Newsletter of the FRIENDS OF THE FARLOW

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Collections Online: Digitizing Fungi, Lichens and Bryophytes in the Farlow

Dr. Michaela Schmull, Research & Curatorial Associate, Harvard University Herbaria

Late summer of 2012 brought two exciting projects to the Farlow Herbarium which are now in full swing. Both are about digitizing parts of our collection and both are a cooperative effort of multiple herbaria in the US.

Lichens and bryophytes are the target organisms for the project "**Digitization TCN Collaborative Research: North American Lichens and Bryophytes: Sensitive Indicators of Environmental Quality and Change**" or, as I like to call it for short "The Lichen and Bryophyte Project." Over 60 institutions are involved, with University of Wisconsin being the lead institution. Institutions will database all their specimens that were collected in Canada, the United States, and Mexico. The project will make, over a span of 4 years, about 2.3 million data records available online. We estimated that the Farlow holds about 130,000 bryophytes and about 94,000 lichens relevant to the project.

These two organism groups were chosen because they occur in the same geographic areas and share similar habitats and a number of ecological traits. Most lichens and bryophytes are desiccation-tolerant and can completely dry out and recover again without any problems. Within each organism group we find species that are more sensitive to certain factors (e.g., pollution, temperature change, and grazing pressure) and

Kamal and Armon at work on the lichen level
Photo courtesy of Anthony Brach.

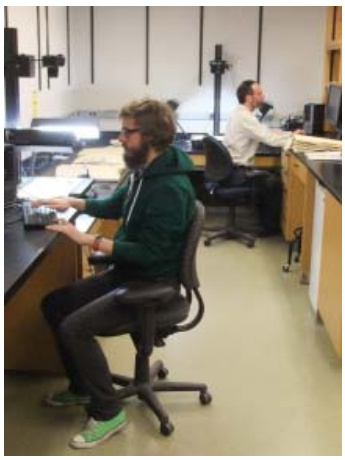
others that are less sensitive. Because of these traits lichens and bryophytes are used as pollu-

The Book Sale is Coming! by June 1, 2013. See page 6.

tion monitors in studies regarding atmospheric deposition. They have also been used in studies of climate change, water quality, and dessication.

The current project is so important because it brings together occurrence records that mainly date back to the 1800s but can be as early as 1700s. These historical records that are part of the Farlow Herbarium's collection can be used for comparisons and consequently, it is possible to examine distribution patterns over time. Effects of urbanization, logging, changes in air pollution, and temperature fluctuations can be studied.

Anthony Brach was hired as a curatorial assistant to work on the project. With him we hired two undergraduate students, Armon Rahim and Kamal Obbad, who are assisting in data entry and imaging the labels. All three are doing a terrific job and since November 2012 have entered a total of 24,715 lichen specimens and imaged a total of 6,832 labels.



Andrew and Anthony imaging specimens
Photo courtesy of Michaela Schmull.

We have a lot to accomplish before the end of the project (2015). Anthony and the students are therefore capturing only minimal data. The generated data will be transferred to the project portal where databased information and the imaged labels will be available online. Volunteers will be able to go to the website and fill in the missing information from the imaged labels. Both tasks are not fully completed yet: we are still working on the best way to submit our data to the project server and IT personnel from other institutions are completing the crowd sourcing component for the volunteers. The project will rely heavily on volunteers, helping us to accomplish our goal to provide all data from our collection. If you are interested in learning more about the project and seeing its capabilities, please visit the website: http://lbcc.limnology.wisc.edu/

Specifically for lichens go to: http://lichenportal.org/portal/

Specifically for bryophytes go to: http://bryophyteportal.org/portal/

We hope you also would like to join the team of volunteers in the near future!

