LONG ISLAND MYCOLOGICAL CLUB

LI SPOREPRINT

HAPPY NEW YEAR!

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FINDINGS AFIELD

On Oct 2, deep into the drought, a birder's report of a possible Cauliflower mushroom led Peggy and me to the Pine Neck Sanctuary, E. Quogue, which had recently received a bit of rain. There we were happy to find a small flush of species, including the pictured Laccaria, growing amongst Sphagnum, which struck me as different than the species I was familiar with.

Laccaria longipes

Using Bessette's key, among those species with white basal mycelium, L. longipes stood out, due to its longer stipe and growth among Sphagnum moss. Examination of the spores clinched this tentative I.D. as they are relatively small, 7-9 X 6-8, subglobose to broadly ellipsoid and echinulate, that is, with small spines, as contrasted with the more common extended spines of this genus.

First described by Mueller in 1991, this species is more commonly collected in the Great Lakes region (Ontario, Michigan, Wisconsin) but has been reported from NY and NJ. Only twice has it been found on NEMF forays, in Maine and Quebec.

We will gladly add it to our LI checklist, and will continue to visit the Pine Neck Sanctuary, in the hope that other novel species will be encountered here.

P. Brandon Matheny talks about *Inocybe unicolor* and other North American Inocybes

(Part 1 of 2) *An interview by Joel Horman, editor, LI Sporeprint*

P. Brandon Matheny is an assistant professor in ecology and evolutionary biology at the University of Tennessee in Knoxville, where he pursues research in fungal systematics and evolutionary biology as head of the Matheny Lab http://www.bio.utk.edu/matheny/Site/Home.html He is internationally known for his expertise in the family Inocybaceae, a large cosmopolitan group with probably as many as 700 species worldwide.

At the Wildacres Foray in North Carolina in Autumn 2012 during a lecture, Brandon mentioned that *Inocybe caesariata,* a species Joel had no doubts about, was more properly called *Inocybe unicolor* Peck and that *I. caesariata* was a hazy European concept. In subsequent discussions, it was decided that a good way to disseminate this information to the amateur community would be an interview in a widely read amateur publication.* A transcription of this interview is presented below:

Brandon in the field in Malaysia.

Joel: I think that, like most amateurs, I was happy to find a distinct enough species of Inocybe to identify on sight without resorting to keys and microscope, and which was agreed upon by all the popular guidebooks, not to look further. As a professional with a special interest in the genus, *your take was of course different. Can you describe for us the scenario by which you were led to doubt the validity of Inocybe caesariata in North America, and where it led?*

Brandon: First of all, it's a European name, first introduced by Fries as *Agaricus caesariatus* in 1838. Karst then transferred it to *Inocybe* 1879. Kaufman included *I. caesariata* in his NA Flora treatment of *Inocybe* in 1924. Hesler applied the name *I. caesariata* in 1936, Lincoff in 1981, and Phillips follows them in 1991.

*(To be published simultaneously in the *Mycophile*)

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PRESIDENT'S MESSAGE

For the past several years, the amount of edible and other mushroom fruitings has been going down hill. When is the last time you found so many boletes that it took all day to prepare them? This year has been the worst mushroom year that I have ever experienced in recent history here on Long Island. Joel, in his Editor's Note mentions low rainfall as one of the reasons for the poor fruitings. I think that drought like conditions at times in addition to very high temperatures did us in. For 2014, I hope things will change for the better. Count me as a person that cannot live by crust fungi alone!

This is the time of year that I get to thank you all for making the Long Island Mycological Club what it is today.

Our board members really help to lighten the load when it comes to planning, new ideas and everything else we do as a unit. This year we have two new members: Maria Saffiota and Rich Cataldo who have graciously volunteered to help out on our board. (We need all the help we can get!) Thanks to Joel, Jacques, Cathy, Dale, Bruce, Bob, Tony, and Roger. What would I do without you?

I wish you all a very happy, healthy 2014. May the mushrooms abound!

