OMPHALINA

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Feb. 28, 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.

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seened AT *gmail* DOT *com*,

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COVER

A new morel species, Humber Village, May 5, 2013. This as yet undescribed and unnamed species is the commonest morel in our province. For the time being it is known by the code name of Mel-36. You are invited to participate in its formal naming (p.23). The cover photo does not represent the average appearance of this species. For that, look inside and be prepared to accept a wide range!

This morel issue tells you more than we know about this genus in the province, including why black morels are yellow (to frustrate you). It just does not tell you where the morel patches are. Well, actually it almost gives that away as well.

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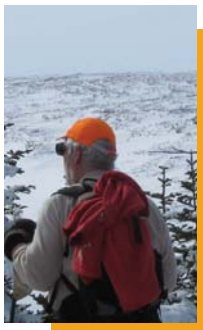
CONTENT



Message from the Editor

The best part of winter is from now until the appearance of slush and mud. The sun is higher, out oftener and up longer. The snow will be firming up, building a crust, making travel easy. The exhaustive tromping through deep layers in semidarkness is behind us. Nothing but the best ahead. And then comes spring in earnest. Guaranteed.

With the arrival of spring come the morels. This year you shall be prepared, because this is our morel issue—early enough to make sure you are all set by May. Thanks to Lidija and Tony Chubb, we even have a morel from the Big Land. Still, most of our small insights are limited to morels on the Island's west coast. Probably it is not too different elsewhere, but like Labrador, we do not have a full picture. Those of you who find morels, please photograph, collect, dry and send them to us. We cannot guarantee that we can get each one sequenced, but if we build up a nice collection, representative of all areas of the province, the chance to interest the sequencers should be high.

As you will learn inside, in over a decade of collecting we have yet to see a "yellow morel" in the province; it would seem that all ours belong to the Elata clade of black morels.

Kerry O'Donnell, one of the authors of these articles, has sequenced most morel species of the world, and maintains an inventory with a numbered code for them all, listing species that group around *Morchella elata* (the Elata clade) numerically as Mel-1 and up. Two of our three species have not been formally described yet; our commonest species is hitherto unknown. In these preliminary reports we use Kerry's code to indicate these species. The authors involved plan to describe and name them formally. When that is done, we shall update you with their "official" scientific names. But you will help:

As a first in the democratization of science, we invite readers to assist in naming the undescribed morels. Read about our morel species in this issue, and then read the appeal on page 23 to name our unnamed species. Send in your choice and see what happens. Results will be reported in a later issue.

Oh, and the next issue will begin with detailed information about our 2014 Foray, including registration information.

See you at the foray!

andrus

A preliminary assessment of the true morels (Morchella) in Newfoundland and Labrador

Kerry O'Donnell*

Abstract

A preliminary assessment of true morels (*Morchella*) from Newfoundland and Labrador (NL) was obtained by using DNA sequence data from portions of three genes to identify 20 collections from Newfoundland and one from a remote location in Labrador (Figure 5). To place this work in a broader context, data on 25 collections from six other Canadian provinces and the Yukon Territory has been included for comparison (Figure 6).

I should like to start by briefly explaining how I got involved in research on the molecular systematics and evolution of morels and how it evolved from there. Realizing that virtually all converts to 'Morelism' aim to worship them in a skillet, a recipe for a Béchamel-like sauce for dried morels/mushrooms is provided in 'The empty skillet' on page 23 of this issue.

Like most stories, this one has multiple beginnings. My entry into the morel research arena began innocently enough when Gary L. Mills, a friend from graduate school at Michigan State University (Figure 1), visited our ARS-USDA research center here in Peoria for a week in the winter of 1990. Gary's objective was to DNA type the morel that he was cultivating commercially for Morel Mountain Mushroom Company in Mason, Michigan,[1] a company then owned by Domino's Pizza Inc. and the Neogen Corporation. Gary initiated research on morels eight years earlier after he read a short note on their cultivation

*Figure 1. First commercial production of a morel (*Morchella rufobrunnea*) by Gary L. Mills at the Morel Mountain Mushroom Company in Mason, Michigan in 1992. The strain was cultured initially by Ronald Ower in 1978.*

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Title banner. A field of dandelions in a secret Corner Brook location. With some Mel-19 among them. Photo: Andrus Voitk.

published in the journal Mycologia.[2] However, it could be said that this story really begins in April 1978 with Ronald Ower's serendipitous discovery of a morel in a mulched area outside the Biology building at San Francisco State University. Ronald subsequently cultivated this morel in the laboratory of Harry D. Thiers, his M.S. thesis advisor. Though Ronald identified the morel as *Morchella esculenta*, two decades would pass before this novel blushing species was formally described as *M. rufobrunnea* based on a collection from Veracruz, Mexico.[3]

After Gary's visit, I initiated a small research project on morels to assess whether species are cosmopolitan, or alternatively, exhibit high continental endemism and provincialism. To address this question, DNA sequence data from portions of four genes were used to investigate species limits of collections sent to me by numerous colleagues and herbaria (Figure 2). In addition, research by Ph. D. students visiting my lab (Figure 3) from Turkey[4] and China[5] significantly increased our understanding of *Morchella* diversity in these morel-rich regions. To promote further research, pure cultures (Figure 4) of the phylogenetically distinct species were deposited in the ARS Culture Collection [NRRL] housed in Peoria at our ARS-USDA research center, where they are available upon request <http://nrrl.ncaur.usda.gov/>.

Two major take home lessons:

1) European names have been broadly misapplied to morels in field guides for North America[6] and Asia,[7] and

2) Only five of the 21 phylogenetically distinct morel species discovered in North America had been formally described.[8]

Figure 2. Putative type specimen of Morchella elata *housed in Museum Botanicum Upsaliense (Uppsala, Sweden) collected by Elias Fries in Femsjö, Sweden in the early 19th century. This specimen was pressed and now looks like road kill. The DNA was too degraded to obtain DNA sequence data.*

Figure 3. The Ph. D. studies of Hatira Taşkın (left, University of Çukurova, Adana, Turkey) and Xi-Hui Du (right, Kunming Institute of Botany, Kunming, PR China) greatly increased our knowledge of Morchella *diversity in these biogeographically diverse countries.*[4,5]

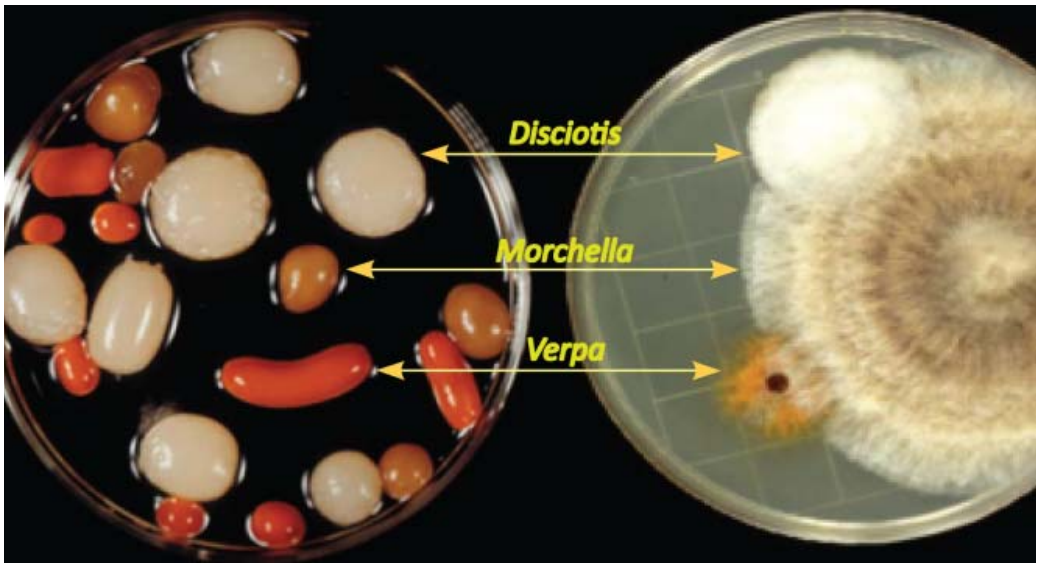

Figure 4. Broth (left) and agar (right) cultures of isolates representing three genera of the family Morchellaceae. Isolates cultured in broth were grown separately and combined for the family photo. The three isolates were inoculated on agar at the same time. Note that Morchella *grows 3-4 times faster than* Verpa *and* Disciotis, *which are being overrun by the morel.*

