moss parasitism somewhat unlikely. However, a mutualistic relationship with the young moss is possible. As would an ectomycorrhizal relationship with roots of roadside trees (mostly conifers in this location).

This is why I like mycology—one of the few sciences where it is possible to wax learned, discussing the identity, and even intimate matters of lifestyle, of an organism one has never seen, collected or examined.

References

1. Perry BA, Hansen K, Pfister DH: A phylogenetic overview of the fami.ly Pyronemataceae (Ascomycota, Pezizales). Mycological Research 111:549–571. 2007.

Melanoleuca verrucipes

Andrus Voitk

In their otherwise directionless enthusiasm, the previous two articles made a somewhat shocking allegation, namely, that possibly a field mycologist might provide answers to questions not even clear to the laboratory investigator. The day before penning this article I received the Boston Mycological Club's Bulletin, with a description of *Melanoleuca verrucipes* by Larry Millman.[1] Fresh from my second encounter with this species, I decided this somewhat uncommon mushroom might make a fitting subject to test the above radical claim.

My first encounter with *Melanoleuca verrucipes* came when Henry Mann led me to some on a chip pile at the Pasadena Ski and Nature Park. White mushroom, flat cap 4–8 cm in diameter with a very low slightly brownish central umbo, attached gills, straight stem barely longer than cap diameter, with conspicuous brown out-turned *Leccinum*-like scale tips, white spore print, ornamented spores. Having seen nothing like this before, it took me quite a while to identify it. The second encounter came eight years later, in an entirely different habitat: several kilometers from the closest road into a raised bog, under waist-high tuckamore in the shallow gulch of a small creek, I saw something flicker white under the dense branches. There was this wood-chip dweller again, by a creekside in a bog, apparently on a thick layer of humus.

Now that we know the mushroom, let us see what "scientific facts" we can find out about it. How does it make its living? Is it mycorrhizal or saprobic? Amazingly little is written about this regarding *Melanoleuca*. Texts I have consulted avoid the topic, and I found no studies of either mycorrhizal or saprobic fungi that included the genus. Can field observations provide evidence for the answer?

Lifestyle. The wood chip pile was in a meadow, away from trees. The title banner shows that the chip pile was partly decomposed, with clover, dandelion and other herbs growing on it. This suggests that *M. verrucipes* is a secondary or tertiary decomposer. Although the second find was among tuckamore, the relationship may be with the well decomposed duff, not tree roots. Millman's specimens grew on "mulch", and he reports that substrate for other finds as well. Many photos on Google Images, Mushroom Observer and MyCoPortal also show them on somewhat decomposed wood chips. The relatively early fruiting time of the second collection (Aug 9) adds weak support for a saprobic lifestyle. Most of the time, mycorrhizal fungi fruit after their tree associates have fruited and can spare energy for their fungal partners

to fruit. Finally, most other *Melaleuca* species I have seen grow either in lawns or duff-rich places in the woods, so my guess is that this species, probably the entire genus, are secondary decomposers, saprobes to a man.

Distribution. Two collections in 18 years makes it uncommon here, and Millman considers it rare in Maine as well. In fact, he considers it so rare that he wonders if it might have been introduced with soil from the Pacific coast, where it seems to be more common. The species was first described by Fries in 1872, found near Uppsala, Sweden,[3] and is known from most of Europe. Anthropogenic introduction of a European species to NL might be more likely via St John's, the oldest city in Canada, rather than the west coast of NL with subsequent anthropogenic transcontinental migration to the east. In any case, the wood chips where our Pasadena collection grew, came from NL Power's cutting and chipping local brush. In addition, finding the species in a remote wilderness bog suggests that it is native.

Taxonomy. The likelihood that each disjunct geographic population may represent a different genetic entity in a species complex would be somewhat higher for a mycorrhizal species, but probably a little less so for a saprobic species, which may be sympatric across the continent, with an opportunity for exchanging genetic material throughout its range.

Conclusion

In the absence of scientific evidence, even two encounters in the field, combined with review of other observations and past knowledge, can provide clues for a likely hypothesis for the lifestyle, origin and taxonomic relationship of a species. These clues also suggest potentially fruitful avenues for further investigation for any doubting Thomas in the lab.