EDITOR'S NOTE

We speak glibly of the balance of nature, little realizing what a thin knife edge that balance rests upon. This year, it has dramatically been demonstrated to us, in a very negative way, as such things usually are. "For every excess a defect, for every defect an excess" Emerson wrote, and the defect in rainfall, while not dramatic in total, amounting to about 38 inches in Suffolk County, compared to an average of 49. this was drastic enough to result in a depressing absence of mycorrhizal mushrooms, especially since this defect was strongest in late summer and early autumn, with October the 2nd lowest on record with a scant .2 inches. There was then no significant rain until Nov. 27 when 1.75 inches fell— too little, too late.

Although Long Island was among the worst hit, this pattern was evident throughout the mid-Atlantic states, with many collectors bitterly complaining of one of the worst years in memory. While one year does not establish a pattern, some climate change models predict fewer but larger rainfall events, increasing the duration of dry soil conditions.

Presently, rainfall has rebounded to normal so it is reasonable to expect a return to the mean, which gives us hope that the new year will be a welcome contrast to the old and our forays productive.

Think Morels!

MATERIAL FOR THE SPRING, 2014 EDITION SHOULD REACH THE EDITOR BY MARCH 1

(Submissions may be forwarded by email in any format or typed.)

(All unsigned articles authored by editor.)

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Matheny on NA Inocybes *(Continued from page 1)*

Then it shows up again in another publication by Roberts and Evans in 2011 called "The Book of Fungi". But what all these authors are clearly referring to is Peck's *Inocybe unicolor,* a conclusion I came to after studying Peck's type and several fresh collections from the southeast U.S. When Stangl came out with his treatment of *Inocybe* in Bavaria in 1989 he included *I. caesariata* in his key in a very cryptic manner and without a description. Stangl may have been using the concept of *I. caesariata* as used by Heim. This latter species was described in 1984 by Bon as *Inocybe heimii*. Funga Nordica indicates that *I. heimii* is a coastal dune associate under Pines and represents *I. caesariata* sensu R. Heim.

So the problem is, and this is fairly typical, we don't know what exactly *Agaricus caesariatus* was. Evidently, neither do the Europeans. There is no type, and Fries' original description lacks sufficient detail for reliable identification. Therefore, it is somewhat reckless to apply the name to North American taxa. Instead, we do have a North American name for what Hesler, Lincoff, and the others have suggested is *I. caesariata*, and that is *I. unicolor*.

***Inocybe unicolor* Peck**

The interesting thing is it's a very common fungus. I think all of my graduate students can now recognize it, or at least they should. It's one of the most common Inocybes in my area, Knoxville, in forests and in urban areas under planted Oak and Basswood. It has also been found in the Smokies in natural habitats and other areas in the southeast (Missouri, Virginia) in Oak-Hickory forests. My guess is that *I. unicolor* prefers calcareous soil, and the area where I live in Knoxville has a karst type of topography.

Atkinson and Murrill knew the fungus but described it under different names. Atkinson described it as *I. marmoripes* (from west of Cayuga Lake, near Glenwood, a suburb of Ithaca) in 1918, and Murrill before that in 1911 as *Inocybe lorillardiana,* so named because he found it on the grounds of the Lorillard mansion in the Bronx, New York fruiting in front of museum buildings in grasses under Hickory (*Carya*). Both of these taxa are the same as *I. unicolor* based on my studies of Atkinson's type and authentic collections labeled as *I. lorillardiana* by Murrill. Kauffman reported all three names (*marmoripes*, *lorillardiana*, *unicolor*) in the NA Flora not understanding, of course, they were all the same. Smith in 1939 reports *I. unicolor* as *I. lorillardiana* in Michigan. So it's pretty widespread, occurring in the southeast as well as the northeast. At this point the species appears endemic to eastern North America, and its unusual for the group in which it belongs, subgenus *Mallocybe* or what I call the *Mallocybe* clade, in that it has long cheilocystidia, which is atypical for the *Mallocybe* group.

