

Monhegan Islanders,

Many thanks, as always, for your welcome and for your support of our work. We continue to explore dimensions of the fascinating interaction between parasitic dwarf mistletoe and spruce on Monhegan. As you no doubt observe in your forests, dwarf mistletoe, a native plant, kills white spruce after leading to deformations in tree branching (the so-called “witches’ brooms” familiar to the island). This past spring, recent Bowdoin graduate John de Villier, Jaret Reblin (a Laboratory Instructor at Bowdoin) and I published a study describing how the severity of mistletoe infection influences the response of white spruce. Our article appeared in the international scientific journal *Botany* in a special issue dedicated to parasitic plants and the findings reported at a 2016 meeting of the *International Union of Forest Research Organizations*, where I presented our work. We conducted the bulk of our study in 2013; however, we re-censused trees in 2016. One interesting finding of ours which I’d like to share is this: in 2016, nine of the 13 study trees originally scored in 2013 as *severely infected* were dead; all but one (which couldn’t be located) of the trees originally scored as *moderately infected* were *severely infected*; nine of the 14 trees originally scored at *lightly infected* were *moderately infected* in 2016, while one was *severely infected*. Clearly, on the timescale of a white spruce’s life, once mistletoe infection has taken hold, progression to death is swift.

My recent sabbatical to the Arnold Arboretum in Boston opened up opportunities to delve into the mistletoe-spruce interaction at scales we’ve never before explored. I partnered with Dr. David Des Marais, recently appointed to the faculty at MIT, to advise a Jacob Barnett in a study of the anatomy of spruce needles. For this study we employed the Arboretum’s scanning electron microscope. Jake, a high school biology teacher when he joined the effort, examined the anatomy of the microscopic pores found on the surfaces of leaves which allow carbon dioxide in (to support photosynthesis) and water vapor out (*i.e.*, transpiration). While mistletoe-infected spruce exhibit some unusual behaviors with respect to transpiration, we showed that this probably isn’t a result of dramatic alterations to the anatomy of the pores. Jake led the presentation of our work at the annual *Harvard Plant Biology Symposium* hosted by the Arboretum this past spring. Jake’s involvement in this project helped motivate him to pursue a graduate study in Biology; he’s presently in his first year of a Ph.D. program at U Mass – Amherst. Go Jake! Your students at Acton-Boxborough High School surely miss you, but you’re on to great things.

Dave Des Marais is an expert in the study of genes and how they influence the appearance and behaviors of plants. Dave takes advantage of cutting-edge technologies that enable us to examine thousands of genes simultaneously from a single sample. In 2016, we collected small amounts of needle tissue from infected and uninfected red and white spruce trees on Monhegan Island with the hope of understanding which genes are “turned on” or “off” by mistletoe infection and to what degree. In the parlance of the field, how does mistletoe infection affect host tree “gene expression”? Dave is still at work perfecting our extraction procedures and analyses. We hope to have something more to share about this part of our project in the years ahead.

On a final note, I wish to thank you for your thoughtful stewardship of Monhegan's forests. The Wild Lands are an extraordinary place. Dwarf mistletoe has had visible and, to some, distressing impacts on Monhegan's forests; however, your careful stewardship has allowed native broad-leaved trees to flourish (birch and maple most conspicuously) at our field site along the Pebble Beach Trail. Much of the Wild Lands are recovering from 19th century deforestation for pasture. Your stewardship is facilitating the natural ecological succession towards mature forests. That's worth celebrating.

Yours sincerely,

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