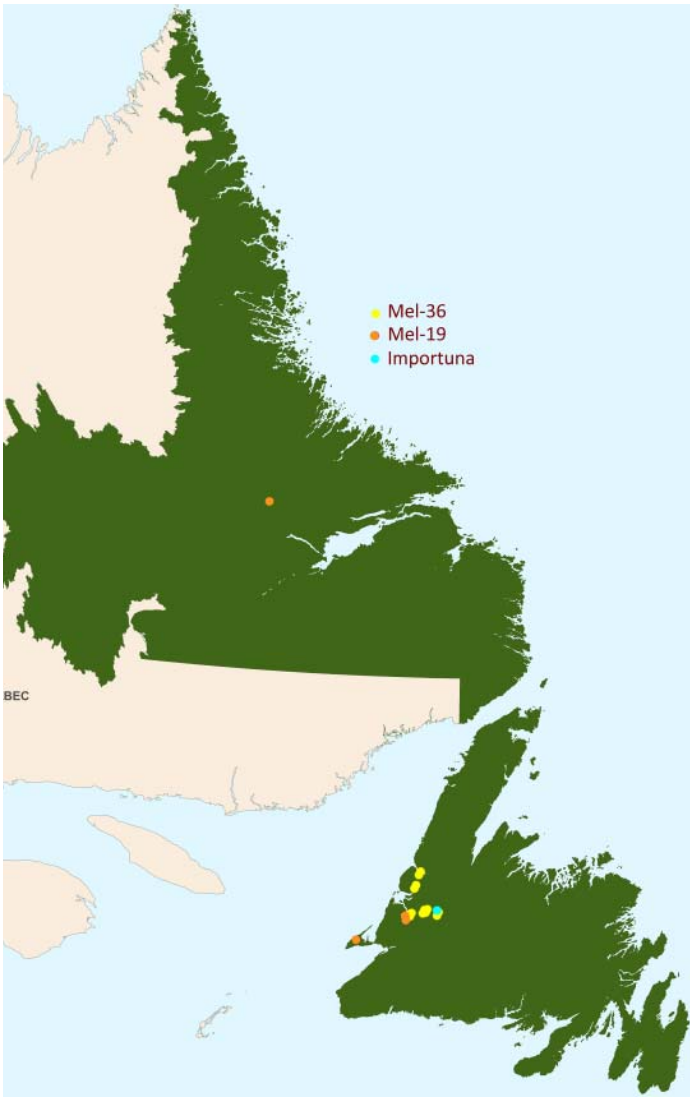

Figure 5. Map of Newfoundland and Labrador locating the 15 collections of Morchella *sp. nov. (Mel-36), four of* Morchella *sp. (Mel-19), and two collection of* M. importuna. *(Some dots overlap.)*

Thus, molecular phylogenetic analysis of morels in North America and Europe[8] laid a foundation for the taxonomic revision of *Morchella* in the United States and Canada. Kuo et al. described 14 of the unnamed species from North America,[9] but seven of these names are nomenclatural synonyms of names published just a few months earlier by a French pharmacist, Philippe Clowez.[10] Currently, I am collaborating with a French group that includes Philippe and Danish mycologist Karen Hansen on a revision of the 2012 revision[9] (Richard et al. in prep.).

Take home lesson #3: Following the principle of nomenclatural priority, names for seven of the species described in 2012[9] were dead on arrival.

DNA sequence data from portions of three phylogenetically informative genes was used to identify the 21 collections from NL, two from NB and one from a burn site from Kananaskis, Alberta. To allow future researchers to utilize the data, the DNA sequences were deposited in GenBank <http://www.ncbi.nlm.nih.gov/>.

Novel findings (Figure 5)

1. 15 of 21 collections from NL represent a new species of *Morchella* (informally called Mel-36), currently only known from NL and NB,
2. the first two reports of *Morchella* sp. (Mel-19) from North America, and
3. the first three reports of *M. importuna* (Mel-10) from Canada.

See other articles in this issue for preliminary descriptions of the undescribed species and a description of *M. importuna* as it appears in Pasadena, NL. Only five of the 21 *Morchella* species in North America are found east and west of the Rocky Mountains and Great Basin, and these include *M. importuna* (BC, Ontario, NL and NB), *M. prava* (BC, Saskatchewan, Ontario), *M. brunnea* (BC and Saskatchewan), *M. americana* (Ontario and Oregon) and *Morchella* sp. Mel-19 (Washington and NL). The present preliminary survey has revealed that at least three of the 10 *Morchella* species in Canada are present in NL (Figure 6). Hopefully this survey will stimulate further studies to document the diversity and distribution of true morels throughout Canada, and to learn more about the newly discovered morels from NL Except for the collection of *M. sextelata* from a post-fire site in Whitehorse, Yukon, the collections from NL represent the most northerly ones from North America. Interestingly, these collections are all members of the Elata Clade (black morels), which raises the following question: Do different biotic and abiotic factors constrain the distribution of members of the Esculenta and Elata Clades?

Probably all of this talk about morels has got you salivating, so a tried and tested recipe for preparing a morel/mushroom sauce can be found in 'The empty skillet' section of this issue.

Acknowledgements

The map of Canada (Fig. 1) was downloaded from Environment Canada <http://www.ec.gc.ca/cas-ahqi/default.asp?lang=En&n=450C1129-1> and is reproduced with permission for non-commercial purposes. The map is a copy of an official work published by the Government of Canada; this reproduction has not been produced in affiliation with or with the endorsement of the Government of Canada. I am pleased to thank Stacy Sink for generating the DNA sequence data, Nathane

