ABSTRACT

TITLE:	Lepidoptera Larvae as an Indicator of Multi-Trophic Level Responses to Changing Seasonality in an Arctic Tundra Ecosystem
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ABSTRACT: Earlier snowmelt and warming temperatures in the Arctic will impact multiple trophic levels through the timing and availability of food resources. Lepidoptera are a vital link within the ecosystem; their roles include pollinator, parasitized host for other pollinating insects, and essential food source for migrating birds and their fledglings. Multiple environmental cues including temperature trigger the emergence of Lepidoptera. In response to changes in seasonality, including earlier snowmelt and warming, we expect caterpillar abundance to increase. We determined the abundance of caterpillar larvae in relation to the timing of snowmelt through two approaches: 1) a climate change experiment in which we accelerated snowmelt by 15 days through the use of radiation-absorbing fabric and warmed air and soil temperatures using open-top chambers, individually and in combination and 2) an observational 50 km transect study with 4 sites that naturally vary in the timing of snowmelt. Caterpillar abundance was determined by pitfall traps in all study plots, and we also did visual searches for caterpillars in the climate change experiment. In the climate change experiment, observations began one to three weeks after snowmelt. In the observational study, observations began prior to when study sites were completely snowfree. We characterized caterpillars by skin type (hairy, spiked, or smooth). The animals were examined for braconid wasp and tachinid fly parasites. Where snowmelt was experimentally accelerated and temperatures were warmed, caterpillar abundance was greatest and more were seen earlier in June. Within the transect study, we observed two seasonal peaks in caterpillar abundance. One occurs within two weeks of snowmelt and one occurs four to six weeks following snowmelt at all four sites. In both studies, we found that caterpillars found soon after snowmelt were hairy or spiky, and smooth skinned caterpillars were most abundant later in the season. Proportion of parasitism was up to 54% of the observed animals and was greatest for caterpillars observed visually in the climate change experiment compared to those observed in pitfall traps in the experiment and across the transect. An earlier, warmer Arctic summer will alter the timing of Lepidoptera and pollinator-dependent life cycles, which could then affect food availability for migrating birds and their offspring.