

Scientific report

CLIMMANI Short Visit Grant 2013

Project title: Nematode abundance, diversity and community structure in the ForHot natural soil warming experiment (www.forhot.is)

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Host: Prof. Bjarni D. Sigurdsson, Agricultural University of Iceland, Iceland



Figure 1. Krassimira and warm hotspring areas and steam vents in Grændalur (“the green valley”), where there has been soil warming for centuries. Hence, the name, because the warmed grasslands stay green during the whole winter, as can be seen in the background.

Purpose of the visit

The main purpose of this short visit grant was to take soil samples in three geologically warmed ecosystems for nematode faunal analysis in the aim to study the response of soil nematodes to soil warming (Figure 1).

This study will contribute to the ForHot research project carried out in Reykir in S Iceland, which is a large-scale study on ecosystem responses to warming (www.forhot.is) and which was initiated by CLIMMANI after the meeting in Iceland in 2011. This natural experiment was established after an earthquake in May 2008, when previously “cool” areas within two ecosystems suddenly started to experience geothermal warming resulting in a gradient of soil temperatures from ambient to + 50 °C over a distance of less than 100 m (Forest and Young Grassland; Figure 2). Then there is the third ecosystem (Old Grassland; Figure 2) which have had such geothermal warming since centuries back; which offers unique opportunities to study how “fast” ecosystems adapt to warming.

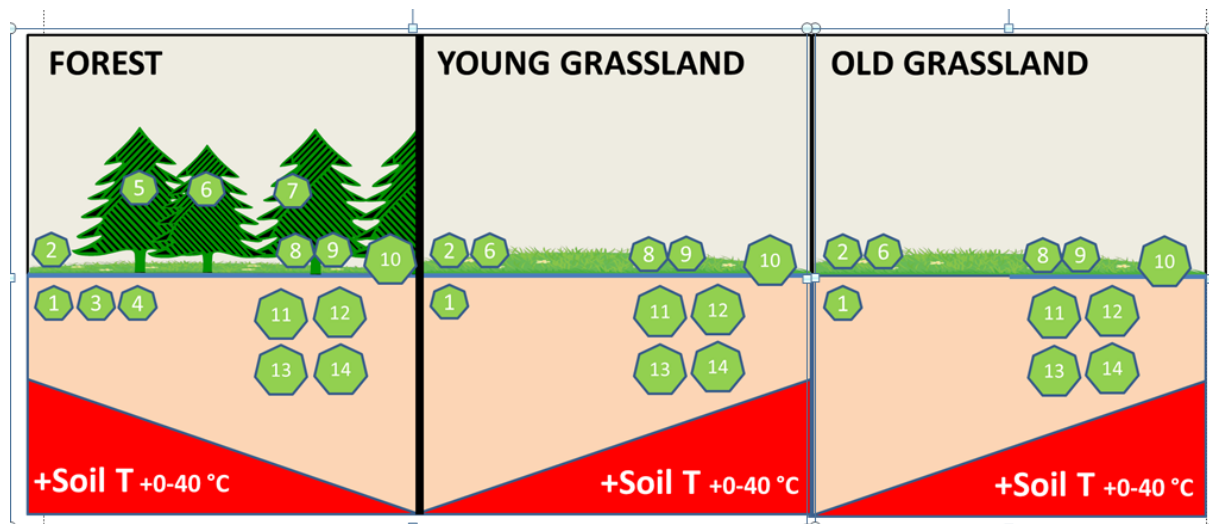


Figure 2. The ForHot project is studying the effects of soil warming in three ecosystems. It is looking at different ecosystem processes and foodwebs. It is divided into 14 different work packages. My work contributes to WP 11.

Soil temperature and moisture content are among the main abiotic factors which directly or indirectly influence the activity, reproduction, distribution and population dynamics of nematodes in the soil. Soil nematodes play an important role in the processes of decomposition and mineralization and thus they contribute notably to nutrient turnover in the soil. Nematode communities are very abundant in numbers and species, which show different

responses to the environmental stress (temperature, moisture etc.). In the soil food web nematodes (representatives of the soil microfauna) interact closely with soil microorganisms (bacteria and fungi) and with soil meso- (collembolans and mites) and macrofauna (earthworms). Therefore any changes in nematode communities induced by soil warming or other environmental factors may have a considerable effect on the function of the whole soil system.

The results of the study will contribute to our understanding of the response of the whole soil ecosystem to global climate change. The nematode fauna of Iceland has been very little studied and therefore the visit will most definitely increase the number of known species for the country.

Work completed

1. After looking at the ForHot field research sites (at Reykir close to the Hveragerdi village in S-Iceland) prof. Sigurdsson and me, we discussed the number of soil samples that we should get to study the response of soil nematodes to soil warming. We decided to take one composite soil sample from each permanent plot of the ForHot study.

2. We took soil samples from the three ecosystems (Figure 2):

- A. Forest (47-year-old Sitka spruce stand which got warm after the 2008 earthquake).
- B. Young grasslands (grasslands that got warm after the 2008 earthquake).
- C. Old grasslands (grasslands that have been warm for many decades).

At each area there are 5 transects, where plots have been established at reference soil temperature (T_s), and at +1, +3, +5 and +10 °C. So, each area has 25 plots, 5 plots of each of the 5 temperature levels. We took soil samples from all 25 plots at each area, thus altogether the total number of samples taken was 75. Samples were taken by using soil corer to a depth of 10 cm. One composite sample consists of 3 single samples.

3. Additionally at each research site 5 composite samples were taken from places where the soil temperature reaches about 50°C.

4. The collected samples were shipped to Poland for extraction, counting and identification of nematodes.

5. On May 16th, I gave a presentation of my research at a faculty meeting of the Agricultural University of Iceland, taking place at the Reykir Campus.

6. On May 13th-14th I visited the University of Akureyri in N-Iceland and had meetings with different researchers. The main host was dr Brynhildur Bjarnadottir.

Future collaboration

1. I am going to continue cooperation for the research project *ForHot: Natural soil warming in a Sitka spruce forest and grasslands in Iceland* (www.forhot.is). During my visit I signed a memorandum of understanding between the Icelandic steering committee of ForHot and researchers and post-graduate students at Cardinal Stefan Wyszyński University in Warsaw, Poland.

2. I met scientists from Agricultural University of Iceland, Icelandic Institute of Natural History and Iceland Forest Research to discuss opportunities for continuing the scientific collaboration; mainly within the frame of ecological research carried out in Surtsey (a volcanic island that was created by eruption in 1963).

3. I discussed the possibility of joint projects in the future with dr Brynhildur Bjarnadottir from the University of Akureyri.

Planned publications (in international peer - reviewed journals)

Krassimira Ilieva-Makulec et al. Nematode abundance, diversity and community structure along a geothermal soil warming gradients, 2014 (in preparation)