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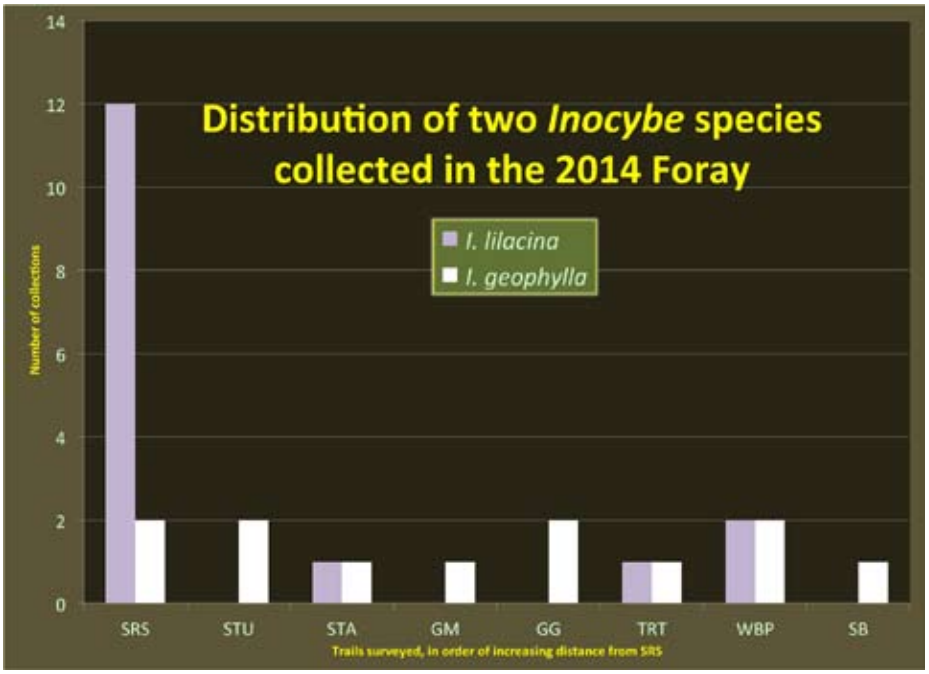
2. Vizzini A, Para R, Fontenla R, Ghignone S, Ercole E: A preliminary ITS phylogeny of *Melanoleuca* (Agaricales), with special reference to European taxa. Mycotaxon 118:361–381. 20201
3. Fries ME: Hymenomycetes Europaei. Epicrises systematis mycologici. Uppsala, p 43. 1874.

Lilac inocybes in NL

Andrus Voitk
with just a little help from
Brandon Matheney, Rachel
Swewnie, and FNL participants

If you participated in the 2014 Foray, you may remember the graph on this page from the 2014 Foray Report.[1] It shows that in 2014, three times more lilac species of *Inocybe* were collected in Sir Richard Squires Memorial Provincial Park than on all other trails together. We returned there the next year, and these two years account for 20 of the 36 lilac inocybes collected by our foray in 15 years. This disparity first drew our attention to these species. We discussed it with Brandon Matheny, a keen student of the genus, and sent him some specimens.



