LONG ISLAND MYCOLOGICAL CLUB

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INOCYBE GRAMMOPODIA, NEW TO NORTH AMERICA

Inocybe grammopodia
2011 collection

The number of Inocybe species that can be identified in the field is notoriously few, and some near-cryptic species require DNA barcoding to attain certainty. In this instance, we have a species that exhibits such extreme variability, both macro and micro, that DNA becomes an indispensable tool. Our original account, in the Spring 2017 issue of this publication, regarding a June 2016 collection from Moore's Woods in Riverhead suspected that it might be new to North America. However, we were able to identify it no further than *Inocybe aff. pusio*, as the Italian mycologist, Enrico Bizio, one of whose specimens were a 100% match for ours, had not completed his research regarding its phylogeny. At that time, he was of the opinion that it was not *I. grammopodia,* as originally thought, due to discrepancies in description from the holotype, found in the mountains of Morocco and originally published in 1970 in *"Flore de Chanpignons Supérieurs du Maroc"* by G. Malencon & R. Bertault.

These discrepancies were primarily in the color of the stipe, which was lavender in ours but

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THE NORTH AMERICAN MYCOFLORA PROJECT

Over 100 years ago, in the early part of the twentieth century, the New York Botanical Garden published "North American Flora" in 32 Volumes, of which volumes 2-10 dealt with fungi, containing descriptions and keys to all the then known species. Although not without its usefulness at the present time, it is understandably out of date, in nomenclature as well as comprehensiveness, many species having been renamed, removed, or relocated in other genera, based in part on the recent explosion of molecular sequencing. But for some genera, providing the only available keys, e.g., *Lepiota, Cortinarius*, etc.,(Accessible online at https://www.biodiversitylibrary.org/bibliography/889#/summary)

The NA Mycoflora Project (NAMP) is a concerted and cooperative undertaking, enlisting amateurs and professionals, to bring NA mycology into the 21st century by publishing as complete and accurate a mycoflora as possible. This effort had its beginnings in 2012, when several mycologists (Else Vellinga, Brandon Matheny, and Tom Bruns) published papers broadcasting a plea for such a comprehensive project. This led to a meeting at Yale in July 2012 of amateur and professional mycologists when the idea of a modern NA Mycoflora was solidified, and whose motto may be said to be Vellinga's remark that "without a sequenced specimen it is a rumor". (Videos and pdf's of their presentations may be accessed at http://www.northamericanmycoflora.org/presentations.html

In part, this effort is motivated by what may be

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PRESIDENT'S MESSAGE

Many new and exciting things are happening in the world of fungi and some are written about in this issue. However, not much is going on as far mushroom hunting so far this June and July. Here and there you can find a few things but the heat and infrequent rains thus far haven't helped in our quest. Maybe soon….I hope. (Please remember to let us know if you find a really productive area that we could foray in.)

The NEMF Foray is getting nearer and I am happy to see that some of our members are signed up for this event. Usually our club is under represented so this makes me very happy. Even if the rain gods are miserly, there is much to see and learn. These regional forays are a great chance to meet other people and see a new area. (In this issue there is information on COMA's Clark Rogerson Foray. If anyone is interested, you can just sign up for a day to see what it is like. This happens to be the first foray off Long Island for Joel and me about 20 years ago. We got the bug!)

Recently, Joel and I attended a barbeque and were shocked to see at least a pound of raw mushrooms in a small salad. After a brief lecture on not to eat too many raw mushrooms, not many ate that salad. (Oh shame! My niece made it.)

Talking about eating mushrooms reminds me that if you positively identify an edible mushroom and don't have a clue as how to cook it, look on the web. You may use the Latin name but the common name of the fungus will work better. There are so many recipes that it is mind boggling and it may take awhile to discover the one you want. "Edible Wild Mushrooms of N.A." by David Fischer & Alan Bessette is my favorite..

Hope to see you along the trails very soon.