Inocybe lorrillardiana Murrill

How far north it gets I don't know. It fruits between June and Sept. and into Oct. in Tennessee. *Inocybe unicolor* also occurs in my front yard under native *Quercus*, and for those of you know Rytas Vilgalys at Duke University it fruits in his backyard in Durham, North Carolina. I have seen similar dried specimens collected by David Lewis in east Texas that require confirmation.

The good thing is the species is easy to identify in the field, which is kind of unusual for an *Inocybe*. In outward appearance it's phenotypically similar to *I. subochrachea*, another species endemic to eastern North America, but they are quite different microscopically: *I. subochracea* has abundant bright yellow hymenial cystidia as "metuloids" when a squash mount of a piece of gill tissue is examined in KOH under the microscope. *Inocybe unicolor* lacks metuloids and has no pleurocystidia, sterile terminal cells that occur on the faces of the gills.

Joel: What first elicited your interest in the genus Inocybe? Was the intrinsic difficulty of identification a challenge?

Brandon: Oh, yeah! It probably was what drew me to them because up to that point I was just collecting mushrooms for food, and I had probably sampled between 90 and 100 species starting in 1996 when I was living in Seattle. For several years I went

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Matheny on NA Inocybes *(Continued from page 3)*

out often, looking for edible mushrooms to prepare for the table. I was looking for a challenge, so I decided to identify Inocybes, which were quite diverse in an area where I had been doing an inventory, getting to know the local flora in an area outside of Seattle, a low elevation forested wetland including Douglas fir, Western hemlock, Red alder, and Black cottonwood. This held at least 10 species of Inocybe, and I wanted to know what they were.

Eventually, I was introduced, by members of the Puget Sound Mycological Society (PSMS) to Joe Ammirati, professor of mycology at the University of Washington. So I worked with Joe for a little bit- he was kind of testing me out, I think, to see how dedicated I might be. He after a time said, "OK, I can help further you along taxonomically, training-wise, but you have to show up early Saturday mornings." So I would come to his lab early Saturday mornings, and he started me off sorting through *Tricholoma* species. I would study the Tricholomas microscopically to get a feel for the diversity within the genus. All those PSMS forays with Brian Luther, Dick Sieger, and their microscopes really paid off!

Eventually, I began to work more often on Inocybes. Joe then let me have access to the herbarium to get material identified by Stuntz to compare with my own, and also enabled me to have access to the taxonomic literature, which was extremely helpful. I kept at that for a while, perhaps for a period of several months, and by that time Joe was more familiar with me. At some point later thinking about my future, I asked him if I applied to the UW for grad work would he take me in. And he goes, "If you work on *Inocybe*"; so I said "OK." That was my ticket in. However, given that my scientific background was pretty shallow, I had to go back and ramp it up: I had to spend a couple of years taking math and chemistry at a local community college and some upper division biology courses at the University of Washington before I entered graduate school.

Then I finally got in by Fall of 1998 and worked on systematics of what I call the family Inocybaceae, since they are not closely related to *Cortinarius* (Cortinariaceae); I did that for the next five years. So I would say their diversity really elicited my interest plus the challenge of their identification.

Joel: There have been various schema for dividing Inocybe into sections and subsections, yours among the most recent. Is this work done for the most part, or do you see further revisions in the future?

Brandon: I recognize clades or monophyletic groups (species or descendants that share a unique common ancestor), and in some cases these clades do not correspond to taxonomic sections and subsections of Singer, for instance. So there's a lack of evolutionary understanding and natural relationships if we continuously refer to non-monophyletic sections and subsections. For example, the *I. lanuginosa* group is monophyletic and contains a suite of species such as *I. lanuginosa*, *I. leptophylla*, and *I. teraturgus*. What we are now learning is that there is a contingent of Australian and southern South American species (most undescribed) that are closely related to *I. lanuginosa* and its allies.