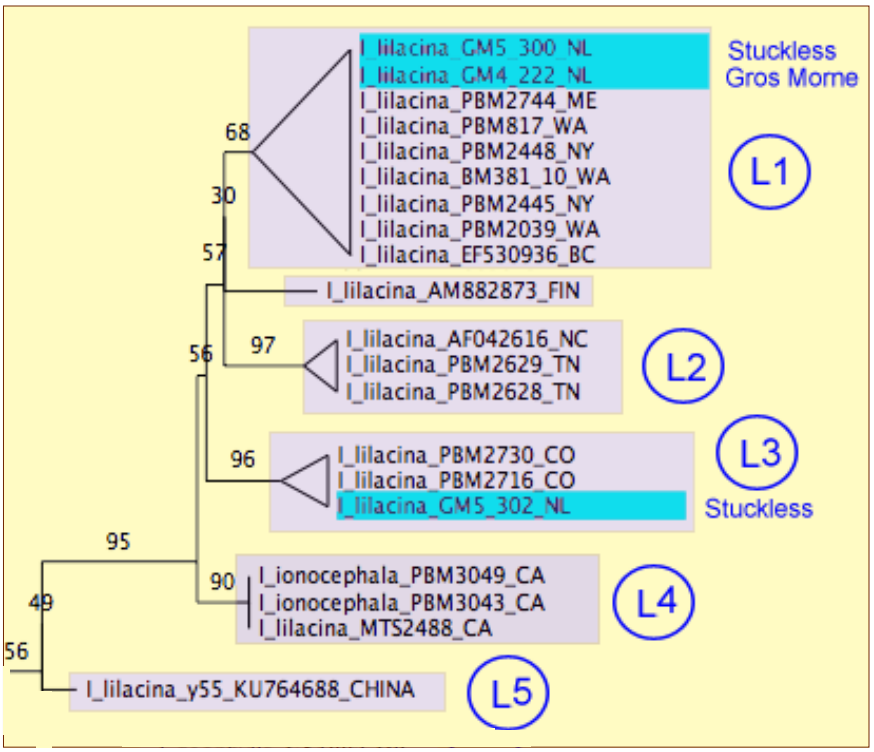
After some study of this group, Brandon shared some preliminary results with us, which we, in turn, shared with you.[2] The upper phylogeny tree on the next page, combining findings from two loci, is modified from that report. It shows that several genetically separate species of lilac inocybes were found (each separate lilac panel); our specimens (teal background) fell into two clades. The big job left was to describe them and determine which had been described before and which were newly discovered

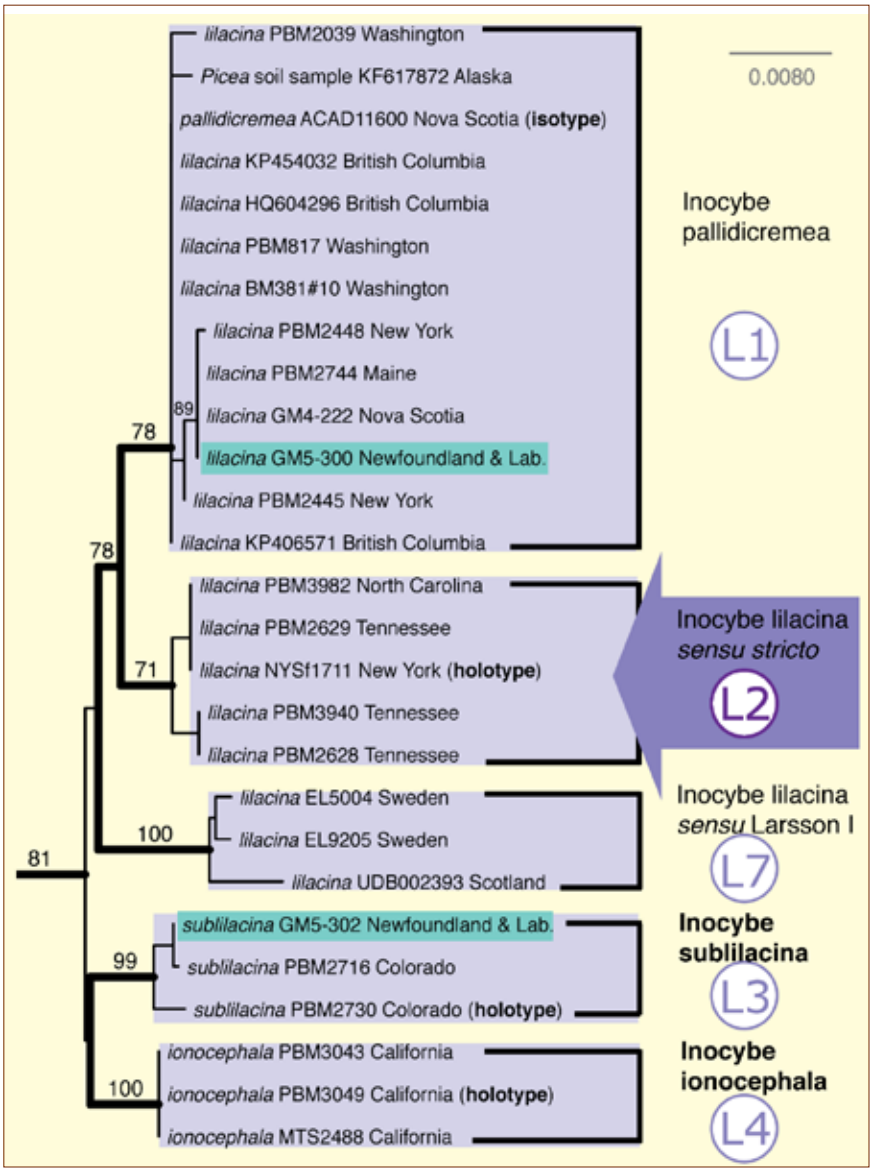
species. This work is now done and published,[3] and the lower tree, combining data from three loci, is modified from this recent publication.