EDITOR'S NOTE

"Citizen science" and "crowd-sourcing" are two terms that, although not synonymous, are often coupled. Researchers, via electronic methods, usually smartphones, are gathering data on a variety of subjects, from butterfly counts to plankton collection by sailors. Many projects do not require any expertise by public participants, only the ability to recognize the study subject and to use a smartphone to snap a picture.

The Mycoportal Project (see page 1) may also be labeled citizen science, but some knowledge of mycology (i.e., fungi identification) is needed in order to collect meaningful data. LIMC participation need not be limited to our forays, although a number of collectors scouring an area will certainly produce more species than a lone forager. Accordingly, we are asking you, our members, not merely to seek edibles on your own excursions, but to act as though you were on an organized foray, using a smartphone to document any unknown, strange or interesting examples and sending them to one of our identifiers (to be designated) for an opinion. If of interest, field data as to substrate, habitat, identifying features of the find, etc., should be noted, and the collection dried at low heat (105 ^{0} F or less) for future study.

MATERIAL FOR THE AUTUMN EDITION SHOULD REACH THE EDITOR BY SEPT 1ST.

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

 (All unsigned articles authored by editor.)

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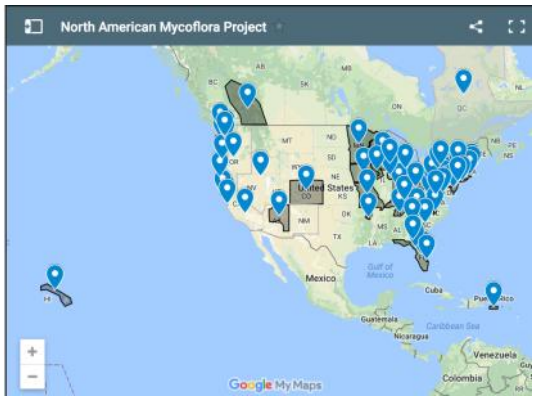
NA Mycoflora Project *(Continued from page 1)*

called "Euro-envy" inasmuch as Europe is blessed with, not just one, but several series of floras (Fungi of Switzerland, Flora Agaricina Neerlandica, and Fungi Europaei) to which both amateurs and professionals have contributed, and which is still ongoing after some decades. Of course, NAMP might take even longer, considering our much greater geographical area and species numbers. Else Vellinga estimates that number to be around 20,000.

But we are off to a running start, with 70 entities (clubs, organizations and individuals) having signed on to NAMP, ranging from Puerto Rico to British Columbia (see map of participants).



Map of Mycoflora Project participants.

An impotant aspect of NAMP is maintaining a web presence and some 15 of these projects already do so on Mushroom Observer https://mushroomobserver.org/project/project_search?pattern=mycoflora while others can be found at https://www.inaturalist.org/projects/search?utf8=%E2%9C%93&q=mycoflora but many of these are fragmentary or redundant. As many of our members are aware, our contribution may be found at http://mycoportal.org/portal/checklists/checklist.php?cl=79&pid=8 which displays an up to date checklist of all our Long Island species, several unique to NA, and others not found elsewhere in NYS.

Of our approximately one-thousand species, 178 have voucher specimens in the NYBG and another 62 in the NYS Museum. Of these, about 20 have been sequenced by AlvaLab in Spain, and uploaded to GenBank, the online repository of all publicly available nucleotide sources maintained by the National Center for Biotechnology Information (NCBI). While the cost of sequencing has declined significantly, it amounts to $20 per specimen, so that can mount up quickly. However, we expect to be able to sequence a greater proportion of our voucher specimens in the future, having recently been one of 35 projects to receive a grant from NAMP for the sequencing of 30 specimens, which are already in process. This grant was made possible by a donations from the professional association, the Mycological Society of America, and a gift of $10,000 from Paul Stamets and Dusty Yao made through NAMA.

