New England Botanical Club – Minutes of the 1033rd Meeting
1 February 2008
Robert Bertin, Recording Secretary

The 806th meeting of the New England Botanical Club, being the 1033rd since its original organization, was held on Friday, 1 February 2008 in the lecture hall of the Fairchild Biochemistry Building at Harvard University with 40 members and guests in attendance. The slate of candidates for the upcoming year was announced by Alice Schori, chair of the nominating committee. Pat Swain announced that a description of the Massachusetts Natural Heritage and Endangered Species small research contracts program was available on the MNHESP website (www.nhesp.org).

The evening presentation was by Dr. Michaela Schmull, research associate at the Farlow Herbarium, and was entitled "Substrate Influence on Speciation of Lichenized Fungi." Dr. Schmull first reviewed the basics of lichen biology. Lichens consist of a fungus, generally an ascomycete, together with green algae or Cyanobacteria. Fungal hyphae wrap around the algal or prokaryote cells and induce their partners to provide photosynthetic products to the fungus. Lichen thalli take any of several forms, usually categorized as foliose (leaflike), fruticose (branching), and crustose (encrusting). Lichens are found on a wide variety of substrates including rocks, soil, bark, wood, dead vegetation, leaves of higher plants, other lichens, and various artificial substrates such as pavement and roof shingles. Because the fungi lack roots, these organisms cannot extract nutrients from the substrate in the manner of a higher plant, though many lichens are substrate-specific. Factors that could contribute to substrate specificity include pH, which differs among rock types and even between bark of different tree species. Also of potential relevance are nutrient availability and levels of heavy metals, which can be toxic to lichens in low concentrations. However, the mere presence of heavy metals does not preclude lichen growth, as revealed by the greater lichen cover on balsam fir (*Abies balsamea*) than on red spruce (*Picea rubens*) in the Adirondack Mountains, despite higher manganese levels in fir bark. Electron micrographs of thin sections of this bark revealed that much of the manganese was immobilized in crystals and therefore did not affect the lichen. Also affecting suitability of substrates for lichens is the local microclimate, including such factors as light, temperature, relative humidity, evaporation, and substrate moisture-holding ability. The latter is particularly important because the lichenized algae photosynthesize only when moist.

While species concepts vary, a species is here recognized as a group of individuals that can potentially interbreed and look more or less similar to one another. The basis of lichen taxonomy has shifted somewhat with time. Macroscopic features such as color and growth form were particularly important until the mid-1800s, when microscopic features, especially the structure of the apothecia (fruiting bodies) were more widely used. Views of species limits have also shifted, from relatively narrow through the early 19th century to somewhat broader after this time.

Dr. Schmull reexamined the issue of species limits in lichens of the *Caloplaca holocarpa* complex using modern molecular techniques to see which of these historical views of species was more accurate. Members of this complex occur on various substrates, including bark, dead wood, and various kinds of rock. All have an inconspicuous thallus and numerous orange-pigmented apothecia. Previous taxonomists combined or separated the forms of *C. holocarpa* from different substrates in various ways. Dr. Schmull created a phylogeny for members of this group and related taxa using nuclear internal transcribed spacer (nITS) regions of the ribosomal (r)DNA. She found that the bark-dwelling form *C. pyracea* is a good species and forms a sister group to all other *Caloplaca* taxa in the analysis. Bark- and wood-dwelling *C. holocarpa* and *C. thuringiaca* form a clade that is a sister group to all remaining *Caloplaca* species. However, it was not possible to determine whether they should be considered separate species or a single species. The rock-dwelling *C. lithophila* is also a good species, and is a sister group to the rock dwellers *C. maritima* and *C. marina*. The general conclusion is that different species exhibit strong substrate preferences, a view that is consistent with the views of the early lichen taxonomists.