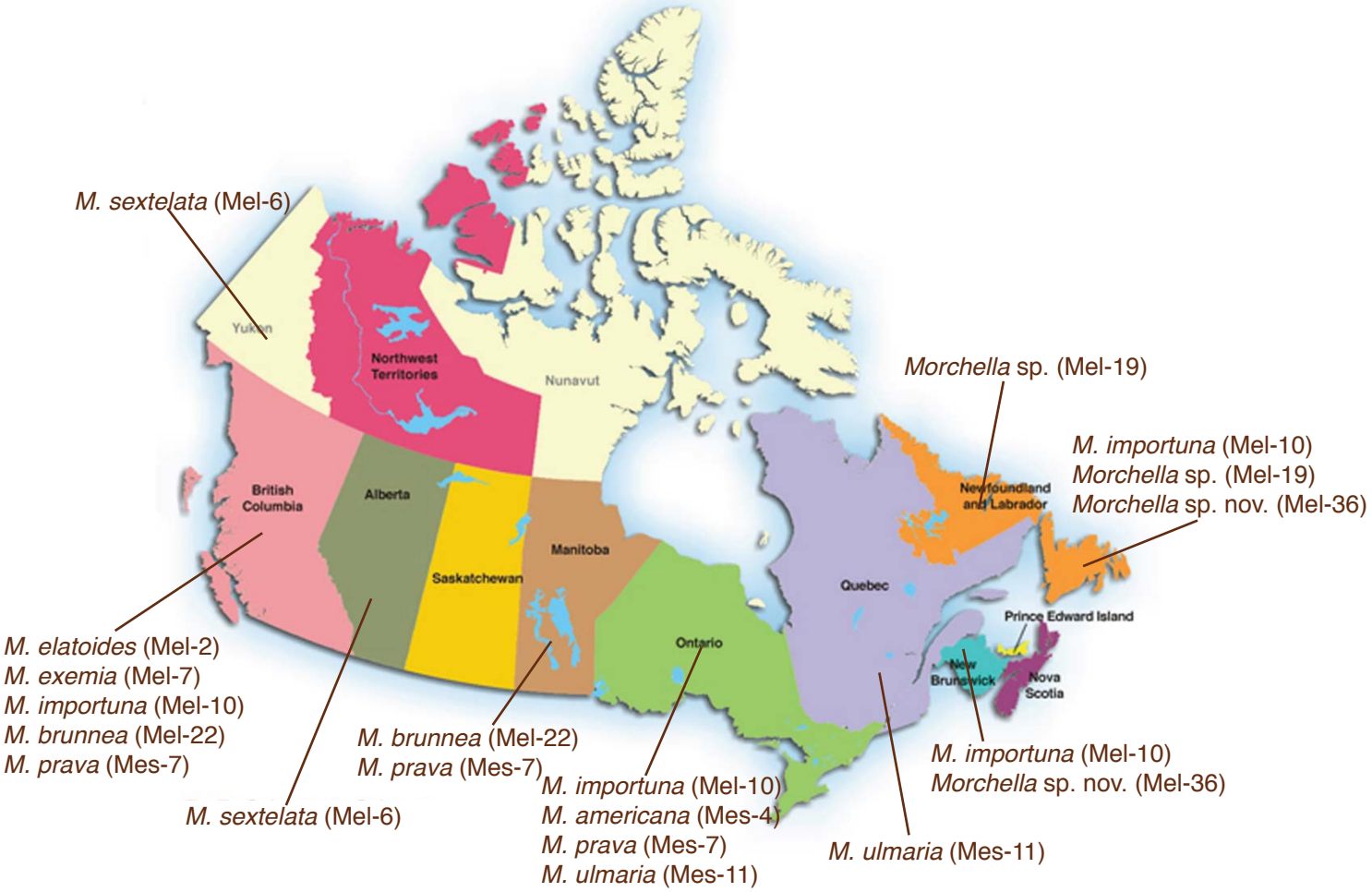

Figure 6. Map of Canada downloaded from Environment Canada <http://www.ec.gc.ca/cas-ahqi/default.asp?lang=En&n=450C1129-1> listing Morchella *species from seven provinces and the Yukon territory that were identified using DNA sequence data. Only five of the species,* M. importuna *(Mel-10),* M. brunnea *(Mel-22),* M. prava *(Mes-7),* M. americana *(Mes-4), and* Morchella *sp. Mel-19 are found east and west of the Great Basin and Rocky Mountains. Mel and Mes, followed by an Arabic number, were used to distinguish phylogenetically distinct species, respectively, within the Elata (black morels) and Esculenta (yellow morels) Clades.*[8]

Orwig for running sequences in the NCAUR DNA Core Facility. I also thank Michael Burzynski, Tony Chubb, Claudia Hanel, Dave Malloch, Aare, Maria & Andrus Voitk for collecting specimens, and submitting them for study. The mention of firm names or trade products does not imply that they are endorsed or recommended by the US Department of Agriculture over other firms or similar products not mentioned. The USDA is an equal opportunity provider and employer.

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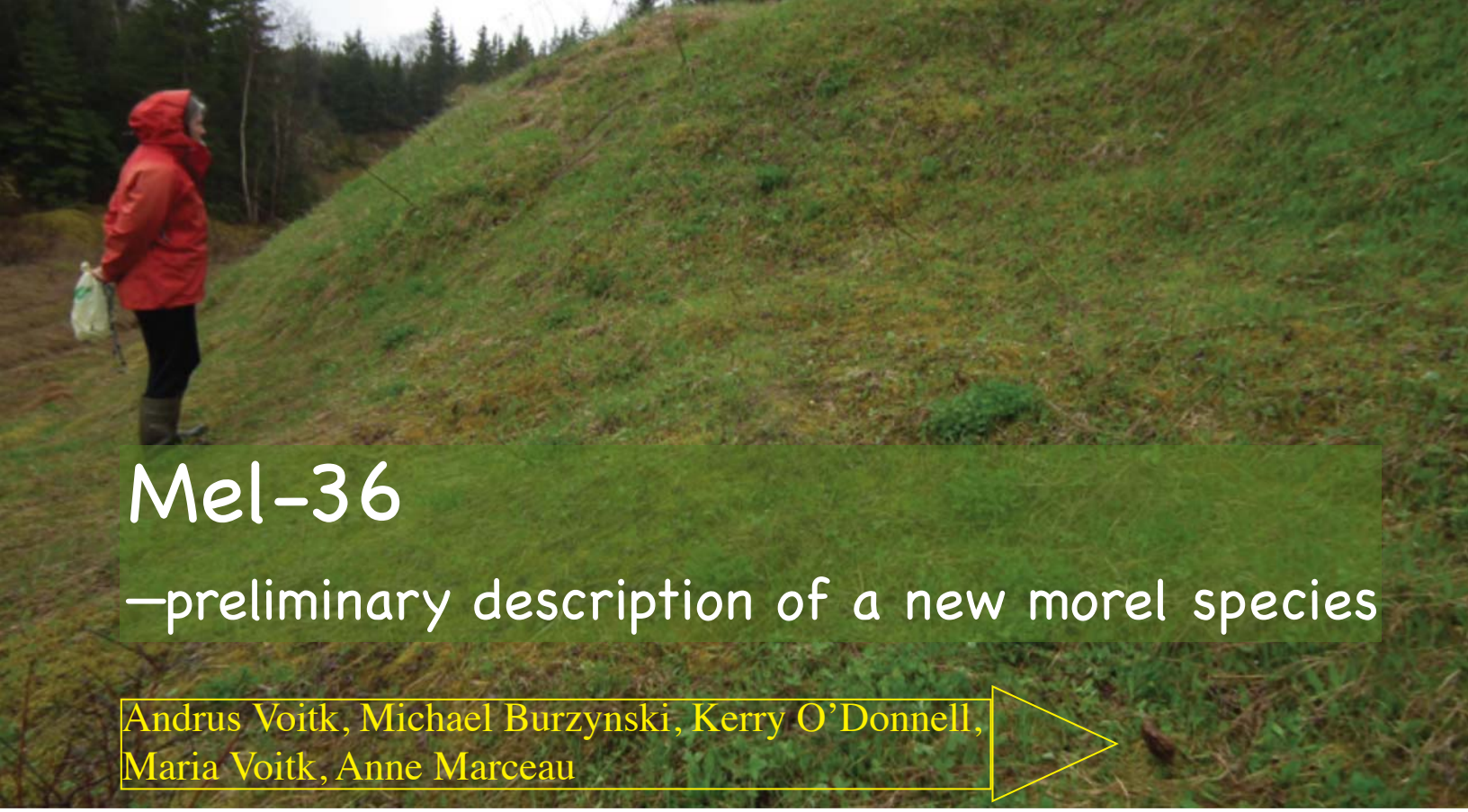


Mel-36

—preliminary description of a new morel species

Andrus Voitk, Michael Burzynski, Kerry O'Donnell, Maria Voitk, Anne Marceau

Mel-36 is the commonest morel species in Newfoundland and Labrador. Discovered here, the species has since also been confirmed in New Brunswick. In appearance it resembles either *Morchella angusticeps* or *M. septentrionals* both macro- and microscopically. The latter two species differ primarily in fruitbody size, the former being tall and the latter short. Mel-36 covers the size range of both.