I. unicolor (a L.I. specimen)

If you look at section *Inocybe* by Singer, he's got a lot of species in it. However, this group is not monophyletic and should be restrained to the handful of species that share a common ancestor inferred by a molecular phylogeny. This includes *I. relicina*, found only in Finland, Sweden and Norway; the very cool and exciting *I. tahquamenonensis*, a dark purplish black scaly thing, which is endemic to eastern NA, and *I. tubarioides*, which is very weird, typically fruiting on rotten wood and also endemic to Eastern NA. The North American species are not common, and every time I see *I. tubarioides*, it often throws me off. It looks like a cross between a *Psilocybe* and a *Telamonia*, if you ask me. And then we found another species down here in North Carolina that I'm pretty convinced is undescribed - a sort of reddish scaly species, and it is most closely related to *I. tubarioides* and *I. tahquamenonensis*. It's been brought to me different years from Mt. Mitchell State Park in western North Carolina during the Wildacres NAMA regional foray. I'd like to get this one described but am hoping for a better photo!

Joel: Are there other Inocybe species that grow on wood? Isn't that unusual?

Brandon: Yes, it is unusual as most Inocybes fruit on the ground. However, *I. leptophylla* sometimes occurs on wood, and *I. lanuginosa* is often found on rotten wood, but also on the ground. There are a few others, species near *I. subcarpta* or *I. boltonii* that I've found on rotten wood, but their taxonomy is not settled. Egon Horak has described a few others that occur on rotten Southern beech wood from the south-

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Matheny on NA Inocybes ***(Continued from page 4)***

ern hemisphere.

Joel: It's a long time between publication of new general field guides, perhaps 10 years or more. Until the next one is published, should there be a mechanism for the distribution of name changes or substitutions for the benefit of ardent amateurs?

Brandon: Ideally, there are existing resources for current taxonomy and nomenclature: MycoBank and Index Fungorum -and that's probably where I would start, but I don't know if they would accept my suggestions with respect to *I. unicolor* without them being published. But I could suggest that they treat *I. marmoripes, I. lorillardiana*, and *I. caesariata* sensu american authors as taxonomic synonyms of *I. unicolor*. Doesn't hurt to ask.

Joel: There are some Inocybe species which seem to be accepted transatlantically, e.g., I.geophylla, I. lacera, I.hystrix, etc. Should we doubt the applicability of these names to North American species, inasmuch as they are based on European descriptions?

Inocybe hystrix

Brandon: Yes, if we have evidence to suggest otherwise. We don't really know what percentage of species in NA is actually widely distributed across the holarctic. Karen Hughes and Ron Petersen have a project assessing this for a broad array of taxa. If I had to guess, I would say in *Inocybe* 50% or along those lines, but it might also depend upon what region of NA you are considering because the similarity between, e.g., the California flora and the European flora is probably going to be low. I think the number of shared species between some parts of Europe and eastern North America might be higher in our spruce-fir zone.

Joel: So you do leave open the possibility that some are genetically identical?

Yes, we have data that support that for several species. *Inocybe hystrix*, for example, is genetically the same in Tennessee and North Carolina as in Sweden. And we found another species from Europe in the spruce-fir zone in the southern Appalachians called *I. pseudoasterospera*, and that is also the same genetically as a European collection. Brad Kropp and I confirmed two European species also occur in NA: *I. spuria* and *I. obsoleta*. I believe Ellen Larsson and Cathy Cripps have demonstrated this as well for some species in the *Mallocybe* group that occur in alpine settings. I've collected *I. sindonia* under Norway spruce in Seattle, but this species is obviously introduced. It's also not uncommon under planted pines in New Zealand and Australia.

Joel: What mechanism would allow them to remain the same after millions of years and the separation of continents?

Brandon: Good question. Gene flow between disparate populations of *I. hystrix*, *I. pseudoasteropsora*, *I. spuria*, and the others is somehow being maintained whether by migration of similar plant partners (think of Birch, Willow, Pine, Spruce) in response to glacial cycles or simply long-distance dispersal. This is a complex topic especially with respect to phylogeographic patterns (or shallow geographic relationships between populations or very closely related species) of organisms in the holarctic. Others, like Jozef Geml at Leiden in the Netherlands, have thought more deeply about this. It's one reason why I decided to focus on studying historical biogeographic patterns (more ancient geographical area relationships among species) of Inocybaceae in the southern hemisphere where the geological history is less ambiguous.

