The Importance of Frost Boils for Recruitment of Arctic-alpine Plants in the Mealy Mountains, Labrador

by
Jolene Sutton

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Department of Biology
Memorial University of Newfoundland.

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ABSTRACT

In arctic-alpine environments with closed vegetation, there is limited space for seedling recruitment. The objective of this study was to determine if gaps caused by frost boils (sorted polygons) offer "safe sites" for recruitment and persistence of arctic-alpine plants. To conduct this study, a 1 m^2 quadrat was used to survey a number of frost boils, as well as areas of closed vegetation, in the Mealy Mountains of Labrador. To determine if frost boils were important for recruitment, comparisons of seedling densities in frost boils and closed vegetation were made, and persistence of *Diapensia lapponica* within frost boils was examined. Seedling density was determined to be greater within frost boils than in closed vegetation. *Diapensia lapponica* numbers were observed to increase in some resurveyed frost boils, indicating that persistence was likely. Further comparisons were made to determine how the dynamics of the different substrates (frost boil and closed vegetation) differ. Substrate upheaval was measured using wooden dowels inserted in the ground. Heave was significantly greater within frost boils than within closed vegetation. Within the frost boils, displacement levels were highest near the center and decreased outward. This pattern of upheaval within sorted polygons likely results in larger substrate particles being deposited near the edges of frost boils. It is also believed to result in the zonation of vegetation that occurred for both seedlings and non-seedlings. Soil temperatures that were greater within frost boils compared to within closed vegetation may enhance germination in frost boils and may have been a foundation for the higher seedling densities recorded on the bare substrate. Seed numbers obtained from soil samples were lower in frost boil substrate than in vegetated substrate indicating a smaller seed bank. Lower seed numbers combined with higher seedling densities confirmed that frost boils are favorable sites for germination. Understanding the function of these natural cold soil processes for seedling recruitment becomes critical when considering the long-term effects of global climate change at higher latitudes. If soil warming alters substrate dynamics, adverse consequences to seedling recruitment in arctic-alpine environments can be expected.