The species is hitherto unknown, and will be reported formally, together with a new name, in a peer-reviewed scientific publication. When that happens we shall update the readers of Omphalina. In the meanwhile, here is our description. As mentioned, this is unlikely to help you distinguish it from other species. However, given the paucity of other species in Newfoundland and Labrador, unless you are seeing a mass fruiting in a newly mulched flower bed, should you find a morel in our province, odds are this is it.

Two examples of typical habitat for Mel-36: well drained, grass covered sandy slopes, man-made several decades ago, at the edge of the forest. The forest is primarily coniferous, with some birch, bordered by smaller shrubs, such as alder and Amelanchier. *Mushrooms appear over 1-12 metres from the forest edge (the authors point to one in the title banner). Mushrooms on the more lush upper site are of "normal" size; those on the poor soil to the left are at least 50% shorter.*

Two collages to show the variation in colour and shape of Mel-36. The primary shape is elongated with longitudinal rows of pits and ridges, the ridges darker than the pits. Mushrooms grow singly, not in clusters with joined stems. Many are bent or leaning, with only a few growing straight upright.

All of these features resemble the descriptions of Morchella angusticeps *or* M. septentrionalis, *and before sequencing them, we had assumed those to be the identities of our species.*

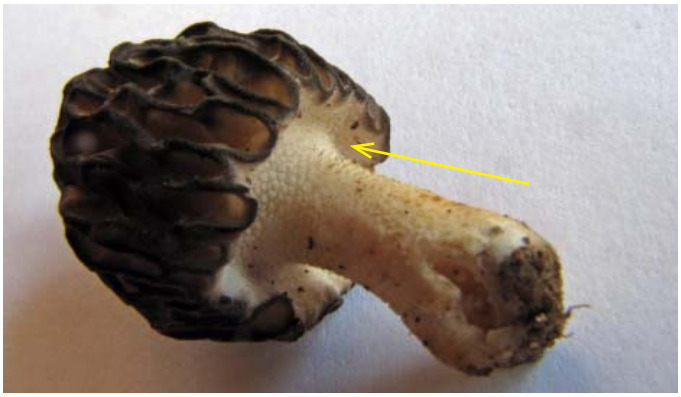
Most populations have an average height around 60-120 mm (upper collage), but we have a few populations of small morels, averaging 30-60 mm (lower collage). The two populations resemble each other, although the smaller ones have fewer rows of ridges and pits, and have less chambering at the base of the stem. The small mushrooms have remained the same for over a decade, without size increase, their stature not a factor of mushroom maturity.

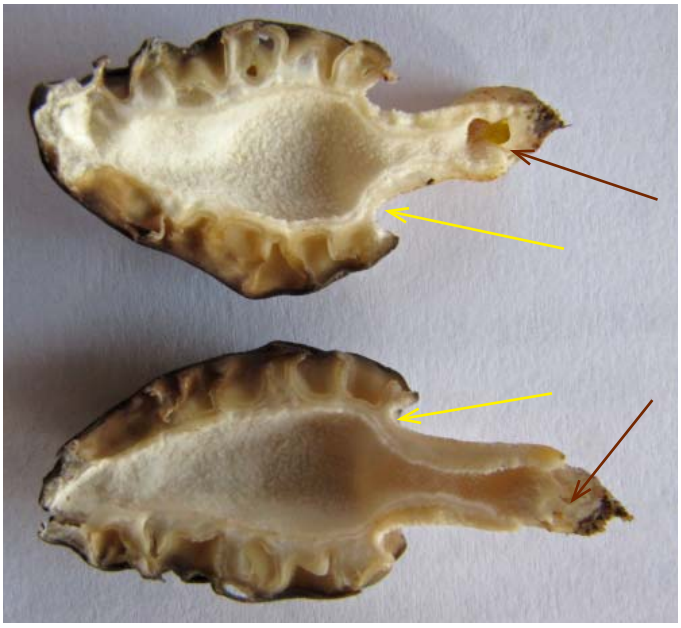
Because of this persistent difference in size, we had assumed them to be different species, but DNA sequence analysis revealed they represented a single species, distinct from Morchella angusticeps *or* M. septentrionalis.

Both the photos of their habitats (previous page) and the background on these photos clearly shows that the bigger mushrooms have a richer substrate. A causal relationship between size and substrate richness, although unproven, is highly suggestive.

Right : Cross sections to show the cap fused to the stem, with a small furrow (yellow arrows) where the outward flare of the stem meets the overhanging cap edge. Chambering of the lower stem in mature specimens is also shown (brown arrows), much more noted in the "normal" sized mushrooms (below) than the small ones (upper).

Note the pebbled appearance of the hollow inside as well as the stem, particularly in the furrow region.





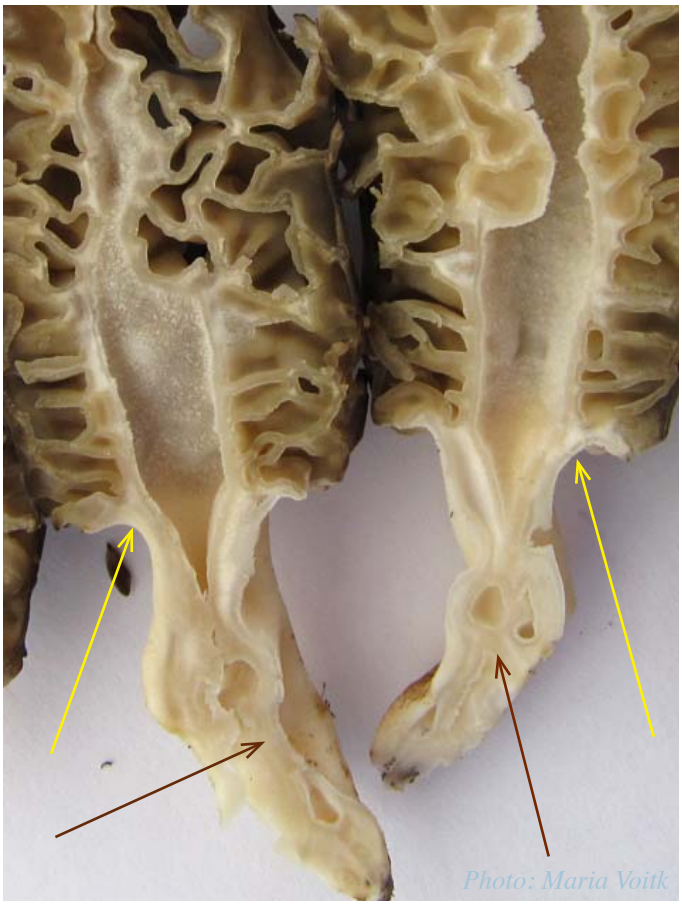


Photo: Maria Voitk

Mushroom: 15-140 mm tall. Appears suddenly and rarely grows more than 30% after first appearance. Average cap:stem proportion is 60:40; most growth happens by disproportionate lengthening of the stem. Distinct populations of small (15-70 mm tall) and large (40-140 mm) mushrooms remain true to size year after year. Appear singly over defined areas; never cespitose, although rarely two may be together. Often reflexed at the base, so that not many appear upright. Mushrooms highly attractive to slugs and snails, which can be found both outside and in.

Cap: shape varies from a blunt cone (the commonest shape) to an oblong ball, and, uncommonly, a sharp cone; diameter 8-50 mm; 10-24 longitudinal ridges between rows of somewhat irregular pits with a few cross ridges. Ridges are granular, not hirsute and pits are glabrous or very finely granular. Colour is light tan, ranging between light and dark chocolate as it ages, approaching black on the flat outer surfaces of the ridges. Ridges darken and pits lighten on drying in situ and all colours lighten when exposed to constant rain.

