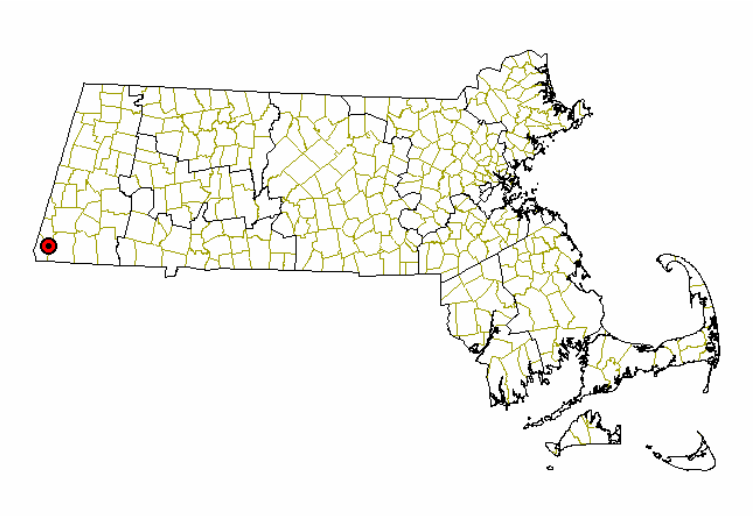
MT EVERETT MYCOFLORA PROJECT

Summary

[Rick Van de Poll, Ph.D. January 2002]



Overview

During the spring and summer of 2000, a comprehensive inventory of macrofungi was conducted on the summit of Mt. Everett in Mt. Washington, Massachusetts. The study was conducted at the request of the Southern Taconics Research and Conservation Center in order to further the biodiversity knowledge of the unique summit area. Plans by the State of Massachusetts Department of Environmental Management to install telecommunication facilities on Mt. Everett's summit prompted this private review. This summary report is intended to provide a preliminary synopsis of findings of the research on macroscopic fungi during the growing season of 2000. Pending further microscopic identification of selected collections, a final report with a complete species list will be provided shortly.

Site Description

Mt. Everett lies in the southwestern corner of Massachusetts in an area of north-south running highlands known as the southern Taconics. At an elevation of 796 m (2608 ft.), Mt. Everett stands out as the highest peak in the region. It consists largely of metamorphic quartzite and schist from the Devonian Age, and is considered a true 'monadnock' in the sense of it being a fairly isolated peak that resisted general erosion of the surrounding peneplain during the last 375 million years. Soil types are thin to non-existent, as much of the surface material was removed during the last period of continental glaciation. Cool, moist conditions have created thin, spodosolic podzols, which overlie a fairly smooth bedrock surface.

Perhaps most interesting among Mt. Everett's attributes is its summit plant community. Comprised mostly of pitch pine (*Pinus rigida*) and red oak (*Quercus rubra*), this forest and woodland community is dwarfed in size, and rarely exceeds 4 m in height throughout most of the +/- 10 ha. summit area. The result of long term fire cycles, shallow soils, and poor nutrient conditions, this plant community is relatively unique in the northern Appalachian Region of the eastern United States. Only in a few isolated mountaintop areas in the southern Taconic mountain range does such an expression of plant structure and species composition exist.

Conditions for the occurrence of macrofungi are regulated by this plant community. Fairly deep duff and humus layers exist on the summit of Mt. Everett owing to the long period of time since the last catastrophic fire. Tree ring dates by the author of between 90 and 150 years were taken during a preliminary survey in November of 1999. Subsequent studies by the Harvard Forest have confirmed this as a general maximum stand age. Surface organic material over 20 cms in depth were not uncommon in the summit area when the macrofungi plots were established. A well developed 'A' horizon indicated that this duff layer contributes to a fairly mesic, mineral soil regime, especially in light of the amount of exposure to drying winds. The compact crown structure and dense understory layer of ericaceous shrubs have also favored a relatively positive growing condition for fungi.

Methods

Sampling methods followed Rossman et al. (1998)[1], with some adaptations for macrofungi in temperate climate growing conditions. Five transects were established in

[1] Rossman, Amy Y., Rodham E. Tulloss, Thomas E. O'Dell, and R. Greg Thorn. 1998. *Protocols for an All Taxa Biodiversity Inventory of Fungi in a Costa Rican Conservation Area*. Boone, N.C.: Parkway Publishers, Inc.

May of 2000 in a random, radial fashion originating from the summit bench mark (#1, USGS). Transects were laid out with a Silva Ranger T-15 compass and 50 m Keson fiberglass tape. Circular, 4 m^2 plots were marked with flagging and wooden stakes every 10 m along the transect line. Transect lines ended where the tree canopy exceeded 5 m in height, or where a visual assessment of the plant community suggested that the limit of the summit dwarf pitch-pine-oak community was no longer present. Discontinuous patches of this community that occurred further down slope were not included in the transect sample.

