

Project acronym: GeneFreeze

Project title: Genetic adaptation to freezing and thawing in Enchytraeids

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Discipline: Life Sciences & Biotech

Station(s): Rif Field Station (Iceland), GINR (Greenland), CEN Whapmagoostui-Kuujjuarapik Research Station (Canada), NIBIO Svanhovd Research Station (Norway), NERC Arctic Station (Svalbard/UK)

Predicted warming of Arctic and other cold regions can lead to the reduction (or absence) of insulating snow cover during frost periods, increasing the risk of freezing of soils despite a general increase of average temperatures. Invertebrates such as enchytraeids and other organisms that inhabit these soils may therefore become exposed to more frequent freezing and thawing events in the future. Changes to soil freezing dynamics may impose a challenge to soil invertebrates and in particular the ones that resort to freeze-tolerance as main survival strategy to endure harsh winters.

In a large-scale comparative study of enchytraeid populations collected along a thermal (latitudinal) gradient we will ask the questions: (1) What are the physiological mechanisms underlying freeze tolerance?, and (2) Is there a risk that increased frequency of freezing and thawing events will threaten soil biota in the Arctic and subarctic areas?

The objectives are to: (1) collect at least 30 populations of *Enchytraeus albidus* along a climatic gradient throughout its geographical distribution (i.e. from Svalbard in the north to Spain in the south). (2) perform basic ecological observations of the habitat and abundance of enchytraeids and in particular *E. albidus*. (3) raise laboratory cultures in a common garden test design (4) test effects of repeated freeze-thaw events and measure membrane fluidity, membrane lipid composition, glucose mobilization, and expression of candidate genes during cold acclimation and freezing (5) gather temperature data (and frequency of freeze-thaw events) from visited Inter-Act sites with the purpose of correlative analysis of experimental data.