Joel: What about Inocybe geophylla? Isn't this a widespread and easy-to-recognize Inocybe?

Brandon: *Inocybe geophylla* will turn out to be a complex of different species, morphologically similar, for example some forms with an umbonate pileus and others convex, others more robust in size, different ecology, etc. After we generate the multi-gene phylogenies, then we can map out the morphological and ecological or geographical differences and see how well they correspond to different clades. *Inocybe insinuata*, described by Kauffman from California, I would consider an autonomous species in the *I. geophylla* group; it may be more widespread along the west coast and is a chunkier version than *I. geophylla* in the strict sense, which no one has confirmed from North America yet. *Inocybe lilacina*, often treated as a variety of *geophylla*, is clearly different, and furthermore in NA several species of *I. lilacina* can be separated morphologically, molecularly, and geographically. The northern California version of *lilacina*-which I would regard as a new species -lacks the intense lilac-violet colors of, for example, the form found in the southeast US, which will prove to be a different species as well from they

Matheny on NA Inocybes ***(Continued from page 5)***

type, which is broadly distributed between Washington and New York. Crazy as this sounds all of them are different than European *lilacina*. In Europe at least two different clades of *I. "lilacina"* have been recovered. The type collection, however, was described by Peck as *I. geophylla* forma *lilacina* near Albany, New York. I have DNA sequences from material I collected in Peck's stomping grounds and very close to the type locality. There may also be a unique lineage of *I. lilacina* sampled from the Rocky Mts. So we're seeing quite a bit of distinction in populations of *I. lilacina* across NA. The issue is: do we recognize them as different species? And I would argue that, yes, we should, because in several cases there are clear morphological differences corroborated by the gene phylogenies and geographical distributions.

Joel: *Based on molecular analysis you constructed a chronology of the seven subgenera of Inocybe, and elucidated the evolutionary biogeography as well. Can you touch upon the historical background of the east/west split in North America?*

Brandon: Alexander Smith was very intrigued by this split, I think. The Great Plains forms a natural barrier between eastern NA and western NA, and he also noted major differences in the fungal flora (or mycota) out west versus those in the east, and to me, having collected in both these areas, they are obviously very different. However, no one has really done a rigorous biogeographical analysis yet a focus on divisions within the North American mycota. Scott Redhead published a really interesting article on this some years ago but using a morphological species concept. In this paper he suggested several different biogeographical patterns among Canadian macrofungi. Part of the problem is, if we're going to assess just how different these floras are, we need to have reliable concepts of what the species are, and right now that is one of the major impediments to mushroom taxonomy in NA. And as more and more work is done, we're finding out that -wow, there are several species that we can detect, using molecules, within what is otherwise a single morphologically recognized species; or, we're simply not able to see what the differences actually are without the aid of gene trees.

(End of part 1. Continued next issue.)

LIMC ANNUAL MUSHROOM DAY OCT. 20,PLANTING FIELDS ARBORETUM

Although hard hit by the drought, LIMC members went far afield, assiduously collecting in the damp corners of Suffolk county and New Jersey to accumulate enough collections for this day. It was to prove our last hurrah for the year, with all our remaining forays cancelled for lack of fungi.

This photo essay courtesy of LIMC member Ernesto Martinez:

LIMC members assembled.

Patricia and Steve face the public.

Joel answering some questions.

Maria and Aaron at the tables.

***Volvariella surrecta,* parasitic on Clitocybe sp. (2nd time ever!)**

Michelle Mi displays a specimen.

■ **TICK BITE CREATES VEGETARIANS:** More than 1000 people have fallen victim to the bite of the Lone Star Tick which has created an allergy to Alpha-gal, a sugar found in the flesh of mammals. As a consequence, they cannot eat any meat products without suffering severe allergic reactions and possibly anaphylactic shock. Some must even avoid milk products or get their medication specially formulated since some pill casings contain gelatin, an animal product. The connection was serendipitously discovered by Dr. Thomas Platts-Mills, in 2006 when investigating why some cancer patients were having a severe allergic reaction to Cetuximab, which contains Alpha-gal. It is the only known case of a sugar triggered allergy, and in many patients repotedly disappears in time. (*Widely reported in the news media,* 2013.)