Each circular plot was visually surveyed for macrofungi at least twice during the growing season (May to October). The sampling procedure included a careful inspection and accounting of every mushroom fruiting body within a 1.13 m distance of plot center. Data sheets recorded plot number, time, species (tentative if uncertain), number of fruit bodies per plot, weight per carpophore in grams, and whether a specimen was collected for further chemical or microscopic analysis. Additional data collected for each transect included weather conditions, soil conditions, date of last rainfall event, and general plant cover for each plot. Visual surveys of each plot utilized a pre-measured stick to aid in determining the plot edge, and included both surface observations and a careful combing through the leaf litter for hidden carpophores. Macrofungi were considered to be greater than 1 mm in length (any direction), although notes were made on fruiting bodies smaller than this if it was felt that they could potentially exceed 1 mm in their maximal growth form.

Collected specimens were labeled with all pertinent descriptions of their fresh condition on small note cards, and placed in a wax paper bag. These bags were separated by date and stored in a cool, dry location until they were either dried for further analysis or dissected for immediate microscopic review. The latter included both macrochemical and microscopic analyses, using a standard set of chemical reagents and a Wolfe 1000 compound microscope. Notes on each analyzed specimen were taken and identification took place through the use of appropriate keys (see References).

Results

Five radial transects totaling 970 m were established at the summit of Mt. Everett along the following compass bearings and with the following lengths:

Transect 1	284 deg.	240 m
Transect 2	340 deg.	200 m
Transect 3	70 deg.	140 m
Transect 4	142 deg.	160 m
Transect 5	207 deg.	230 m

Ninety-seven circular, four m^2 plots, or a total of .04 ha (.1 ac) were established over the course of 2 days in May and were sampled on the following dates and locations:

May 25-6	Transect set-up, first records of five species
June 21-22	T5, T2 (up to T2-150)
July 23-24	T2 (160-200), T3, T1 (up to T1-120)
August 21-22	T1 (130-240), T4
September 24-25	T5, T2 (up to T2-160)
October 22-23	T2 (170-200), T3

All transects were sampled at least once, and three were sampled twice. Total plots sampled during the five active months of sampling equaled 152, or roughly 30 plots per sampling visit. Total sampling hours equaled 64.8, or roughly 13 hours per site visit. Site visits normally spanned 2 days. An additional 14.75 hours were spent either establishing the plots or sampling their soil, vegetation, or lichen cover attributes.

Plant data collected within the 97 plots resulted in an average canopy height of 3.1 m, and average canopy closure of 88.7% and an average open ledge amount of 11.3%. Red oak (*Quercus rubrum*) was the most common canopy species (N=50), followed by pitch pine (Pinus *rigida*) (N=17). Black Huckleberry (*Gaylussacia baccata*) was the most common understory species, both as the primary (N=27) and secondary (N=26) dominants. A total of 25 vascular plants were listed as the primary, secondary, or tertiary dominant in terms of areal coverage in the plots. An additional 57 vascular plants were recorded within the plots. Pitch pine dominated plots were positively associated with black huckleberry ($P<.05$) and lowbush blueberry (*Vaccinium angustifolium*) ($P< .1$). Taller canopies (>5.5 m) were positively associated with red maple (*Acer rubrum*) and mountain laurel (*Kalmia latifolia*) understories ($P < .05$).

Soils were mostly Lyman-Tunbridge-Rock Outcrop fine to very fine sandy loams. These frigid, podzolic glacial tills are typical of higher elevations along ridgetops and isolated summits. Soil depths ranged between 0 and 50+ cm; soil pH readings varied between 4.0 (surface O.M) and 4.5 (B horizon) (N=6).[2] Surface soil temperatures ranged from 5.5°C and 16.5°C.[3] Soil moisture levels ranged from mesic to sub-hydric throughout the season.

Rainfall during the growing season was above average, both in frequency and amount. Sampling efforts were preceded by moderate to light rainfalls less than 3 days prior to sampling on every occasion. Damp subsurface conditions were present on every collecting date, with soil moisture levels exceeding 40% in the upper B horizon throughout the season. In only one sampling session was some dessication observed in the upper organic layer. Deep duff and litter layers likely contributed to this very positive growing condition for fungi.