Stem: 4-20 mm diameter, widening at the bottom; covered with fine whitish granules; white to tan. Flares out to attach to cap edge with a buckled white groove or furrow (sulcus); hollow, roughly round to laterally compressed, heavily infolded and chambered at the bottom in older or larger specimens.

Flesh: white; cap and stem hollow; inner cavity covered with fine white granules.

Spore print: light yellowish.

Microscopic: SPORES: 18.3-22.6 x 9.6-14.5 µm (average = 20.8 x 12.9, Q = 1.7); ASCI: eight-spored, width 17.4-24.1 µm (ave. 19.9); PARAPHYSES: width 7.7-19.3 µm (ave. 11.9); STERILE EDGES: capitate elements absent or very rare.

Fruiting period: Between the first and the last week of May. Most appear within 5-7 days, with a few additional mushrooms cropping up for another 1-2 weeks. Fruiting begins as the grass starts to show signs of new leaves, and finishes as grass leaves overtop the mushrooms. South-facing slopes fruit before north-facing ones and

Ridges are darker and granular, and pits lighter and glabrous or very finely granular, both in young (above) or old (below) fruitbodies. Ridges become virtually black with age.

Fruiting time of our three species near the Bay of Islands. The temporal relationship should exist elsewhere, although the exact dates may vary. Observations of M. importuna *and Mel-19 are limited, and may be longer.*

have slightly larger mushrooms.

Habitat: Two known sites are under apple trees, one by crab apples and one in an old apple orchard. Other sites are on well-drained gravel roadsides and sand banks of glacial outwash. The mounds are now covered in *Trifolium pretense*, *Fragaria virginiana*, *Ranunculus acris*, *Anaphalis margaritacea*, *Hieracium* spp., *Achillea millefolium*, and various grasses and mosses. Most sites are man-made some 4 or more decades ago and are kept free, or are naturally free of forest. Fruitings are 1-10 m from the forest edge. The forest is predominantly coniferous mixed with *Abies balsamea*, *Picea* and some *Betula papyrifera* and *B. cordifolia*. The border of the forest is edged by *Alnus*, *Amelanchier*, and other shrubs. At least in one locality fruitings seem to be consistently closer to *Amelanchier* than other trees. Usually fruitings are on open grassy slopes, well away from trees, but some bushy species are often within 2-4 m of fruitings.

Discussion

Distinguishing Mel-36 from the other two morel species in NL is difficult. Unlike like *M. importuna*, it is not cespitose, and does not appear in profuse amounts the year after a new flowerbed has been put in and mulched. It has less cross ridges and more regular pits than the other two. It is often bent, not straight, like Mel-19. And, it is the earliest to fruit of the three.

The distribution of Mel-36 is unknown because the area we have surveyed is relatively small. This also means that the possibility of other species is not excluded. The other interesting question deals with its tree associate. Morels are reported to be both saprobes and mycorrhizals at different times. Ours are quite far away from trees, but a relationship cannot be excluded. Two collections grow year after year with apples, one with crab apples and one with domestic apples. It is interesting that at least one site suggests a possible association with *Amelanchier* (chuckley pear). This genus is close to apples, so there may be some coevolutionary preference for this group of trees.

The two different sized populations puzzled us. However, comparing their respective growing areas, the banks of the smaller ones are obviously of poor soil with little organic matter, suggesting fruit body size may be nutrition dependent.

Morchella importuna

The Pasadena mulch morel

Henry & Phyllis Mann

An early morning walk in the Town of Pasadena, NL, on May 9, 2010, took us through a shrub and perennial garden created the previous year. Black organic locally composted soil had been arranged into aesthetically formed raised beds about 30 cm deep, the surfaces mulched with wood chips. The mulch was derived from a mixture of native species, predominantly spruce and fir. On this spring day azalea blossoms were beginning to open and masses of daffodils were blooming. With this sunny colour everywhere, dark shapes on the ground were almost overlooked, but there they were, everywhere, poking up their honey-combed heads on pale yellow legs! Many occurred on edges where mulched beds touched the crushed limestone walking paths, but others were scattered across the bed surfaces, often near or around the bases of the perennials and shrubs.

The morels varied in size, the larger ones up to 14.5 cm in total height, with caps up to 9 cm long and 4 cm wide at their broadest. Caps were predominantly conical, with vertical channels and regular ladder-like cross ridges. The ridges were dark, almost blackish at maturity, and the pits yellowish-brown. Stems were yellowish-brown and finely mealy. A small groove (sulcus) occured where the cap meets stem, about 2–5 mm deep. At the time I considered them to be the black morel, *Morchella elata*, however, recent molecular taxonomy indicates that *M. elata* is a European species.[1] The North American mulch morel was named *M. importuna*. This species appears to be a saprophyte, primarily found in landscape sites and gardens, especially common in the northwest of North America. Morphologically it may be difficult to distinguish it from species like *M. angusticeps* and others in the black morel group (Elata clade). However, the association with cultivated horticultural sites

The splashes of colour almost obscured the morels. However, once seen they were legion. There are 24 in the title banner, and if this picture were enlarged, you could count at least ten such clusters in the foreground flowerbed alone.

probably provides the best clue for the identification of *M. importuna*, the "mulch morel".

The Pasadena horticultural site where *M. importuna* appeared in great profusion in 2010 has been monitored since then. In the summer of 2010 the beds were weeded, but no additional new wood chip mulch was added. May of 2011 again saw the appearance of morels at this site, but in considerably reduced numbers, 28 in total for the season. Again, the beds were weeded and in the spring of 2012 about 10 morels appeared. In the summer of 2012 the gardeners covered the entire beds with a black synthetic ground cloth slotted around shrub and perennial bases to control weeds. The ground cloth was covered with wood chip mulch. In May of 2013 only three morels appeared on the site, squeezing between the ground cloth and the base of a silver mound artemesia perennial. We assume that the ground cloth interferes with the growth of the *Morchella* mycelium and/or the emergence of the fruiting body.

The Pasadena experience with mulch morels appears to follow the pattern elsewhere for this species. The year after the creation of newly formed beds mulched with wood chips, morels appear in great profusion. In the years following there is a rapid decline in productivity of the site.

Perhaps a culture technique could be developed on a bed rotation basis to produce a yearly flush of morels for this species? Someone should try to develop such a scheme for Newfoundland morels in the future!

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Morel species Mel-19
—preliminary report

Michael Beug, Kerry O'Donnell

Mel-19 is a cosmopolitan species, already known from both China and Scandinavia, and now, from both shores of North America. The NL specimens were collected by Tony Chubb on the Naskaupi River of Labrador in 1995, Jim McNeil in Corner Brook in 2002, and Claudia Hanel on the Port au Port Peninsula in 2005 and Corner Brook in 2007. In the same batch for DNA analysis was a specimen collected in 2013 by MB from Washington State (photo below). Its NL appearance is shown in the title banner on p. 4 and the photo on p. 24. Because we did not recognize it as a separate species at the time, our collections were not studied fresh. Instead, we offer a description of the species as it was found in Washington State, where MB has collected and eaten it for years—very delicious!

Enlarged details to show the radial ridges arranged spoke-like across the furrow between cap and stem. If this is a consistent character, also seen in NL mushrooms, then it might serve as one way to distinguish Mel-19 from the endemic and commoner Mel-36.

Known world distribution of Mel-19: a Northern Hemisphere species known from both sides of North America and both sides of Eurasia. Study of morels have found them to be very parochial, seldom, if ever, extending across continents or significant geographic barriers. The cosmopolitan nature of this species is very interesting, because it differs from most of its peers, and surely should figure in its eventual naming.