Macrofungi are the target organisms for the project "**The Macrofungi Collection Consortium: Unlocking a Biodiversity Resource for Understanding Biotic Interactions, Nutrient Cycling and Human Affairs.**" The diverse group includes mushrooms, boletes, puffballs, club fungi, morels, stink horns, truffles and cup fungi, independent of geographic occurrence. Specific taxa have been chosen for this project due to the key roles they play in animal (e.g., as a food source) and plant life, the latter as ectomycorrhizal fungi. Important potential hypotheses that can be tested once information is being available are:

1. Fungal biodiversity is significantly underestimated but is key to understanding community migration and biogeography.

2. Phenological patterns of macrofungal sporocarp production will be altered with climate change.

3. Fungal species of interest or concern for ecosystems and human welfare may be identified and tracked with the aid of herbarium records.

A total of 35 institutions, with The New York Botanical Garden being the lead institution, will capture about 700,000 labels, 100,000 images of fungal specimens, and digitize about 500,000 critical ancillary items such as photographs, field notes, and field book pages over a span of 3 years.

In the Farlow Herbarium we estimate we have about 75,000 relevant specimens which we will database and image labels of, and we will take about 7,500 images of specimens. The data will be made available at the Mycology Collections Portal: http://mycoportal.org/portal/index.php

Andrew Brownjohn has been hired as a curatorial assistant for the project. Two undergraduate students, Matthew Gschwend and Theodore (Jordan) Becerra as well as our volunteer Martha Finta, are helping us to improve the curation of our collection (mainly Gastromycetes) by repacking specimens and making new labels. Andrew is working hard and finished recently the data entry of the Gastromycetes and is currently working on our oversize collection. He databased a total of 4,300 specimens and imaged 2,000 labels.

Matthew and Theodore (Jordan) recurating discomycetes specimens
Photo courtesy of Michaela Schmull.

Similarly to the Lichen and Bryophyte Project we also only capture minimal data. The difference from the Lichen and Bryophyte Project is that missing label information from the images are being transcribed by a New York Botanical Garden employee. Please check out the portal. You can look at checklists, search species with images, or try out the dynamic checklist!

Blow, Ye Fungal Winds, O Blow

by Lawrence Millman

As autumn progresses, a tree concentrates more and more of its photosynthates in its roots at the expense of its leaves and branches, with the result that when a good wind, not to mention a good hurricane, comes along, those leaves and branches often suffer the consequences. In other words, they might end up broken off and lying on the ground. Thus I found myself following the progress of the recent so-called superstorm Sandy up the eastern seaboard with, I confess, a certain mycological interest.

On October 29, 2012, Sandy whacked the Northeast. The following day, I wandered around the Harvard University campus in search of fungi...specifically, fungi on leaves and branches that had been untimely ripped from the mother tree by Sandy's winds. Such was the success of my foray that I phoned my friend and fellow mycophile Susan Goldhor, and she joined me for a fungal prowl of the campus later in the day.

As with a typical foray, I compiled a species list for what I'd like to call the 2012 Sandy-Harvard Foray. I suspect my list would have been quite a bit longer if it weren't for the fact that Harvard's fungally-oblivious clean-up crew removed all errant sticks, branches, and even most of the leaves the day after I engaged in my foray. All those splendid substrates -- gone!! In any event, here's my species list:

Amylostereum chailletii (black? spruce)
Apiognomia quercina (oak leaf)
Botryobasidium sp. (conifer)
Botrysphaeria sp. (oak leaf)
Diaporthe sp. (oak)
Diatrype disciformis (beech)
Diatrype stigma (beech)
Exidia recisa (beech)
Hydnochaete olivacea (various hardwoods)
Hyphoderma sp. (conifer)
Hypochnicium sp. (conifer?)
Irpex lacteus (various hardwoods)
Lophodermium pinastri (white pine needles)
Phyllosticta sp. (maple leaf)
Plasmopara viburni (viburnum leaf)
Rhytisma americana (maple leaf)
Schizophyllum commune (various hardwoods)
Stereum complicatum (various hardwoods)
Stereum ochraceo-flavum (oak?)
Stereum rugosum (maple)
Stereum sp. (oak?)
Steccherinum ochraceum (maple)

Strumella sp. (oak)
Taphrina caerulescens (oak leaf)
Trametes conchifer (beech)
Trametes versicolor (maple)
Verticilium sp. (maple)

Most of the wood-inhabiting species on this list are unaggressive specialists in branch rot, although a few can specialize in top rot, too. The leaf inhabitors are more or less innocuous except in years when large outbreaks attack most of a tree's foliage, affecting chloroplasts and, in the process, interfering with photosynthesis. Those same large outbreaks can also extend to twigs and branches, sometimes with unpleasant results for the tree. This did not seem like one of those years. Likewise, none of the species on the aforementioned list can be classified as uncommon -- seldom seen, perhaps, but not uncommon.

