Biodiversity and microhabitat associations of terrestrial arthropods on Axel Heiberg Island, Nunavut, in the High Arctic

Introduction: Climate change has in recent history driven significant and rapid changes to the Arctic environment, and continues to alter Arctic ecosystems at an unprecedented rate (Callaghan et al. 2004). The effects of this rapid environmental change are however not well understood, as there remain significant gaps in our baseline understanding of the natural history of Arctic ecosystems (Parmesan 2006). As the dominant faunal group in terrestrial Arctic ecosystems, arthropods make ideal model organisms for monitoring Arctic environmental change (Danks 1992). The High Arctic locality of Axel Heiberg Island, Nunavut, Canada may yield valuable information on Arctic arthropod assemblages across spatial and temporal gradients, as its terrain comprises a mosaic of highly variable microhabitats that contrast in vegetation complexity, soil moisture and composition (personal observations, August 2016). However, Axel Heiberg Island has never previously been subject to any dedicated survey of terrestrial arthropods. As climate change continues to rapidly alter the Arctic environment, it is clear that we must urgently fill the vital knowledge gap that is Axel Heiberg Island through a dedicated monitoring program using arthropods as the model organism. But in order for the monitoring program to successfully detect changes to these ecosystems over time, we must establish a baseline understanding of the arthropod communities that are already naturalised on the island; this is therefore the first step of the program.

Objectives: The purpose of this project is to establish a baseline understanding of High Arctic microhabitat associations of terrestrial arthropods on Axel Heiberg Island across both spatial and temporal gradients. This project is the foundational step for a proposed long-term arthropod monitoring program on Axel Heiberg Island.

Methods: This project entails a thorough study of microhabitats with their associated arthropod communities on Axel Heiberg Island. The McGill Arctic Research Station (MARS) will provide logistical support for the project, and the fieldwork will last the entire duration of MARS' summer operational period to allow for an optimal temporal gradient. I propose to catalogue every single microhabitat that can be identified within the enclosed basin in which Colour Lake is located. Within each microhabitat, a transect of 6 yellow pitfall traps (Ernst et al., 2016) will be placed, with each trap spaced 3 metres apart. Where each pitfall trap is placed, a soil sample is also taken to extract soil-dwelling arthropods through Berlese funnels (6 samples per microhabitat). I will additionally attempt to describe and assign a classification to each of the microhabitats. This project may also allow time for a study of arthropod diversity across an elevation gradient, by establishing one or more transects running up Wolf Peak, the nearest snow-capped mountain to MARS. Taxonomic diversity will be looked at as well as functional diversity, because Axel Heiberg Island's understudied nature makes it important to establish what species are already present (the island may also yield some unknown endemics) so that new invaders may be detected (Cameron 2016). Such thorough multidimensional collections data will allow for a variety of comparative analyses along both spatial and temporal gradients later in the lab, and establish the baseline for future arthropod monitoring studies on Axel Heiberg Island.

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