QUESTIONNAIRE

SCIENTIFIC ACTIVITIES

ADVANCED NOTICE FOR SCIENTIFIC ACTIVITIES IN ANTARCTICA

Finnish Antarctic Research Program / Finnish Meteorological Institute

Questionnaire

Advanced Notice for Antarctic scientific activities

In order to facilitate the advanced notification process Finnish Antarctic Research Program (FINNARP) has developed a questionnaire which is an attachment of the Initial Environmental Evaluation of the FINNARP expedition.

Completed questionnaires should be forwarded to the following address:

FINNARP/Sari Matilainen
Finnish Meteorological Institute
P.O. Box 503
00101 Helsinki

email: sari.matilainen@fmi.fi

1 Introduction

Activities in the Antarctic shall be planned and conducted so as to have the least possible effect on the environment in Antarctica; in particular the activities should avoid leading to:

- adverse effects on air or weather patterns
- significant adverse effects on air or water quality
- significant changes in the atmospheric, terrestrial, glacial, limnetic or marine environments
- detrimental changes in the distribution, occurrence or productivity of species or populations of animals or plants
- risks to endangered or threatened species or population of such species
- risk of damage to areas of biological, scientific, historical or aesthetical importance, or of significance to the region's characteristic as a wilderness
- other significantly harmful effect on the Antarctic environment and Antarctic related ecosystems

Antarctica is designated as a natural reserve, devoted to peace and science. The fundamental framework for protection in Antarctica is the Protocol on Environmental Protection to the Antarctic Treaty. The Environmental Protocol is in Finland implemented through the Act to Protection of the Environment in Antarctica 18.10.1996/28 v. 1998.

2 General information

2.1 Project

Project title: Climate Change Driven Microbiomes and Adaptive Radiation of Plants in the Polar Regions

Scientific area (quaternary
geology, verte-brate
zoology etc.): Biology, ecology and evolutionary biology

2.2 Project leader

Name: Kari Saikkonen

Address: Biodiversity Unit, University of Turku, 20014 Turku, Finland (home Graniittilinnankatu 2 D 60, 20100 Turku)

Telephone: +358 (0)40 6683468

E-mail address: karisaik@utu.fi

2.3 Time period

Time period in Antarctica: 27.12.2025 – end of January/beginning of February 2026

2.4 Participants

List of participants in the project:

Name	**Address and phone (home and work)**	**Position/Task**
Kari Saikkonen	**Home: Graniittilinnankatu 2 D 60 Work: University of Turku, Finland**	**Professor**
Marjo Helander	**Home: Graniittilinnankatu 2 D 60 Work: University of Turku, Finland**	**researcher**

3 Description of the project

Give a short description of the project and its scientific purpose

Framework

Our research explores how climate warming influences primary succession in Antarctica's terrestrial habitats, with a specific focus on the role of microbes. Currently, less than 2% of Antarctica is ice-free, but model suggest this could increase to nearly 25% by the end of the century. During the same period, the Arctic Ocean is predicted to become ice-free. Consequently, the new ice-free areas on the Antarctic continent will be the last remaining continent-scale habitat in the world suitable for terrestrial species adapted to extreme cold.

We propose that the great adaptive capacity of microbes plays a significant role in ecological succession in Antarctica. As polar regions warm, newly ice-free terrestrial areas will be first available to pioneering microorganisms from sub- and supraglacial sediments and organisms shifting their ranges poleward. Microbes readily occupying the open terrestrial niche of uninhabitable land promote primary succession by improving soil organic matter and fertility. Furthermore, microbes are essential associates of virtually all higher organisms, including plants and are known to play a fundamental role in determining the fitness of their hosts. Microbes support primary succession, and those associated with their shared hosts comprise multipartite entities, holobionts, which are an extended phenotype and the target of phenotypic selection. Plant microbiomes are evolutionarily older than contemporary land plants, and most of the plant evolution has fundamentally incorporated coevolutionary processes of plant-microbe interactions. Plant microbiomes are crucial to plant nutrition acquisition, pest and pathogen resistance, tolerance to abiotic stress, and plant growth regulation. Microbes modulate plant growth and adaptation both directly by producing biocontrol or signalling compounds and indirectly via the release or modification of phytohormones. Therefore, plant microbiomes will likely shape the direction and pace of primary succession in Antarctica. Although historical biogeography and the present biodiversity of different Antarctic terrestrial environments have been intensively studied, these studies have largely overlooked the role of microbes in successional dynamics.