Map by Strebe from Wikipedia

Macroscopic

Mushrooms are 45-100 mm high. Cap: 30-60 mm high and 25-50 mm wide at the widest point; conical; pitted and ridged with 12-22 primary vertical ridges and occasional shorter, secondary vertical ridges, with frequent sunken, transecting horizontal ridges; sometimes ridges are not vertically aligned, and the pits are large, deep and irregular; attached to the stem with a groove or furrow 2-4 mm deep and 3-4 mm wide. Ridges finely tomentose, pale olive-buff to drab (almost black), dried ridges deep mouse gray, flattened when young, not becoming thin or eroded at maturity. Pits primarily vertically elongated, but occasionally wider than tall, finely tomentose (use loupe); pale olive buff to dark brown to blackish at maturity, drying pale pinkish buff. Stem: 25-40 mm high; 15-30 mm wide, mostly equal in width but occasionally widening basally; finely mealy with whitish granules; white to pale pinkish buff, developing fine ridges or a few folds near the base with maturity. Context: olive buff; 1-2 mm thick in the hollow cap, becoming 2-3 mm thick in the upper stem, layered and chambered near its base. Inner surface: white and pubescent.

Microscopic

Spores: (from fresh spore print) 20-24 x 12-14 µm, elliptical (see title banner). Asci: eight-spored, cylindrical. Paraphyses: club-shaped.

Ecology. Found at one site in Washington State 1,100 m above sea level in a spruce bottom composed of small meadows and open woods with majestic old growth Engelman spruce (*Picea engelmanii*) and nearby boggy areas with mixed spruce and black cottonwood (*Populus trichocarpa*). Fruits in mid to late June.

Comments: At this elevation *Morchella brunnea* fruits in late May to early June and is found on the dryer hillsides above the spruce bottom, under mixed deciduous shrubs, lodgepole pine (*Pinus contorta*), grand fir (*Abies grandis*) and Douglas fir (*Pseudotsuga menziesii*).

If its macroscopic appearance is a consistent feature everywhere, then in Newfoundland and Labrador its irregular pits, and the prominent cap overhang with a deeper furrow between cap and stem, and the radial ridges crossing it (photos, top right), may help distinguish this species from the commoner Mel-36.

We plan to describe Mel-19 and Mel-36 formally in the scientific literature. To help, see page 24.

Fire morels of NL

Andrus & Maria Voitk

In May and June of the years 2002, 2003, 2004 we explored nine (4, 3, 2) sites of the previous year's forest fires, looking for burn morels. Every site yielded copious amounts of *Geopyxis carbonaria*, and one site was totally overgrown with *Gyromitra esculenta*. But morels—none. Or almost none. Were it not for finding the mushroom in the title banner, along with five friends, in the second site in 2002, we should have abandoned the effort much earlier. In the end we concluded that these half dozen morels represented a fortuitous coincidence and there were no fire morels in Newfoundland.

Since then, four morel species have been identified as fire morels in North America. Although none were said to occur east of the Rockies, one of the species, *Morchella capitata*, has been identified as a fire morel in Québec. Because of the recent interest in morels and the identification of a fire morel so close to us, we decided to survey another forest fire site on the Island in 2013, near Stephenville, not far from our home. Needless to say, it did not yield morels.

The finds, *Geopyxis carbonaria*, *Schizophyllum commune* and *Xeromphalina campanella*, are briefly introduced; an unidentified *Mycena* sp., left undescribed here, rounds out the list.

Figure 1. Small sample of Gyromitra *from one 2002 burn site.*

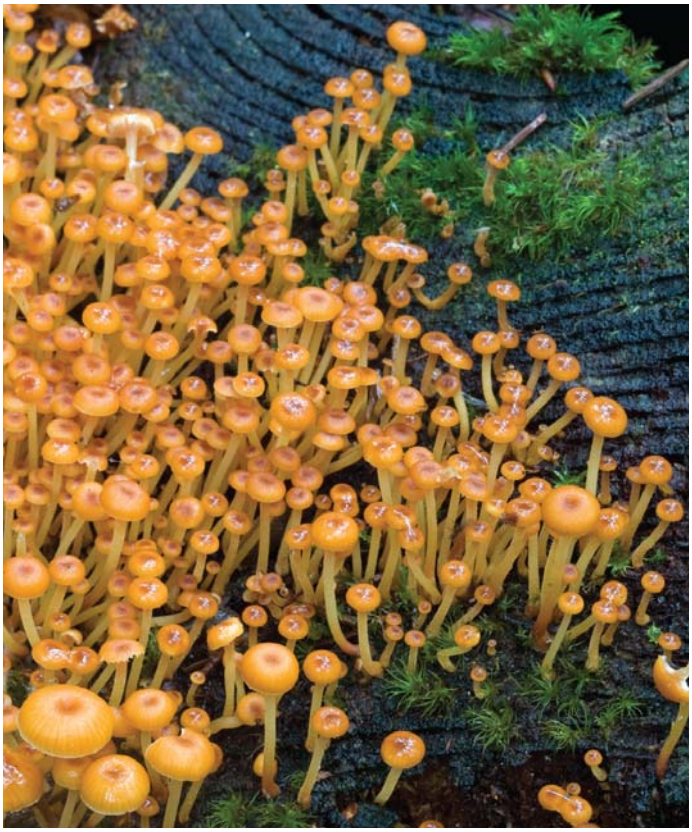

Figure 2. Young Xeromphalina campanella. *Not known to be a fire mushroom. Other than here, we have only encountered it once in the spring. Frequent fruiting in an unusual season—we found repeated colonies on several burned and rotten stumps—suggests that it must like its cellulose toasted.*

Figure 3. Schizophyllum commune *is an uncommon mushroom in Newfoundland and Labrador. It has not been collected during 10 years of forays, and in the same time we have made only one collection, on a dead birch branch. Yet in this fire site it was encountered on several burned alders. Therefore it should not be too surprising to learn that it is a recognized colonizer following forest fire. It is uncommon here, because neither birch nor alder is its favoured host under other circumstances. In regions where oak grows, it is a common find on dead oak logs. Double gills (schizo = split, phyllum = leaf or gill) are the peculiarity of this mushroom. Gills to the left, small mushrooms on burned alder to the right (with out-of-focus mosquito).*

Figure 4. Geopyxis carbonaria, *a very common colonizer of duff after forest fires. These small goblets were encountered in all burn sites, covering the entire ground in some spots.*

The effect of weather on the colour of Mel-36

Andrus & Maria Voitk

Among the new species of North American morels is *Morchella frustrata*, so named by Kuo because of "the frustrating combination of black and yellow morel features that characterize" it.[1] *M. frustrata* is a "black" morel that spends so much of its life being yellow that its common name is mountain blond. Well, our observation of the morels in Newfoundland showed us that our black Mel-36 is every bit as worthy of the epithet frustrata.

This issue's cover picture shows one way a black morel seems to take on blonde hues. When Mel-36 dries in sun and wind in situ, the crypts become an increasingly light colour. If it were not for the ridges, which dry darker (and narrower), it would end up as a totally blond mushroom. The morel on the cover is one of the first group of small morels observed on a south-facing slope (discussed in the article about morel growth). After four straight days of warm sunshine and moderate wind, most morels had become straw-coloured, and dry and light to the feel, suggesting that their useful days were over. However, if the morel is picked when fresh, and allowed to dry without attachment to its mycelium, it shrivels up and looks darker.