Presently two university based laboratories are performing the DNA sequencing, with the fees paid directly to them by NAMP. One is at the University of Wisconsin-La Crosse run by Todd Odmunsen and the other at Duke University under Rytas Vilgalys, to which our specimens have been consigned. That is altogether appropriate inasmuch as he is originally from Long Island (pers. comm.) and was inspired to follow mycology by public lectures given by the late Marge Morris, a founding member and first secretary of LIMC.

The NAMP protocols require a field photograph of each collection to be associated with a unique identification number, the latter provided by field slips which NAMP makes available, and which are to be completed with relevant information such as date, place, species, habitat, collector's name, etc. Taking a photo with a smartphone will provide precise gps information. Accordingly, at our future forays we will provide a few more experienced collector's with field slips, and ask our foray participants to confer with one of them to ascertain if the mushroom they are looking at is of sufficient interest to be photographed and collected. If it is, then the collector will use a smartphone to take a photo, then complete the required data on the slip, entering their name as collector. The species name need not be exact, a genus or family will suffice. Details of this process will have to be worked out in the field.

In this manner, we hope to more quickly and efficiently document Long Island's unique mycoflora, to which we have recently added a third species new to North America. (See page 1 for an update.)

UPDATED CLARK ROGERSON FORAY INFORMATION

Aug 31-Sept 3

Registration is open now to Aug. 20. Accomodations at Camp Hemlock in Hebron, Ct, on 100 acres of woodland. Guests limited to 74 people. Fee for the full (4 day-3 nights) stay is $295 for lodging and meals, which are catered. All rooms double occupancy so singles will have a roommate assigned. It is also possible to register for 1 or 2 nights ($115-225) or just as a day visitor ($40-$70 depending on which day is selected). Chief Mycologist will be Dr. Roy Halling, assisted by Dr. Roz Lowen, John Plischke III, Dianna Smith, etc. Upwards of 300 species are usually collected. The mycophagy session will be served as dinner on Sunday.

For further information and online registration visit http://www.comafungi.org/special-events/clark-rogerson-foray/

Inocybe grammopodia *(Continued from page 1)*

lacked such coloration in the original, which was also described as entirely pruinose, not the case in ours. Spores in the original were slightly larger, 8-11(12) X 4.4-6 (7) while ours measured 8-10 X 4-5µm. Both pleurocystidea and cheilocystidea were present and these, while normally quite variable even within a collection, were not significantly discrepant in configuration or size from Malencon's or Bizio's.

In addition to the June 2016 collection, the LIMC herbarium also contained another dated Oct. 15, 2011 collected in Southaven County Park, Shirley, NY, which is strikingly similar both macroscopically and microscopically. We offer below a short description combining both collections:

Occurring in Autumn in mixed woods, in groups of two. Odor mildly spermatic or not. Pileus 2-3.5 cm. wide, broadly umbonate, at times within a central depression, fibrillose-squamulose, becoming rimose, color medium brown to ochraceous brown to fulvous, fibrils dark reddish brown. Stipe striate, slightly pruinose at apex, equal to slightly expanded toward the base, which is slightly bulbous; 3-4.5 cm. long, 4-10 mm. wide, bulb 5-10 mm., color pale violet to lavender or dingy purple for 3/4 or more of its length, bulb pallid to yellowish. Gills moderately close, adnate, with several layers of lamellulae, rarely forking, to 4 mm. wide, yellowish. The flesh is pale, with a lilac tint.

Pleurocystidea & spores, 1000X

Microscopically, cheilocystidea were more varied in shape than the pleurocystidea. The former were clavate, utriform and lageniform, somewhat smaller than the latter, which were subfusiform with a long cylindrical neck, medium thick walls (2.5 µm at apex) 45-70 X 12-18 µm, some with crystalline decorations at apex.