Implementation

This study builds on our extensive collections of Arctic and Antarctic plants and their microbes over recent decades, including those from the MICROBIPOLAR project (funded by the Research Council of Finland, 2021-2025).

Our current focus is on samples from the Aboa Station in Antarctica, which offers a unique setting to explore microbial colonization and ecological filtering. This includes testing Baas Becking's principle: "Everything is everywhere, but the environment selects"—by examining how environmental conditions influence microbial dispersal and establishment in fragmented environments. According to the theory of island

biogeography, the size of an island and its distance from the mainland, relating to the immigration and extinction rates of species, are the two main predictors determining the number of species inhabiting it. Accordingly, microbiota among sampling sites should markedly vary. We assume that the first pioneering microorganisms from sub- and supraglacial sediments will dominate nunataks and newly ice-free terrestrial areas. In contrast, coastal habitats in the Antarctic Peninsula with lush vegetation sustain a more diverse microbiota. Because fungi seem to be more dispersal limited than bacteria, we expect to see spatially more divergent fungal populations between the sites. Due to the long coevolution of plants and their microbial associates, we expect to detect host species- and habitat-specific community structures with a set of cold adapted core microbes conserved across the sites.

3.1 Field work area

List the areas where the scientific activities are done. Give name, coordinates and time period for each area.

Area	Longitude	Latitude	Time period
Aboa	**13°25′00″ W**	**73°02′59″ S**	**2026**

4 Environmental impacts

4.1 General evaluation

What kind of impact on the environment is anticipated (e.g. emission to the atmosphere from generators/engines, impact on snow free areas from walking, disposal of chemicals, etc.)?

The impacts on the environment includes impact on snow free areas from walking, The target plant (bryophyte) species are selected as not being of concern in Antarctic ecosystems, and the sampling will be performed only in populations big enough as not to be impacted by the sampling.

4.2 Chemicals and radioisotopes

Will the following be brought to Antarctica?

Harmful chemicals ☐ Yes X No

Radioisotopes ☐ Yes X No

If yes, specify the chemicals.

Will the project involve disposal of chemicals to ice, soil, water or air? If yes, specify!

No.
If the scientific activities are done in the station area; area between geodetic container and aerosol container, you may leave the questions in 4.3, 4.4, 4.5 ja 4.6 open.

4.3 Field work

Attach a map where planned areas/routes for field work are indicated.

How many will participate in the field work?
2, Marjo Helander and Kari Saikkonen

Will the party establish separate field camps? If yes, indicate the expected maximum amount of days spent in one and the same field camp.

No.

4.4 Environment

Will the project involve contact with especially sensitive environments or an environment with aesthetic values? If yes, specify!

No.

Will the project involve contact with animals, plants or minerals (e.g. walking on snow free areas, water sampling, catching a bird, mineral sampling)? If yes, specify!

Microbe and plant (bryophyte) sampling.

4.5 Alternatives

Are there any alternatives to planned procedures in the project, in order to avoid or minimize environmental impact? Specify with regards to geographic area, methods, time, extent and length of period.

4.6 Prevention of environmental impact

How will environmental impacts be avoided or minimized?

5-10 small samples (10 gametophytes) from 5-10 bryophyte populations, and soil, ice and water samples will be taken for microbial analyses. Care will be taken not to step on and disturbe the vegetation more than necessary for sampling.

Be aware that if there have been changes to the activity, you must report it to the Finnish Antarctic Research Program.

Date 31.05.2025 **Signature** _____

Kari Saikkonen