There are several lilac species of *Inocybe*, not all shown on this adaptation. The four North American clades, L1–L4, have been identified, named and described, and hence we know what our two species (green background) are called: *Inocybe pallidicremeae* and *I. sublilacina*. The former, by far the commoner species, was described from Nova Scotia by Grund and Stuntz, and the latter is a new species. Both species occur in both eastern and western North America.

Of equal interest is what has not been found here: Peck's *I. lilacina* (clade L2, with big arrow). Generally, most species described by Peck are also found here, so why not this time? Well, looking up the origin of the sequence-identified specimens, it seems that they come from woods made up of any or all of beech, hickory, oak and pine. We have no beech, hickory or oak, and precious little pine—very few accessible woods where pine is the primary component. In addition, judging by the sequenced specimens, New York State seems to be the northernmost limit of its range.

Our two species, *I. pallidicremeae* and *I. sublilacina*, are very much alike. Both may be quite dark purple-lilac in youth, but with time the purple disappears, replaced by various shades of yellow-brown or ochre-tan (see title banner). Lilac tones are the last to go on the stem, so that may give a hint, but otherwise they may look like off-white *I. geophylla*, but can be distinguished from *I. geophylla* by the darker tip of the cap and the presence of yellow-ochre at the base of the stem. The differences between our two species (Table 1), while probably real, are not of much help, because the overlap is too big: *I. sublilacina* is slightly smaller,





Inocybe pallidicremeae

Inocybe sublilacina

has slightly bigger spores, and is slightly more intensely lilac. If these differences do not help, remember that *I. sublilacina* is rare, so that odds are greater that you have *I. pallidicremeae*.

Fine. Now that we know what our lilac species of *Inocybe* are and how to tell them apart (well, almost), what else is there for us to do?

Well, actually, quite a lot. Of 36 collections from all over the province, we have sequenced only three specimens from western Newfoundland, yielding two species. A few more should be studied to be representative. Who knows, there may even be another species hiding somewhere? The Avalon and the adjacent southern part of central Newfoundland seem to be exceptions: no lilac inocybes there, at least so far. Maybe this year?

Even if we only have two species, because we cannot tell them apart but know there is a small degree of difference in spore size, it could be worthwhile to measure the spores of all our specimens. Using average measurements per collection should narrow the amplitude of size fluctuation, and may make differences more obvious, so this would be a worthwhile effort. It would be nice if we could tell them apart without the need to sequence them. Then we could get an idea of their relative distribution within the province. Any reader interested in taking on such a project, please let me know, so that we may look forward to another installment of the lilac inocybe story.

And, finally, we are still left with an unexplained phenomenon: the disproportionately high occurrence of these species in Sir Richard Squires Memorial Provincial Park—the phenomenon that brought these species to our attention in the first place. Maybe if we find out more about them, we can even get some idea about this.

Table 1. Comparison of our two species

	pallidicremeae	*sublilacina*
cap diam[3]	10–40 mm	10–28 mm
stem height[3]	35–60 mm	17–35 mm
ave. spore size[3]	9.0 × 5.3 µm	9.4 × 5.7 µm
lilac intensity	light ephemeral	minimally more
occurrence[3]	common	rare

References

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2. Voitk A, Matheny B: White and lilac inocybes II. Omphalina 8(3):20–23. 2017.
3. Matheny PB, Swenie RA: The *Inocybe geophylla* group in North America: a revision of the lilac species surrounding I. lilacina. Mycologia 110:DOI: 10.1080/00275514.2018.1469880. 2018.