Nolanea lutea and Scleroderma citrinum

An approximate total of 169 species of macrofungi were recorded within the plots during the 6 site visits. An additional 37 species were recorded between plots. Plot macrofungi included over 1230 carpophores or carpophore groups[4] weighing approximately .47 kg. Sizes ranged from 1 mm minimum length to over 15 cm, and from <.1 gm to roughly 95 gm per fruiting body. Slime molds were the smallest species encountered, and *Cerrena unicolor*, a polypore, was the largest.

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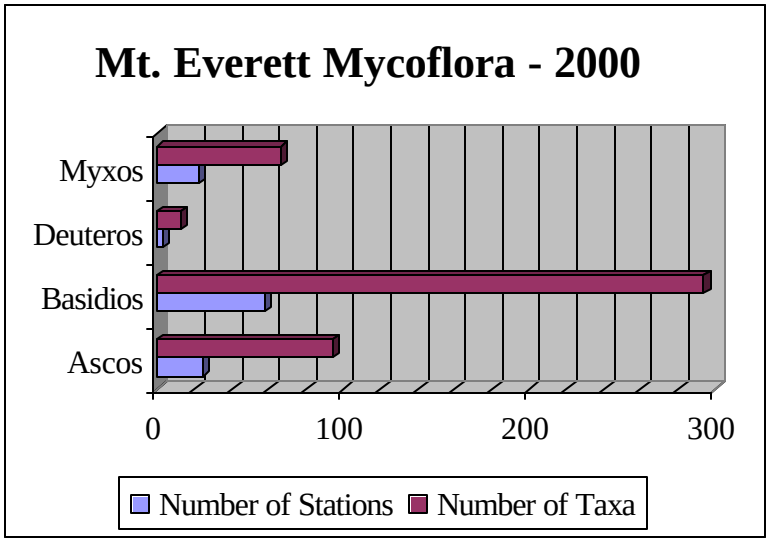
[2] Soil pH tests were conducted in 6 separate locations representing the maximal diversity of soil types. Tests were performed using LaMotte Soil pH Colorimetric test kit with a .1 pH unit level of precision. Samples were taken from the surface (O) horizon as well as the upper B horizon.

[3] Soil temperatures were measured at every tenth plot using a 12.5 cm Taylor Soil Thermometer probe that was directly inserted into the soil surface at plot center.

[4] For fruiting colonies that could not easily be counted – i.e. sheet colonies of basidiomycete crust, tiny Discomycete colonies on wood, and tightly clustered sporocarps of many slime molds – a *station count* was used for numbering carpophores.

The most abundant fruiting group of fungi occurred in the Agaricales, with *Marasmius pallidocephala, Marasmius androsaceus,* and *Mycena stylobates* representing 3 of the top 5 most frequently encountered species (N = 34, N=19, and N=15, respectively)[5]. The second most abundant group occurred in the Discomycetes, with *Lachnum ciliare* and *Orbilia* spp. being the two most common species (N=26, N=12, respectively). Roughly 62% of the carpophores counted were Basidiomycetes, 20% Ascomycetes, 14% Myxomycetes, and the remainder Deuteromycetes.



One hundred and four collections were made during the survey, 88 % of which have been identified through microscopic and/or chemical means. The most common species group remaining to be confirmed are the small cup fungi, mostly in the Hyaloscyphaceae. While none of the positively identified species are new to science, there is a possibility that some of the small Ascomycetes made represent either new species or new range occurrences of species known from other regions. The most notable includes a small, ciliate cup fungus with a golden-orange margin that only occurred on pitch pine. A second unknown species on snowshoe hare dung in the *Arthobium* group may also be new at least to the region. A third species, Beauveria bassiana, was found infesting an adult spider and a related species was found parasitizing a grasshopper carapace.

On the whole, Mt. Everett appeared to contain rich diversity of very small macrofungi, many of which were optimizing the excellent growing conditions provided by the deep duff layer and ample rainfall during the 2000 growing season. Saprophytic, litter-inhabiting marasmioid fungi were the most abundant by frequency and weight, and small Discomycete species were the most common by number of individual carpophores. The latter included species that fruited in the hundreds per individual occurrence. Since a selected group of individuals remain as yet unknown, it is uncertain at this time if either rare or endangered, or previously unrecorded species occur in this unique habitat. Since comprehensive mycofloras are extremely rare in North America, it is also uncertain as to

[5] Based on the number of plot occurrences and not fruit bodies or total weight.

whether some species that may appear uncommon or rare, are in fact unusual. Perhaps the most reliable estimation of 'uniqueness' among this group of highly selected fungi are those that are restricted to pitch pine, since many of the species recorded appeared to have positive associations with that species. That said, final work on the collections remains prior to a more accurate assessment of species rarity on the mountain.

References

ABI. 2001. Association of Biodiversity Information web page. http://www.abi.org

Arora, David. 1986. *Mushrooms Demystified*, 2nd ed. Berkeley: Ten Speed Press.