An even more dramatic change to blonde was shown by the second group of mushrooms on a north-facing slope. The first ones appeared on the last sunny day, after which we had a single day of sunshine among nine days of constant rain. New morels appeared daily for six consecutive days. Each day they seemed paler, until the ones appearing on the sixth day were quite blond beside their earlier black compadres. The title banner shows two morels, about 50 cm from each other, that came up six days apart. The caps are about the same size, illustrating nicely that increase in stem height contributes disproportionately to morel growth after emergence.

Photos on the next page, taken of Mel-36 in other locations (during the same nine days of rain), show that if they are kept wet, they all have the *frustrata* blood in them!

Note: The terms "black morel" and "yellow morel" have now been replaced with "elata clade" and "esculenta clade", respectively.[1] Please refer to the cited article for a more detailed discussion of these terms. To our knowledge, we have no yellow morels in this province. We have seen a few pictures, but with this experience to draw on, we suspect that they were black morels that grew in rainy weather.

Reference

1. Kuo M, Dewsbury DR, O'Donnell K, Carter MC, Rehner SA, Moore JD, Moncalvo J-M, Canfield SA, Stephenson SL, Methven AS, Volk TJ: Taxonomic revision of true morels (*Morchella*) in Canada and the United States. Mycologia, 104:1159-1177. 2012.


Mel-36 in an old apple orchard. Left, photographed in 2005, during dry weather. Right, photographed 2013, under the same tree, after a week of rain. Frustrating, eh?



Mel-36 colour spectrum. Left, photographed in 2004 during sunny and dry weather. Middle and right, photographed in 2013, after a period of persistent rain. Possibly the larger one in the middle began growth during sunny weather, and finished during rain, whereas the smaller one grew only during rain; certainly the one on the right appeared in the rain.

The growth pattern of Mel-36

Andrus & Maria Voitk

Many mysteries surround the growth of morels. Do they sprout up suddenly, going from no mushroom to a medium sized mushroom overnight? How much time does reaching full size take? Is there significant growth after emergence? How long do they last? Buscot measured morel growth and found that once they emerge, they reach 2/3 final size within 24 hours and final size in 1-10 days, depending on several external conditions.[1] Kuo shows time lapse pictures of one morel that more than doubled in size over three weeks, and states that they may last that long.[2] Most of the growth was due to increase in stem length, which agreed with Buscot's observations.

We surveyed two nearby Mel-36 patches to explore some of these questions.

Method

A south-facing and a north-facing slope, both known to produce fruitings almost every year, were monitored daily after the disappearance of snow, April, 2013. Morels were marked with numbered stakes and measured daily. Total height was measured from the base of the stem to the tip of the cap in a straight line; angulation between cap and stem was ignored.

The week before fruiting on the south-facing slope was warm and rainy, changing to warm and sunny two days before and throughout fruiting. During fruiting, temperatures ranged 1-6°C for night time lows and 15-18°C for daytime highs. The week before fruiting on the north-facing slope, the weather was warm and sunny, changing to persistent rain one day after fruiting began. During fruiting, temperatures ranged 1-11°C for night time lows and 1-20°C for daytime highs.

Results

South-facing slope

No morels were seen May 2. Morels (numbers in brackets) appeared May 3 (14), 4 (10) 5 (6), 11 (2), and 12 (2). The last four were not used in the study. Size when first seen ranged from 16-54 mm, and the biggest reached 66 mm. Average size on discovery was 33 mm, and increased roughly 10% a day for the first three days, levelling off by day 4 (Figure 2). Size increase was about 75% due to a lengthening of the stem. Three days after emergence, 5 (18%) had died (mostly felled by slugs), and of the remainder, 20 (80%) had dried up. Once they began to dry, they shrank a little in size. They seemed to emerge quickly and when first seen were almost 80% of full size. Three days after emergence, growth had stopped, and because the majority seemed too dry to be viable, further monitoring was stopped.

North-facing slope

No morels were seen May 9. Morels (numbers in brackets) appeared May 10 (9), 11 (5) 12 (1), 13 (2), 14 (3), 15 (3), and 17 (1). The last four were not used in the study. Size when first seen ranged from 14-47 mm; 47 mm was the tallest recorded. Average size on discovery was 26 mm, and increased slower than the south-facing ones, peaking about 30% bigger five days after discovery (Figure 2). Again, about 70-75% of overall size increase was due to stem growth. Two (7%) were felled. Once no further growth was documented for three days, they were harvested, a decision partly prompted by an unseasonal snowfall!

Discussion

Fruit bodies emerged in less than a day, at which time they had attained 70-80% of their maximal size. It is possible that some may have been overlooked initially, but several appeared between known marked mushrooms, where photographs from the previous day did not show morels. In addition, newly discovered morels growing during rain were paler, suggesting recent arrival. These observations suggest that most (if not all) of the newly discovered morels were new since the previous day. This is in keeping with the observations of Buscot.[1] The growth pattern was also similar, reaching full size in a few days, with subsequent growth proportionately more due to stem length increase.

There was a clear difference between morels growing on a south-facing and on a north-facing slope. The former appeared a week before the latter, were bigger, and grew faster: the average size of the shaded mushrooms peaked at the level where the sunny ones began (Figure 2). However, south-facing mushrooms suffered more stochastic events, and their duration seemed significantly shorter. Most were dry four days after appearance, whereas north-facing ones still looked viable seven days after discovery, even though they had quit growing after five. These findings are in keeping with our observations in past years:

Figure 1. The north-facing slope, with morels staked and numbered. At this magnification you can almost make out small dark specks against the bottom of each light marker stick. Emerging at the same time in one limited area suggests that these are the fruiting bodies from the mycelium of a single organism.

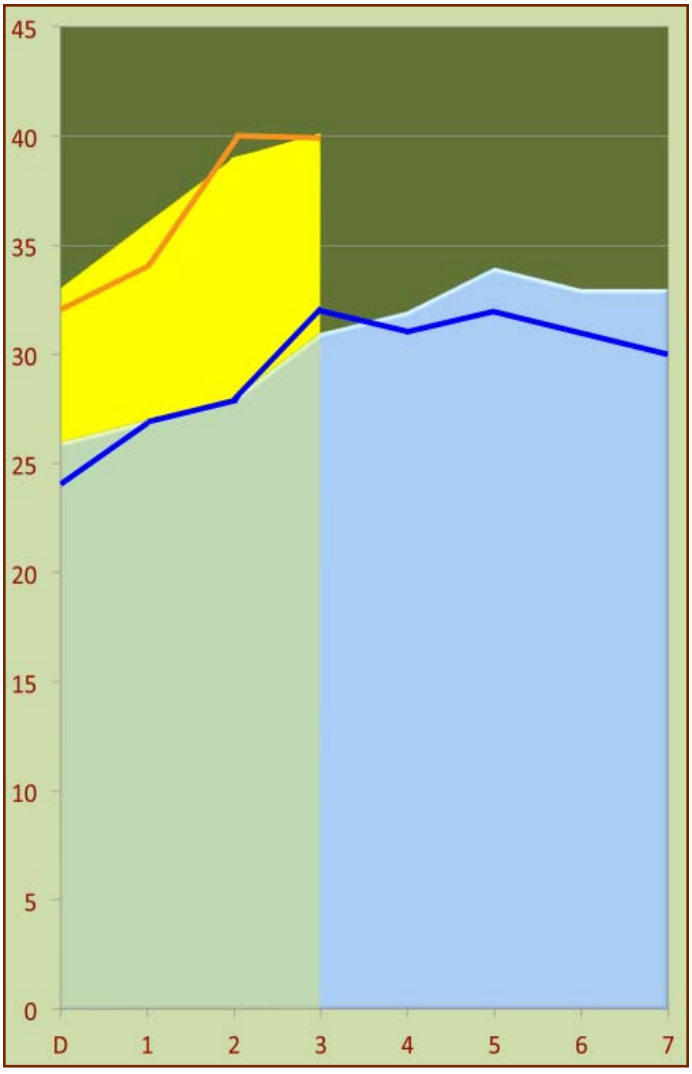

Figure 2. Growth of M-36 on south- and north-facing slopes. Y-axis = height in mm, X-axis = days from day of discovery (D). Yellow (including the part that looks green when over the blue) plots the average size of morels on the south-facing slope, and the orange line shows the same for the first day's cohort. Blue plots the average size of morels on the north-facing slope, and the dark blue line shows the same value for the first day's cohort. At their peak, the north-facing morels are as tall as their south-facing fellows were when first out. The south-facing morels added about 10% a day for two days, after which growth became negligible and mushrooms began to dry. The north-facing ones increased at a slower rate, becoming 30% taller five days after appearance. Further growth ceased, but mushrooms remained viable, probably because of a week of constant rain.