The Bishop's Sketchbook

Preliminary report:

Genus *Cudonia* in NL

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Is databasing, photographing, drying and archiving our foray finds worth it? A lot of effort goes into these tasks at our foray by a dedicated team. Accession of specimens to our fungarium and the "cleaning up" of the list takes several people at least a month or two after the foray. Then it is uploaded and made available on our website and MyCoPortal (a site dedicated to making the collections of most herbaria, from the New York Museum of Natural History to FNL, available to the scientist and amateur alike).[1] That is a lot of effort and time from a lot of people; it definitely takes up resources, adding to the cost of what otherwise could be a simple weekend of public mushroom gathering. What do we get from that effort?

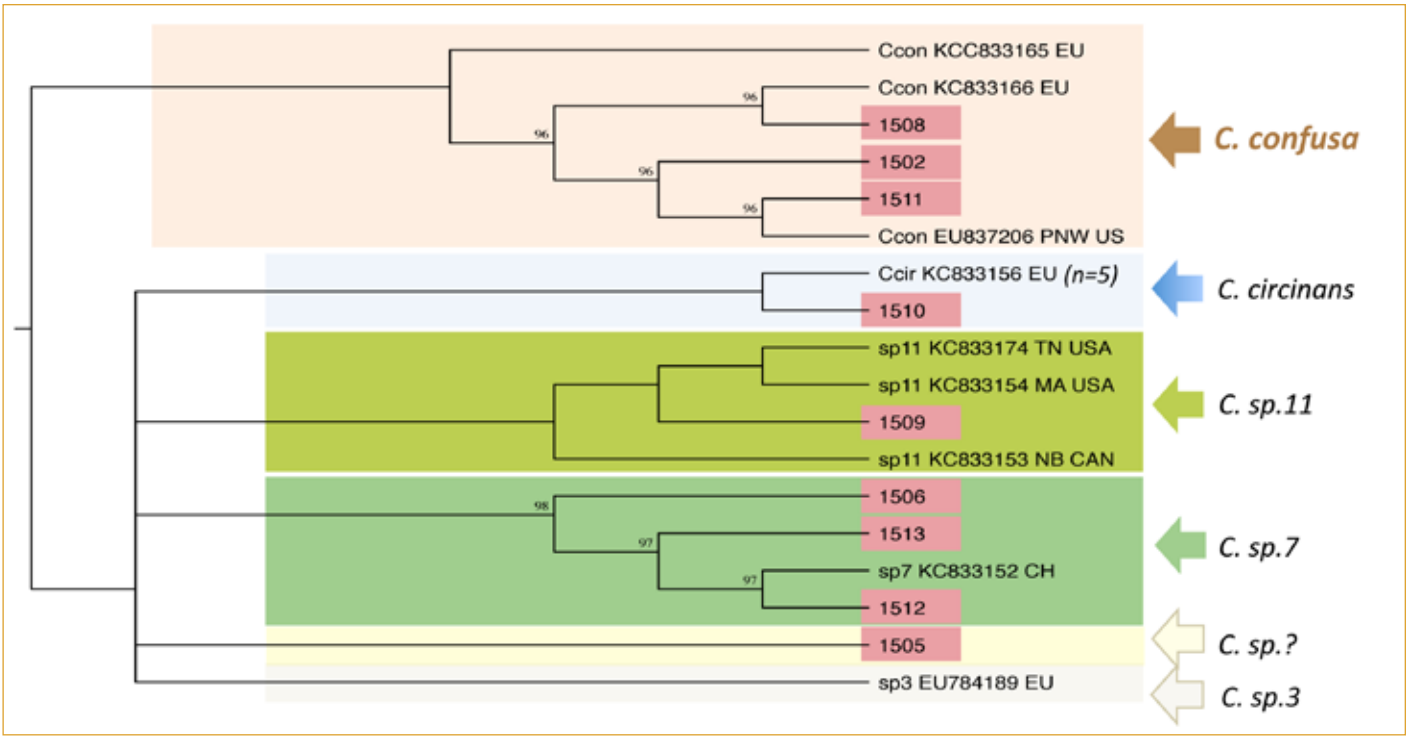
Oh, never mind. Let us leave that question and talk about the genus *Cudonia*, instead.

