Vertical patterns in epiphytic bryophyte communities of Nova Scotia, Canada

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Bryophytes play important roles in forest ecosystems, particularly in old-growth forests, where their diversity and abundance often exceed t of vascular plants. Previous work in eastern hemlock forests of Nova Scotia found greater bryophyte diversity and abundance on the lower bole than in the canopy, whereas studies elsewhere documented substantial canopy communities. This study examined how bryophyte species richness and community composition differed between tree bases and lower crowns in mature to old-growth temperate hardwood forests of Nova Scotia. Bryophyte surveys were conducted on mature to old-growth trees in 28 sites in five regions during 2022 and 2023. We sampled the lower bole and lower crown using single-rope ascension techniques. Environmental variables, including canopy openness, tree size, age, height, and pH were measured and analyzed using ANOVA and multivariate methods. A total of 52 bryophyte species were recorded, averaging 10.5 species per tree. Species richness was similar between tree bases and crowns, contrary to predictions of declining richness with height. Community composition varied significantly along the vertical gradient, reflecting differences in microclimatic conditions and habitat structure. Tree species was an important determinant of bryophyte assemblages near the base, whereas tree age significantly influenced canopy communities. Canopy assemblages were largely a subset of species occurring at tree bases but included several species of conservation interest. Conventional ground-based surveys may underestimate bryophyte diversity and overlook important canopy communities. These findings underscore the conservation value of old-growth hardwood forests and the importance of preserving structural complexity over vertical forest gradients.

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