■**MUSHROOM SPORE SELF-DISPERSAL:** Wind is not necessary to spread mushroom spores, according to a paper presented at the annual meeting of the American Physical Society Fluid Dynamics Division. By the use of high speed videography, it was shown that fungi, rather than passively dropping spores, actively manipulate their local fluidic environment by altering the buoyancy of the air surrounding the mushroom using a combination of water vapor and active cooling. "This manipulation allows spore escape and dispersal from caps that may be spaced a few millimeters above the ground, or apart from each other." The added lift can carry spores up to 4 inches horizontally and vertically.

Recent work by Anne Pringle of Harvard University has found that mushrooms also actively spread spores by shooting them out at high speeds in rapid succession. *(Reported in Scientific American, Nov.25, 2013.)*

A controversy regarding spore dispersal distance is presently raging in the pages of Mycologia, with one party concluding (on the basis of experimentation) that most spores fall within 1 meter of the cap, and the other (on a theoretical mathematical basis) maintaining that experimentation samples only a minor fraction of released spores. Stay tuned. *(Spores do travel, Mycologia, N.Dam, 105(6), 2013, pp. 1618–1622. Dispersal of ectomycorrhizal basidiospores: the long and short of it, T.R. Horton et al, Mycologia, 105(6), 2013, pp. 1623–1626.)*

■***HEBELOMA CRUSTILINIFORME* IS A VALID NA SPECIES:** Many fungal species names based on European descriptions have, with the advent of DNA analysis, been found invalid, and as a consequence, given a new epithet. Since 2007 LIMC has been cooperating with the Belgian Hebeloma researcher Henry Beker by providing local collections. Recently, Dr. Beker, together with Jan Vererholt and Ursula Eberhardt has published "Epitypification of *Hebeloma crustiliniforme"* designating an epitype based on molecular data of an extensive European database of collections, as well as several collections on Long Island. This provides proof positive that the species that occurs in NA is identical to the European species, and that the name can unequivocally be applied here. *(Epitypification of Hebeloma Crustiliniforme, J. Vesterholt, U. Eberhardt & H.J. Beker, Mycological Progress, 25 Sept. 2013.)*

■**HOW MANY *MYCENA PURA* ARE THERE?** We have all noted the tremendous variability of this radishy, pinkish Mycena, but it is even more mind-blowingly variable than anyone might have conjectured. A very complex phylogenetic analysis using three different genes, which I do not pretend to understand, has established that there exist 11 different cryptic species, which could not be cultured so as to test the biological species concept. All but one of the phylospecies failed to show any discernible pattern with respect to morphology, ecology, etc. The morphologically recognizable one is raised to species level as *Mycena luteovariagata. (A three-gene phylogeny of the Mycena pura complex reveals 11 phylogenetic species and shows ITS to be unreliable for species identification.CB.Harder et al, Fungal Biology 117 (2013) 764-775.)*

■ **QUICKER THAN A SPEEDING PERIODOLE:** Bird's nest fungi's propulsion of their periodoles (spore containing "eggs") are well known to be initiated by falling rain drops. This charming scenario has now been subjected to high-speed video documentation. Mean ejection speeds varied from 1.5 –3.6 meters/sec., using less than 2% of the rain drop energy. Discharge took place only after the basidiome was water filled. The raindrop then fractures the "purse", leaving the sticky end of the cord exposed, which is deployed upon contact, this occurring in less than 700 ms. *(Splash and grab: Biomechanics of peridiole ejection and function of the funicular cord in bird's nest fungi. MOHasset et al, Fungal Biology, 117 (2013), 708-14)*

(Compiled by editor from cited sources.)

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What we hope ever to do with ease, we must learn first to do with diligence.
Samuel Johnson, lexicographer (1709-1784)

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