Our spore measurements were congruent with those of Bizio. He has compared the holotype with a large number of collections ("dozens of specimens in over 15 collections" and found that Malencon's collection had spores whose range exceeded 10 µm, his personal collections from a local garden area averaged less than 10 µm, with a length/width ratio of under 2. For this reason, as well as a more brownish pileus, and a bulbless, lilac hued stipe, he has erected a subspecies, *Inocybe grammopodia var. paleoveneta.* He is frank in stating that this is being carried out although all the samples are molecularly identical. We shared our 2016 specimen data with him and he refers to it in his paper, as belonging to the new variety.

To quote Bizio (translated from the Italian with Google Tranlate): "*I. Gramopodia* is a species endowed with an extremely marked polymorphism in the macroscopic aspect: the surface (of the) pileus may have a velvety, fibrillated, woolly appearance or be smooth, rimose atmargin; it may have abundant gray veil or be free of it; the disc can be crackedor not; it can take on fawn-tawny colors, cinnamon-bistro or even reddish-brown or reddish; the cap can have the edge massively covered by the permanent veilin adults or be without it; the lamellas can acquire a shade with reddish maturityor not; the stem can take a bulbous shape or just a little enlarged at the base or even simply cylindrical; it may appear streaked or smooth; pruinose only at the top, but even a little lower; it can take pink-lilac colors or remain greyish-white. More stable is the smell, always defined as distinctly spermatic."

The tendency at the present time is to subsume all varieties and subspecies under the species name. Brandon Matheny, internationally known Inocybe expert, whom we consulted, is of the opinion that while our 2016 collection can legitimately be labeled *I. grammopodia,* subspecies designation is questionable. Therefore, both our collections will be donated to the NYBG herbarium as *Inocybe grammopodia* and added to our species checklist and ultimately to the Mycoflora Project.

ACKNOWLEGEMENTS

I am indebted to Brandon Matheny, for generously providing me with his expert advice and guidance and sending me material from Malencon's opus. I am grateful to Enrico Bizio for making his paper available to me and for his informative communications.

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GLEANINGS.. from the research literature

- **ORIGIN OF FROG-KILLING CHYTRID FUNGUS PINPOINTED:** A wide-ranging geographical genomic study involving international cooperation of over 38 authors has traced the origin of *Batrachochytrium dendrobatidis,* causative agent of amphibian decline and extinction in six continents, to Asia. Korea was identified as a global center of *B. dendrobatidis* diversity and East Asia the probable locus of its ancestral population. It is estimated that the ancestor of the worldwide spread of the disease occurred between 120 and 50 years ago, which places the blame on global expansion of trade commencing in early 1800's, particularly the trade in amphibians for exotic pet, medical and food purposes. This continuing association points out the need for strengthening of transcontinental biosecurity. (*Recent Asian origin of chytrid fungi causing global amphibian declines. S.J.O'Hanlon et al, Science 360, 621–627 11 May 2018)*

- **ANOTHER GOOD REASON TO EAT MUSHROOMS:** While mushrooms are known to be rich in B vitamins, selenium, copper, potassium, and Vitamin D when exposed to sunlight, recent research has focused on their high level of the antioxidants ergothioneine and glutathione. Mushrooms were shown to have the highest levels of ergothioneine compared to all other food sources (red beans, oat bran & liver) and demonstrated to be bioavailable, that is, active in the human body after a meal. This in contrast to other claims of beneficial food substances which have been demonstrated only "en vitro". The present study establishes that glutathione is likewise present in mushrooms at high levels, with variation according to the species. The highest levels were found in cultivated Maitake and Yellow Oyster (Pleurotus citrinopileatus) and wild Porcini (Boletus edulis), with higher concentrations in the pileus compared to the stipe. These levels were higher than found in any other vegetable source. The authors conclude that mushrooms "are a rich dietary source of these critical antioxidants...and may be associated with reductions in oxidative stress-related diseases and disorders."(*Mushrooms: A Rich Source of the antioxidants ergothioneine and glutathione. MDKalaras et al, Food Chemistry, 233 (2017) 429-433.)*