Cudonia is a small genus of saprobic ascomycetes, mostly restricted to the Northern Hemisphere, with a stem and cap, the cap being the hymenium or reproductive surface, where asci reside, producing spores. Molecular studies of the genus have been sparse until a global study by Ge and collaborators in 2014.[2] In addition to six known species of *Cudonia*, they demonstrated an additional 15 phylogenetic species clades (groups sharing common DNA sequences expected in a distinct species, but not recognized as species before). For the time being they left these species undescribed, labeling them Ge sp1–15. Putative (i.e. not linked to type material) *Cudonia circinans*, type species for the genus, was found limited to Europe only, with close relatives in North America.

In NL the genus is uncommon but not rare, usually found on or among duff in coniferous forests. Not dramatic, colourful, drop-dead gorgeous or edible, this small genus is probably undercollected. Over 16 years the foray fungarium contained eight collections from annual fall forays and AV's fungarium had five, made throughout the season.

Fruiting body shape resembles that of *Leotia*, found in the same habitat, although the latter are gelatinous, unlike *Cudonia*. Should you take an interest in this group and confuse it with *Leotia*, you need not feel bad. Five of our foray specimens identified as *Cudonia* turned out to be *Leotia*—including the specimen listed as "*C. confusa*" that led to this story.

Our story started when the first author (VM), a researcher at UBC and member of the Vancouver Mycological Society, decided to study some *Cudonia* species from E. C. Manning Provincial Park in southwestern BC. To compare her finds to species known from Canada before, she turned to MyCoPortal, where she saw *Cudonia confusa*, a species new to Canada, listed in the FNL collection. She asked to study a sample. After a few e-mails back and forth, AV was able to convince VM that the road to knowing the species of *Cudonia* in Manning Park leads through sequencing all NL collections of the genus. This is the story.



The specimens flew business class across the continent, where they were lined up for the DNA cooker (title banner). Above is a pruned version of the neighbour joining tree based on one marker, produced using clades defined by Ge et al.,[2] and some sequences from that study. NL specimens are shown on a pinkish background. The upper arm is *C. confusa*, and the lower arm is part of a large series in the *C. circinans* complex. If these proportions are representative, then our commonest species of the genus are the *C. confusa* that prompted this story, and the new, undescribed and unnamed species, Ge sp7. We only have one collection of Ge sp11, a taxon represented only by examples from continental eastern North America to date.[2]

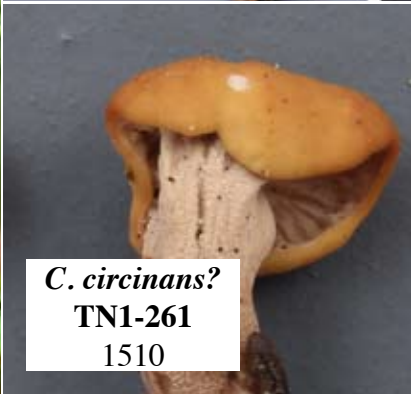
In addition to these three species (in the brown and green panels), we have two collections with more uncertainty about their placement, each on a separate, light coloured panel. The light colour symbolizes uncertainty about their placement. It is possible that yet other species may be present in NL, e. g. sample 1505 was distinct from the rest in the present comparison, so thorough study will be needed to understand its correct placement.

More interesting is the specimen on the light blue panel. The other specimen in that panel is used to represent five samples that Ge and collaborators identified as *C. circinans* s.s. The "ss.", short for "sensu stricto" (= in the strict sense), placed after a name indicates that the "original" or "real" species is meant, not other closely related ones in the complex. Their nearest relative was the undescribed North American species, Ge sp11. Does this mean that *C. circinans* s.s. occurs in North America as well as Europe? NL may be a good source of material to begin addressing this question. Possibly unexpected, such a finding would not be unique: other species complexes are known to have European species in eastern North America (see pp. 2–6).

Why did Ge and collaborators not describe the new species they found? Authors of global studies can identify clades from molecular studies on small segments of dried specimens from all over the world. They are unlikely to know all these species intimately. Even we, in whose backyard these five species were found, would have a difficult time to describe them based on nine collections. Study of many more collections is needed before we can hope to know them enough to attempt a description that differentiates between them.