Bessette, Alan. 1988. *Mushrooms of the Adirondacks.* Utica: North Country Books.

Bessette, Alan, Arlene Bessette, and David W. Fischer. 1997. *Mushrooms of Northeastern North America*. Syracuse: University of Syracuse Press.

Bessette, Alan, William Roody, and Arlene Bessette. 2000. *North American Boletes*. Syracuse: University of Syracuse Press.

Bondartsev, A.S. 1981. *The Polyporaceae of the European USSR and Caucasia*. Jeruselem: Israel Program for Scientific Translations, Keter Press.

Gilbertson, R.L., and L. Ryvarden. 1987. *North American Polypores*. Vol. I & II. Oslo: Fungiflora.

Gleason, H.A., and A. Cronquist. 1991. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*. 2nd. ed. Bronx, NY: The New York Botanical Garden.

Hesler, L.R. 1969. *North American Species of Gymnopilus.* New York and London: Hafner Publishing Company.

Hesler, L.R., and A.H. Smith. 1963. *North American Species of Hygrophorus.* Knoxville: University of Tennessee Press.

Hesler, L.R., and A.H. Smith. 1979. *North American Species of Lactarius.* Ann Arbor, MI: University of Michigan Press.

Hawksworth, D.L., B.C. Sutton, and G.C. Ainsworth. 1983. *Ainsworth & Bisby's Dictionary of the Fungi*. 7th ed. Kew, Surry: Commonwealth Mycological Institute.

Jenkins, David. T. 1986. *Amanita of North America*. Eureka, CA: Mad River press.

Katsaros, Peter. 1989. *Illustrated Guide to Common Slime Molds.* Eureka, CA: Mad River Press.

Kauffman, C.H. 1918. *The Agaricaceae of Michigan*. Vol.s I & II. Lansing: Wynkoop, Hallenbeck Crawford Co.

Kibby, Geoff, and Raymond Fatto. 1990. Keys to the species of Russula in Northeastern North America. Unpublished.

Lincoff, G. 1981. *The Audubon Society Field Guide to North American Mushrooms*. New York: Alfred Knopf.

Magee, D.W., and H.E. Ahles. 1999. *Flora of the Northeast: A Manual of the Vascular Flora of New England and Adjacent New York*. Amherst: University of Massachusetts Press.

Massachusetts GIS home page: http://www.state.ma.us/mgis/

Moser, Meinhard. 1983. *Keys to Agarics and Boleti* 4th ed. London: Roger Phillips.

New England Interstate Water Pollution Control Commission. 1998. Field Identification of Hydric Soils. v2. Concord, MA: NEIWPCC.

Petersen, Ronald H. 1968. *The Genus Clavulinopsis in North America*. New York and London: Hafner Publishing Company.

Rossman, Amy Y., Rodham E. Tulloss, Thomas E. O'Dell, and R. Greg Thorn. 1998. *Protocols for an All Taxa Biodiversity Inventory of Fungi in a Costa Rican Conservation Area*. Boone, N.C.: Parkway Publishers, Inc.

Smith, A.H., and H.D. Thiers. 1971. *The Boletes of Michigan*. Ann Arbor, MI: University of Michigan Press.

Smith, A.L., Helen V. Smith, and Nancy S. Weber. 1979. *How to Know the Gilled Mushrooms*. 1st. ed. Dubuque, IA: Wm. C. Brown Publishers.

Smith, A.L., Helen V. Smith, and Nancy S. Weber. 1981. *How to Know the Non-Gilled Mushrooms*. 2nd. ed. Dubuque, IA: Wm. C. Brown Publishers.

Sneddon, L. 1998. Draft Eastern Regional Natural Community Alliances. Boston: The Nature Conservancy Eastern Regional Office. Duplicated.

Soil Survey Division Staff. 1993. *Soil Survey Manual*. USDA Handbook No. 18. Washington, D.C.: US Government Printing Office.

Stephenson, Steven L., and Henry Stempen. 1994. *Myxomycetes: A Handbook of Slime Molds.* Portland: Timber Press.

Tulloss. Rodney. 1999. Appendix A6: Draft keys to species of *Amanita* occurring in the Northeastern U.S.A. and eastern Canada. Unpublished.

Tylutki, Edmund E. 1993. *Mushrooms of Idaho and the Pacific Northwest: Vol. 1 Discomycetes*. Moscow: University of Idaho Press.

Van de Poll, R.D. 1996. Natural and cultural resource inventories: A guide to comprehensive methods for the private landowner in New England. Doctoral thesis. The Union Institute. UMI Publications. Cincinnati, OH.