- **MYCOTOXINS IN HUITLACOCHE (CORN SMUT):** *Ustilago maydis,* Corn Smut, is a fungus that infects corn, forming galls that are considered edible and are widely consumed in Mexico and are considered a specialty food item in the USA, where they are also available canned. However, this study demonstrates the presence of several mycotoxins which result from secondary infections by disease causing fungi such as Aspergillus and Fusarium species, fumonisin and aflatoxin among them. They are known to cause serious toxicological problems in animals and/or humans, and are not easily destroyed by cooking or commercial canning methods. The authors caution that the levels of mycotoxins present in commercially available corn smut products warrants further study. The reader may arrive at a stronger conclusion. *(Mycotoxin contamination in corn smut (Ustilago maydis) galls in the field and in commercial food product. HK Abbas et al, Food Control, 71 (2017) 57-63)*

- **ANCIENT SEA-FLOOR FUNGI:** Prior to this study, fungal life had been thought to extend back about 500 million years, but this has now been extended to 2.4 billion years. These microfossils were discovered in South Africa, in lava that had been extruded on the sea-floor, and were a serendipitous discovery during a routine microscopic investigation for minerals in material from a drill core. The fossils consisted of microfilaments 2-12 μm wide in vesicules and fractures, forming "mycelial-like structures" with branches that anastomosed, touched, and entangled each other. They are said to be indistinguishable from younger mycelial fossils found in "deep biosphere habitats in the Phanerozoid" which are one-third the age of these. The authors have scrupulously ruled out abiogenic mechanism as the origin of these microfossils, although they acknowledge that distinguishing them from biogenic origins is " difficult and controversial". The authors suggest that "Fungi living in 2.4 billion year old submarine basalts, however, would imply that the fungal clade is considerably older than previously thought, and that fungal origin and early evolution may lie in the oceanic deep biosphere rather than on land." *(Fungus-like mycelial fossils 1 in 2.4 billion-year-old vesicular basalt. S. Bengston et al, Nature, Ecology & Evolution, April 24, 2017, Vol 1, Article 1041)*

FORAY RESULTS SUMMARY

WELWYN PRESERVE, APRIL 21:

Auricularia sp.

Our traditional opening foray here was not held in the hope of Morels, but of Ascomycetes, but they too were scarce. We found only 6 species, 4 of which were Ascos. The Wood Ear, *Auricularia* sp. was found, but although we have been calling it *Auricularia americana,* recent information reveals that species occurs only on conifers so we may have been finding *A. angiospermarum*; we'll have to do some spore measurements.

PLANTING FIELDS, APRIL 28 & BETHPAGE SP., MAY 12 were both cancelled due to a lack of any fungal fruiting.

EDGEWOOD PRESERVE, MAY 19:

With the failure of Bethpage SP to produce in recent years, Edgewood has become the go-to spot for Spring Oysters, *Pleurotus populinus.* With the aid of pruning poles, we collected many full bags of these, with an added bonus of Leccinum "aurantiacum" which is fast becoming a Spring as well as Autumn visitor. There was a total of 9 species, including the otherworldly parasite *Gymnosporangium juniperi-virginianae* (above).

PLANTING FIELDS ARBORETUM, MAY 28:

Following adequate rainfall, Jacques announced a Flash Foray for Memorial Day, and a nice total of 18 species.was found. Of these, 3 were new to our list, a surprisingly high percentage: *Pluteus aurantiorugosus, Stereum gausapatum,* and *Pleurotus cornucopiae*, the latter unfortunately growing in a poison ivy patch, which put most people off. While edibles were few, a giant fairy ring of hundreds of *Marasmius oreades* made up for that lack.

