ARCTIC 2023 – PROJECTS SELECTED FOR IMPLEMENTATION

ArcticAir: Arctic Aerobiology

PI, LEAD INSTITUTION

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ABSTRACT

The risks of invasions of remote ecosystems by new microorganisms is a major threat as they are likely to impact the diversity and function of resident communities and local ecosystems. In the Arctic, aerial transport is the primary source of new biological inputs. Airborne communities are believed to be influenced by environmental and climatic conditions, which are already changing rapidly on a global scale, but especially in the Arctic region. Yet, the influence of climate change, weather patterns and environmental conditions on these airborne communities are still unclear. Airborne microorganisms are known to travel intercontinental distances and if they survive, they may colonize previously remote and potentially pristine environments. In the Arctic, the Polar Dome may currently limit such invasions but warm and moist air mass intrusions from mid-latitudes to the Arctic may provide a new highway for airborne microorganisms. Despite the essential role of these airborne microorganisms in ecosystem dynamics and their contribution to precipitation patterns, many questions remain on their role, diversity and dynamics.

The ArcticAir project will characterize airborne communities in the Arctic region, identify potential drivers, determine the risks of microbial invasion and, most importantly, monitor the interannual variability of these airborne communities and the associated environmental drivers.

To this end, we will conduct continuous air sampling from Svalbard to the North Pole, along and around Greenland and through the Northwest Passage, creating the largest dataset of airborne microbial communities for the Arctic. This dataset will allow us to investigate the richness and diversity of these communities, the factors influencing their assemblages (e.g. climate, source, weather) and determine their metabolic activity in this unique and dynamic ecosystem and determine the changing microbial invasion risks from other regions of the globe. Opportunistic soil sampling during landings will allow us to determine the potential sources of airborne microorganisms while increasing the global database of Arctic soil samples.

Overall, the most important aspect of this project is the unique contribution that PONANT can provide: the possibility to conduct annual sampling over similar cruise tracks, allowing us to monitor changes in these airborne communities from year to year and assess interannual variation. This is a first step towards understanding the impact of climate change on these communities, an issue very much of current public concern. This is especially

important as the Arctic region is warming 3 times faster than the rest of the world and the ecosystems are already undergoing profound change, particularly in respect of ice loss.

The results of the ArcticAir project will be shared with the public via the media (both social and commercial), lectures and science seminars; and shared with the scientific community at conferences and via the publication of scientific manuscripts in high impact research journals.

Overall, the ArcticAir project will answer key ecological knowledge gaps concerning airborne microbial communities and their changing roles in ecosystem function, helping us understand (and monitor) the impacts of climate change on airborne microbial communities in the region.