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Time needed for first lichen colonization of terminal moraines in the Tröllaskagi peninsula (North Iceland)

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The Tröllaskagi peninsula is located in Central North Iceland. The peninsula belong to the Tertiary basaltic areas in Iceland and is characterised by numerous glacially eroded valleys and fjords. The altitude ranges from sea level to 1500 m. Around 150 glaciers, debris covered glaciers and clean glaciers exist in the cirques of the Tröllaskagi peninsula.
Lichenometric techniques were applied to date moraines formed by some of these glaciers, especially from 1970-90, establishing growth rates for some species, e.g. 0.5 mm/year for Rizocarpon geographicum. However there is no information available on how long the lichens take to colonize the boulders in a moraine once it has become detached from the retreating glacier.
The aim of this paper is to observe how long it takes for the boulders on the moraines to be colonized by lichens in the Tröllaskagi peninsula, where the separation date of a moraine from the retreating glacier tongue is known. Two case studies were used. The first was the surging glacier Búrfellsjökull, in the Búrfelllsdalur valley, an affluent of the Svarfaðardalur valley. The Búrfellsjökull glacier surged in 2001-2004 and the glacial terminus advanced 150-240 m, overrunnig a moraine formed around 1955 and formed a new moraine. About 2-3 years after the surge termination in 2004 the glacial terminus was already retreating and had left the moraine isolated (Brynjólfsson et al. 2012). The other case is the Gljúlfurárjökull glacier, in the Gljúlfurárdalur valley, an affluent of the Skíðadalur valley. It can be seen from the series of aerial photographs that the glacier terminus advanced during the 1990s until the year 2000. In 2004 the glacial terminus was already retreating and had separated from a small moraine formed during the previous advance. Thus, two different glaciers halted and formed one moraine each which they separated from almost similar time. During the detailed field work carried out in August 2014 on both moraines, lichen thalli were located and their greatest diameters measured, examining the surface, boulder by boulder, along a 100 m stretch of each moraine and counting those with existing lichen thalli and those without them.
The results from the two moraines are very similar:
a) Only 15 – 18% of the boulders presented some type of thallus.
b) There is little variety in the thallus size on one specific boulder, but great variety between different boulders, even when they are very close together.
c) The largest thalli of the moraine only appear on isolated boulders, between 3 and 0.7%.
d) In the Rizocarpon geographicum thalli, exceptional sizes were found of isolated thalli with max. diameter of up to 2,8 mm. The most frequent size observed on boulders with homogeneous thalli is 1 - 2 mm.
e) Some sectors of the two moraines still have ice under the boulders, which may explain the uneven lichen colonization in different parts of the moraine.
These observations should be taken into consideration when examining the age of the moraines using lichenometry. 8-10 years after a moraine separated from the glacial terminus, only a minimum number of its boulders are stable enough to allow lichen colonization. As time passes, the blocks gradually become stabilized and allow lichen colonization. This may explain the widely varying thalli sizes found between different blocks in the same moraine.

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