Of the species I documented, the one that I've encountered least frequently was *Amylostereum chailletii*, a specialist in white rot. Morphologically, *A. chailletii* is a typical *Stereum*-like species, but one of its modes of spore dispersal is anything but typical. Female wood wasps of the *Sirex* genus are equipped with a sporangium for carrying its spores. With their ovipositors, they'll deposit their eggs and a toxic mucus, along with those spores, into their tree of choice, usually a softwood. A while later, a batch of new wood wasps and their *Amylostereum* symbionts will greet the world.

Since I didn't have the foresight to scrutinize the campus for fungi a day or two before Sandy's arrival, I can't say what percentage of the species might already have been on the ground, but I suspect it would be a relatively small percent -- maybe a few *Rhytismas,* the *Trametes*, the *Hymenochaete olivacea*, and the *Schizophyllum*. A vastly larger number of the species on the list would still be residing in trees were it not for Sandy's robust winds. Thus only a mycololgist trained in tree-climbing or having a binoculars suitable for spying on canopy-dwelling warblers would have found them.

I won't say that the results of the 2012 Sandy-Harvard Foray left me clamoring for another hurricane. After all, hurricanes can have tragic consequences that would offset even a lavish fungal inventory. Sandy herself killed 253 people in seven countries. But I can say this: Sandy's visit reminded me that there are considerably more fungi out there than we tend to observe in our earthbound daily lives.

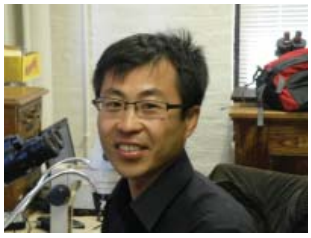
News from the Farlow

Graduate student **Danny Haelewaters** has received the Theodore Roosevelt Memorial Fund Research Award from the American Museum of Natural History. He will present 3 posters at the Mycological Society of America meeting in Austin, TX, August 10-14. The posters are entitled: "Two New Species of *Diphymyces* (Fungi, Laboulbeniales) from Borneo," "The Laboulbeniales of the Boston Harbor Islands" (with **Serena Zhao**) and "MSA Student Section 2013." In March he gave two talks. The first was at the Family Festival at the Harvard Museum of Natural History and was entitled "Looking for Microscopic Parasites Through Time." The second was an invited presentation for the Boston Mycological Club entitled "Laboulbeniales: an Ecological Approach." In addition, in July Danny will attend the Workshop on Molecular Evolution at the Woods Hole Marine Biology Laboratory.

Salome in the snow at the Farlow Herbarium
Photo by the editor.

Salome Urrea Valencia, from the Universidade Federal de Santa Catarina, Trindade-Florianópolis, SC, Brazil, came to the Farlow on a Friends of the Farlow Graduate Fellowship from February 4th to February 9th to study the species of *Lepiota* from Brazil which are in the Farlow in order to add to

the material she has already studied in her survey of *Leucocoprinus* and *Leucoagaricus*. Salome is a graduate student in Brazil under Maria Alice Neves, a former recipient of the Friends of the Farlow Graduate Fellowship.



Hai-Sheng Yuan at work in the collections
Photo courtesy of Barbara Hanrahan.

Hai-Sheng Yuan, from the Chinese Institute of Applied Ecology in Shengyang, China, arrived as a visiting scholar on March 1st for a period of one year. He is here studying polypores and other aphyllophoroid groups of North America. He has already worked these groups from the provinces of China, Europe, Africa and South America. He would like to put all the data together to compare and analyze through sequencing, the origins as well as the evolutionary and geodistribution clues of these species.