Description of new species begins with circumscription of prevously known species, linking them to types—or making new typifications, if type material is not available or does not yield DNA. Even *C. confusa* and *C. circinans* s.s., as used above, are assumptions until then. Most collections were from coniferous woods. Because Peck's species are usually found here, of specific interest to us is the placement of the type specimen of the leaf litter denizen *C. lutea*, described by Peck.[3]

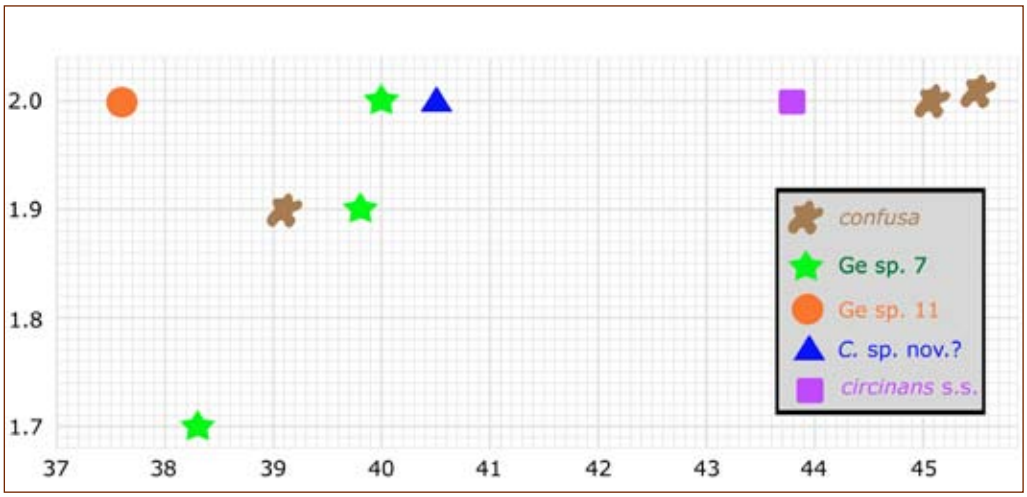
The message for us: we need to do much more collecting of *Cudonia*.



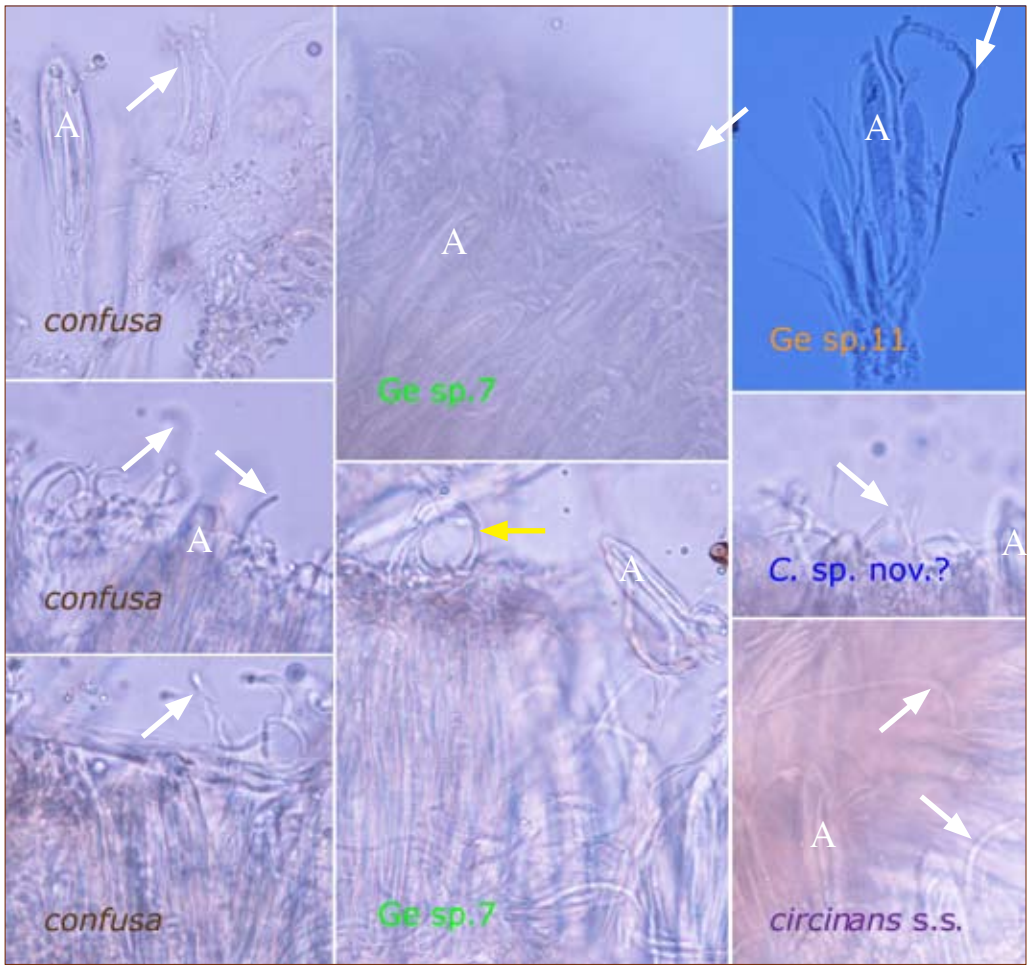
Above are photographs of our sequenced specimens. On the left are in situ pictures of our three collections of Ge sp7: dense troops of small, opaque, hygrophanous mushrooms with caps rarely over 10–12 mm in diameter, growing on coniferous needle duff. The middle column shows photos of two of our *C. confusa*: slightly larger mushrooms, growing in moist woodland *Sphagnum*. The longer stems are usually light-coloured, but as the top photo shows, may also be darker. The right column shows our three singelton species. On the basis of a single photo, no "obvious" character can be considered a reliable differentiator, but we could not resist the temptation to show the underside of the cap of *C.* cf. *circinans*—the only one with stem ridges extending to the cap edge, looking like ridged gills.

