Title of the internship :
The rhizospheric microbial community of an endemic cushion of the Kerguelen Islands: Role in the plant adaptation to extreme environment and its response to climate changes.

Supervisors :
Cécile Monard, Françoise Hennion and Michèle Tarayre

Institute:
UMR ECOBIO

Summary (up to 300 words) :
The sub-Antarctic Kerguelen Islands are extreme environments subjected to rapid climate change, mostly with temperature increase and loss of precipitations. The native sub-Antarctic flora is poor and composed of perennial and often long-lived plants, potentially more vulnerable to rapid environmental changes. Endemic species, *ie* the most geographically restricted, should be even more at risk.
Lyallia kerguelensis (Montiaceae), an endemic cushion plant of the Kerguelen Islands, is particularly infrequent on the archipelago and specialized in certain habitats. In addition, many cushions show more or less important necrosis. Our research aims at understanding the role of the rhizospheric microbial community of *L. kerguelensis* in this plant adaptation to the extreme environment and in the observed necrosis. We hypothesized that *L. kerguelensis* susceptibility to necrosis rely on both soil abiotic properties and its rhizospheric microbial communities.
During the last summer campaign, rhizospheric soils from several individuals of different populations of *L. kerguelensis* located at contrasting places according to soil properties within the Kerguelen Islands were sampled and immediately frozen at -20°C in order to analyze the bacterial and fungal communities using a metabarcoding approach (Illumina sequencing). At the meantime a composite soil sample was harvested to determine its abiotic properties and pictures of the corresponding cushions were taken to estimate the necrosis rate of the plants. The aim of the internship is thus to i) analyze the rhizospheric microbial diversity of the different cushions using DNA extraction, PCR amplification and MiSeq sequencing and ii) evaluate the link between both the microbial and abiotic soil properties and the necrosis rate of the plant individuals observed in each studied population. The results obtained will help to identify some factors involved in the adaptation of *L. kerguelensis* to extreme environment and to its response to climate change. Such features are of interest considering the vulnerability of endemic plants to changing environments.
We are looking for a highly motivated student, used to both molecular and bio-informatics tools and confident in statistics.

Other informations :

Insertion within an ongoing research project (yes/no) : yes
IPEV Program 1116 PlantEvol 2015-2019 (F. Hennion PI)
LIA in collaboration with Massey and Otago Universities, New-Zealand and ESE Paris-Saclay (2017-2021) (F. Hennion PI).

Publications on the field of research (up to 3) :

Pansu, J., Winkworth, R.C., Hennion, F., Gielly, L., Taberlet, P., Choler, P., 2015. Long-lasting modification of soil fungal diversity associated with the introduction of rabbits to a remote sub-Antarctic archipelago. Biol. Lett. 11. doi:10.1098/rsbl.2015.0408

Yergeau, E., Bokhorst, S., Kang, S., Zhou, J., Greer, C.W., Aerts, R., Kowalchuk, G.A., 2012. Shifts in soil microorganisms in response to warming are consistent across a range of Antarctic environments. ISME J. 6, 692–702. doi:10.1038/ismej.2011.124