Michaela Schmull and Judy Jacobs (Senior Conservator, National Park Service, NYC and daughter of FoF member, Marcia Jacobs) will be teaching a course this summer from July 14th-20th at Eagle Hill in Steuben, ME. The course is entitled, Lichens, Biofilms and Stone.

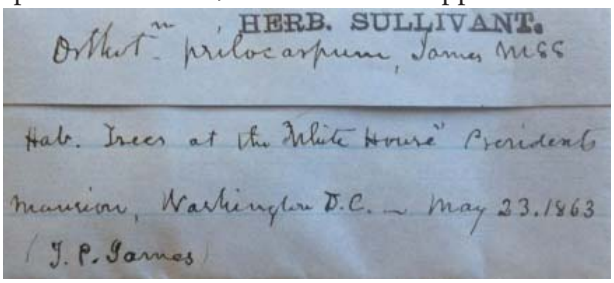
Teresa Iturriaga working with the Curtis Herbarium
Photo by the editor.

Teresa Iturriaga, Professor at the Universidad Simón Bolívar, Venezuela, is with us for 3 months through a grant from the David Rockefeller Center for Latin American Studies as well as funding through the Farlow herbarium. While she is here she is assessing the changes in frequency and distribution of rare fungi recorded from Venezuela which are housed in the Farlow. Information about these fungi will be enhanced by the digitization of the relevant historical fungi collections made by A. Fendler between 1854-1856, A. Gaillard in 1887, and A.F. Blakeslee in the 1990s.

Fun Finds in the Farlow

by Genevieve Lewis-Gentry

Sometimes it is easy to forget that history was happening at the same time that botanists were out collecting the specimens many of us interact with on a regular basis. Maybe when working with specimens from the U.S. Exploring Expedition you might think about the wooden ships they were sailing on. You might ponder what discoveries they were making on the 1838-1842 voyage while out in the open seas. I do those things, but what I usually don't do is think about what was happening in the world when specimens were collected. I am sure I have handled 150 year old specimens before, but this one stopped me and



Orthotrichum psilocarpum from the Farlow Herbarium
Photo courtesy of the Farlow Herbarium.

made me think.

I had never seen a specimen in the Farlow that said it was collected at the White House. That alone was very exciting. A presidential specimen! Then I looked again and thought about the date. The specimen was collected at the White House in the middle of Abraham Lincoln's presidency, and the middle of the Civil War. It was almost five months after the Emancipation Proclamation was made.

This seemed like a significant collection hiding away in the W. S. Sullivant moss herbarium. It also seemed likely that since the collection was from T. P. James that perhaps we would have more

in the James Herbarium.

I was amazed at the find of three specimens of *Orthotrichum psilocarpum* all collected at the White House during the Civil War by T. P. James. It seems likely that there are other species collected in the same place, but until the entire Farlow Collections are in a database it will be hard to know. (The many digitization projects mentioned earlier should help.)

Annual Book Sale!

The annual Friends of the Farlow members only book sale list will be mailed out by June 1, 2013. Keep an eye out for the list so you don't miss the deadline for getting the book order list back in time!

Squam Rock: lovely setting for 2013 Clara Cummings Walk (May 4, 2013)

by Danny Haelewaters

Miss Clara Eaton Cummings, Hunnewell Professor of Cryptogamic Botany at Wellesley College (1855, Plymouth NH - 1906, Concord NH), has greatly contributed to botany and lichenology in particular. She began making collections at very young age and before the age of ten "she could tell every tree growing in the woods near her home by a small piece of the wood and bark."[1] While the annual Friends of the Farlow Clara Cummings Walk does not intend to be as rigorous and dedicated as Miss Cummings was in the field, it enables our members to meet, enjoy the first rays of sunlight, walk in human's original habitat—nature—and have a closer look at lichen and algal diversity.