Although most of the first group dried in the sun and wind, not all did, and the graph suggests measurement should have continued. Clerical error, mistaking growth of the first day's cohort to be that of the whole group, contributed to the decision to stop. The difference in size between post-emergence days 2 and 3 has no statistical significance.

the north-facing morels fruit 1-2 weeks after those on the south, are always noticeably smaller and seem to crop up and persist longer. Buscot[1] and many others relate soil temperature to morel growth rate; although we did not measure soil temperature, both aspect and weather seemed to act in concert to favour warmer soil for the south-facing cohort.

Answers to the questions at the beginning are that morels emerge "out of nowhere" within 24 hours, require 3-5 days to gain a further 20-30% in size, then cease growing. These factors are influenced by aspect and weather. Weather aberrations prevented us from determining their duration before decomposing.

These findings may provide some guidance to the food forager. If your patch is readily accessible, perhaps it is worth returning in few days for a 30% increase in size. If your patch is far, for the food forager there may be little advantage to temporizing. Leave some to sporulate and collect what you need for your table.

Our findings apply only to M-36. Our impression is that the same pattern applies to other species, an impression shared by many foragers, and supported by measurements such as done by Buscot. However, some differences are likely.

References

1. Buscot F: Field observations on growth and development of *Morchella rotunda* and *Mitrophora semilibera* in relation to forest soil temperature. Canadian Journal of Botany, 67:589-593. 1989.

2. Kuo M: Morels. University of Michigan Press, Ann Arbour. 2005.

The empty skillet

MOREL BÉCHAMEL SAUCE

Kerry O'Donnell

If you do not have too many morels in Newfoundland and Labrador, here is a wonderful way to make the flavour go a long way with even a few. A gourmet sauce that gives a continental flavour to that special meal. Guaranteed to work the first time and every time.

INGREDIENTS

10-15 gm dried morels*
1 nice filet mignon per person
2 tbsp white wine or beer
3 tbsp butter
1 tbsp white flour
1 cup whipping cream
Salt and pepper to taste.

*As you can see from the picture, in this case I have used a morel-mushroom mixture, cultivated and sold by my friend Gary Mills <gary.mills@dnpworld.com>.

PROCEDURE

To a bowl containing 10-15 gm dried morels/mushrooms, pour enough hot water to cover; cover with cellophane wrap and allow at least 10-20 min to rehydrate.

Cook filet mignon (or other meat) in heavy skillet on stove top, remove, wrap in aluminum foil and place in warming oven.

Deglaze pan with ~2 tbsp white wine (or beer).

Melt 2 tbsp butter in skillet over medium heat, add rehydrated mushrooms plus liquid and cook several minutes until most liquid is reduced and mushrooms are well heated.

Move mushrooms to one side and add 1 tbsp butter to centre of pan; once melted, add 1 tbsp white flour and cook roux for ~ 5 min (to remove flour taste).

Stir in 1 cup whipping cream and heat to boiling over high heat; reduce heat and stir until sauce has desired consistency.

Add salt and pepper to taste.

Place in serving bowl and serve meal (sauce keeps several days if well refrigerated).

NAME THOSE MORELS!

Mel-19 in a secret Corner Brook location, Newfoundland and Labrador, June 5, 2007.

Most morels seem to be parochial in nature, apparently adapting to their particular environment and habitat through an evolutionary process of natural selection. The result is a large number of species, each in its own region.

Mel-36 is one of these. Initially we only knew if from the Island, so a name reflecting Newfoundland seemed appropriate. However, subsequently we had a specimen sent in by Dave Malloch from New Brunswick, which proved to be the same species. Although a name reflecting where it was first discovered is still acceptable, a name reflecting its distribution might be more appropriate. You decide—make your choice from the following epithet candidates to come after Morchella:

enelensis (en=N, el=L, ensis=from; i.e. from NL)
eselensis (es=S=Saint, el=L=Lawrence; i.e. from the St. Lawrence basin)
laurentiana (laurentian, i.e. of the [St.] Lawrence area; a more traditional name in biology)
maritima (maritime, i.e. from the Maritime Provinces, or maritime region, if found from New England later on)

Mel-19 is different, seeming to be able to make a home in all three continents in the northern hemisphere. It is the only morel species known to remain the same across the seas. To reflect this unique feature, choose among these potential epithets:

cosmopolitana (well travelled)
eohespera (eos = sunrise/east, hesperis = sunset/west; ie found in both the East and the West)
oikogaia or **ecogaia** (oikos = home, gaia = earth; ie at home in all the world)
sempereadem (semper = always, eadem = the same)
sophisticata (world traveller)
transoceana (across the oceans)

Ultimately the right, privilege, responsibility and fun of selecting and proposing a new name belongs to the author(s) describing the species, but most have assured us that they have no strong feelings, and find any of the listed names acceptable. Therefore, your vote may be the deciding factor, and the authors may only have to step in to break a tie.

To our knowledge, this is the first naming of a species by popular vote, so here is your chance to be part of a historic occasion.

Choose your favourite from these lists and send to <foray AT nlmushrooms DOT ca>. If you cannot decide between two names, send both. Or three.

THE MAIL BAG

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

Congratulations! You're getting a great lineup of authors with interesting things to say.

DM

The description of genera derived from *Hygrocybe* contained gender inconsistency with species of *Gloioxanthomyces*. I checked the original and Index Fungorum, to learn that the genus is masculine.

AJG

Ed response: Thank you for your sharp eyes! We had a new typesetter last month, an elderly fellow, whose mind wandered off, while his fingers traveled in their set ways, despite all the cautions and warnings. We know this is not a valid excuse and shall do our utmost to prevent recurrence. As a first step we have fired the typesetter.

ERRATA:

Gloioxanthomyces vitellina and *Gloioxanthomyces nitida* should read *Gloioxanthomyces nitidus* and *Gloioxanthomyces vitellinus*, respectively. Both versions appeared in the article.

In the discussion of new names, I sensed that you are not convinced 100% of the utility of the new genera in *Hygrocybe*. If so, why adopt them for our foray?

HT

Ed response: Good question. A few people (well, two, actually) have asked that verbally.

From a phylogenetic point of view, recognizing the derived genera seems like the correct thing to do: the evidence to support it is there. From a user's point of view it may not be nearly as obvious—hence the claim that *Hygrocybe* (excluding *Camarophyllus*) had worked quite well before and might continue to do so. This is a fair way to put the evidence and choices before you.

The fair way to test a new method is by embracing it (i.e. giving it a chance). Since neither author has a personal vested interest in the outcome, why not do a fair trial? BTW, we shan't be alone in giving them a trial—see below.

I really enjoyed the articles on *Hygrocybe* and The birth and fate of new generic names. Very informative. After reading the article on *Hygrocybe*, which I sent to the main identifiers of MycoQuébec, we changed the *Hygrocybe* names on the site.

RLB

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