Resupinatus applicatus

MUTTONTOWN EQUESTRIAN, JUNE 2:

A grand total of 40 species was the highest we ever recorded for this place and time. Among them were 2 species not previously recorded, *Akanthomyces aculeatus,* a parasite of insects (usually moths) in the Cordyceps family; and an easily overlooked tiny jelly (with a long name) *Guepiniopsis buccina.* We owe these finds to the sharp eyes of our younger members, Anthony Sama in particular. Others species included a goodly amount of Wood Ear, which since they occurred on hardwood, were probably *Auricularia angiospermarum,* but sadly they were eaten before a spore measurement could be made. Should anyone have any dried ones, please let me know.

Akanthomyces aculeatus

Also interesting was the infrequently collected (it resides on the undersurface of rotten logs) *Resupinatus applicatus,* known as the Black Jelly Oyster (Above). One tiny immature Bolete, with a dark brown cap and white reticulum, was probably *Tylopilus variobrunneus,* whose reticulum darkens with maturity.

ATTENTION LIMC MEMBERS

Trial Period for our Social Media Group on Facebook & Yahoo:

Our LIMC Yahoo groups' page has been malfunctioning for some time, causing frustration for members unable to post photos or comments, so that I created a new group on Facebook, which is working well. However, as soon as this was accomplished, Yahoo upgraded its groups systems, and is now functional. However, given its previous history, we have decided upon a trial run for both Facebook and Yahoo before we make a decision and would be guided by our members' comments. Both groups are by invitation only, so if you would like to try Facebook, please contact me (msotolongo@optonline.net). (There are enough members on Yahoo for the trial.) ***Maria Saffioti***

FROM OUR MEMBERS:

Mulch buddies; Wine Cap & *Agrocybe putaminum* by Karl Hoenzsch

***Psilocybe* sp., probably *ovoidiocystideata*, by Maria Saffioti.**

***Peziza vesiculosa* by Stefan Rosen & Andrea Barraca.**

An early *Agaricus "arvensis"* by Dale Robins

***Pleurotus djamor*, the pink oyster mushroom, grown by James Lampert.**

***Annulohypoxylon* sp. by Andrew Greller**

from "*Microbia-A Journey into the Unseen World Around you". by Eugenia Bone, 2018, Rodale Books*

"..tbere are seven fungal phyla, based on how they produce sexual spores. .. a phylum is a very wide category. ours is Chordata, and it includes sea squirts and the Queen of England. ...there is a lot of diversity within each fungal group and almost all of them contain decomposers, mutualists, and parasites.

It was members of the phylum Glomeromycota that likely made the evolution of terrestrial plants possible. Their hyphae penetrate the root cells of plants by chemically suppressing the plant's immune system, which allows the fungus to deliver an IV of mineral nutrients to the plant. These are endomycorrhizae (from the Greek for "inside' 'fungus" and "root"), and they are present in 80% of all plants. These fungi don't produce mushrooms. Ectomycorrhizae ...do produce mushrooms. ..Ectomycorrhizal fungi partner with fewer species of plants, about 3% of mainly forest trees, but they are ubiquitous because their host plants exist in large numbers

Endo– and ectomycorrhizae increase a tree's access to nutrients 1,000 times beyond the reach of its own roots. Indeed, if you brush away the soil from the roots of a conifer and squeeze the tips, they'll smell like mushrooms. They are the "pipelines of the environment" said Kristine Nichols, the Rodale Institute's chief scientist. They nurture tree seedlings by colonizing the young roots and connecting the seedling to the nutrient infrastructure of mature trees. Mycorrhizae are the bosoms of the forest, connecting a wet-nursing tree to a hungry seedling.

Fungi in microbial mats may have initiated soil building by mining the primeval rock for nutrients and decomposing dead organisms in the mats to capture their carbon and then diversified into mycorrhizal roles as plants evolved. The earliest terrestrial fossil found so far is a fungus called *Tortotubus*, which looks like a microscopic split end and colonized Earth 440 million years ago. Likewise, lichenlike organisms may have been early pioneers. There are fossil lichens dating from 400 million years ago."

IN THIS ISSUE

"The question is not what you look at, but what you see."
Henry David Thoreau, Journals, 1851

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