The semi-public Squam Rock Land Trust reservation, Annisquam Village, is located at the shores of the Annisquam River, which flows into Ipswich Bay. "Squam" is suggested to be Indian for a harbor in the mouth of a river, the "Annis-" prefix might refer to Cape Ann.[2] The first European settlement in Annisquam was established in 1631. The Annisquam Harbor Light Station rests on the rocks of Wigwam Point and has been there since 1801. In 1851 the wooden tower was replaced after falling into decay and it stands there to this day. The lighthouse was added to the US federal government's National Register of Historic Places in 1987.

Annisquam Harbor Light Station
Photo courtesy of Danny Haelewaters.

ALGAE

Many specimens of seaweed (algae) were collected. Some of the collections have been pressed and will be kept at the Farlow Herbarium for further identification and study. So far, four species have been identified, using Lamb et al.[3]: *Ulva lactuca* L. (sea lettuce), *Chondrus crispus* Stackh. (Irish moss), *Fucus distichus* L. (rockweed), and *Fucus vesiculosus* L. (bladderwrack). An interesting fact is that *F. vesiculosus* can be used as an indicator for the presence of pollution in the environment, as its cells show more metabolic activity in response to the addition of a toxicant.[4]

LICHENS

Worldwide the number of lichens is suggested to be in the order of 30,000 species.[5] Our walk in the Squam Rock Land Trust reservation yielded up to 49 species in 39 genera in 15 families. For comparison: the Boston Harbor Islands netted 175 species in 67 genera in 33 families.[6] For New England a total of 461 species in 98 genera have been put forward, 257 of which (55.7%) are considered regionally rare or declining.[7]

The highest diversity of lichens at Squam Rock seems to be on the boulders. All lichen growth forms were represented. What we saw was typical

for local rocks in the area. There was some maritime influence, e.g. the greenish-yellow to orange *Xanthoria parietina* (maritime sunburst lichen) on the rocks and trees. This find offers an immediate connection to Miss Clara Cummings, as George Davis found out that she collected *X. parietina* herself in Annisquam, March 31 1892.

Xanthoria parietina collected by Clara Cummings that is housed in the Farlow Herbarium
Photo courtesy of Danny Haelewaters.

Rocky intertidal shores are physiologically very stressful habitats for organisms.[8] They need to be able to resist the constant changes in the environment, such as pounding surf, flooding with salt water, long-time exposure to air, and considerable fluctuations in temperatures. Lichens can adapt their metabolic functions to different environmental conditions, a phenomenon known as "plastic physiology."[9] The rock surface above the high tide line is referred to as the spray zone. This zone is exposed to salt spray and characterized by periwinkles, tar black *Hydropunctaria* (= *Verrucaria*) and orange *Caloplaca* lichens.

Caloplaca scopularis on the rocks at Squam Rock.
Photo © Kay Fairweather

A full list of all identified lichens found at Squam Rock during the 2013 Clara Cummings Walk will be available on the FoF website soon.

THANKS

Kay Fairweather, Jason Karakehian, Elizabeth Kneiper, Elisabeth Lay, Mike Prague, Michaela Schmull, and Sarah Verhaeghen are acknowledged for identifying specimens found and observed.

A special thanks goes to Jason Karakehian for his organizing efforts to make this year's Clara Cummings Walk a success.

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Clara Cummins Walk Follow-up

notes from Elizabeth Kneiper

This year's Clara Cummings Walk attracted about 26 participants, which is a very good number for the walk. This walk was also the first time ever any children came along and it was great fun to have 2 little girls out looking at nature with the Friends of the Farlow! The beautiful location attracted many new faces from the Boston Mycological Club as well as causing requests for a repeat of the trip. The participants were really interested and quite up for being taught and to learn about the algae and the lichens. FoF member Martha Finta shared her expertise on the geology of the shoreline rocks and made delicious cookies for us all. In other words, it was a friendly reunion, a social event, and a fun day with algae and lichens.

Join us!

Receive the FOF Newsletter, notification of the annual book sale, discount on Farlow publications and services, invitations to the annual meeting and other events, and a special welcome when visiting the Farlow.

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