The average spore size for each collection (24 spores each, single, blinded observer) is plotted on the left. Although the small numbers do not permit firm conclusions, *C. confusa* seems to hve the longest spores, wile those of Ge sp.7 are shorter. The paraphyses (arrow), the structures between the asci (A), shown on the next page, vary from straight or gently curved to bent like a shepherd's crook. The new species seems to have some more ornately curved ones (yellow arrow), but, again, the small numbers did not permit conclusions.

These micro- and macromorphological characters are no longer



reliable for known classical species, because they were described at a time when the existence of several similar species was not known, and therefore, likely encompass a potpourri of characters of all. Thus, when you describe new species, forming a complex of similar species, not only do you need to fix the original sensu stricto species by typification, but you must also provide a new description, which attempts to distinguish it from the neogeminoids. Hard work, but without tending to our system, it will not serve its purpose: to provide us taxonomy with clarity.



The distribution of our *Cudonia* collections correlated more with collectors, than collectees. Most collections came from the west coast of NL, where we have held more forays than elsewhere, and where AV lives and collects. More interesting is where cudonias were not found. That they are uncommon on the primarily barren Great Northern Peninsula and Labrador Straits is understandable. But the absence of the genus on the well wooded Avalon Peninsula, where two forays have been held, presents a mystery begging for an answer. Look for them this year!

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Now we can return to the question of whether databasing, photographing, drying and archiving our collections is worth the effort. The answer depends on how curious we are to know what species of mushrooms grow in our province. If we are content to call all our *Cudonia* species "*C. circinans*" because they resemble a picture with that name in a book from elsewhere, then it is a waste of time. But if we are truly interested to learn what really grows here, maybe even compare this to other regions, then these efforts are essential. As this story clearly illustrates, these efforts provide information and preserve specimens for investigators from anywhere in the world for further study. Such study will lead to accurate knowledge of our mycota. Without this effort you would not be reading this article because it could not have been written. We would continue naming everything *C. circinans*, unaware that we have five similar species, one of which might actually be *C. circinans* s.s. This would be a new addition to the most current knowledge about these species. We also know that we need to collect and study more specimens, in order to really know our species well enough to be able to describe them, adding to our own and the world's knowledge pool.

This article was written with the express purpose of alerting all 2018 foray participants to keep an eye out for *Cudonia*.

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