

Climate change impacts on alpine ecosystems in the Daisetsuzan National Park in northern Japan

*Gaku Kudo¹

1.Faculty of Environmental Earth Science, Hokkaido University

Alpine ecosystems are the most sensitive nature against rapid climate warming. Thus, alpine ecosystem is a suitable system for the detection and prediction of the ecological impacts of climate change. So far, there are many reports on the physiological, phenological, and distributional responses of organisms inhabiting alpine ecosystems to climate change. Recent climate change may increase the risk of species extinction, decreasing population, diversity reduction, and vegetation changes in alpine ecosystems. However, long-term monitoring of climate, environment, and ecosystem changes in Japanese alpine regions are restricted. I introduce the evidence of climate change and its impacts on alpine ecosystems in the Daisetsuzan National Park in Hokkaido, northern Japan. As the major ecological responses to climate change, the modification of phenological events and the distribution shift of organisms are known in many ecosystems in the world. Warm summer temperature and early snowmelt accelerate the phenological progress of alpine plants that cause earlier and shorter flowering season of alpine plant communities. Rapid changes in plant phenologies may disturb the plant-pollinator interactions, resulting in the decrease in pollination service for plants and food resource for insects. Phenological mismatch between alpine plants and bumble bees was detected in unusually warm summer in this area. Major vegetation changes observed in the Daisetsuzan National Park are decreasing populations in alpine snow-meadows and expansion of dwarf bamboo. These changes may be caused by the recent warm summer temperature, longer snow-free period, and drier soil conditions. Expansion of bamboo distribution results in the decreasing species diversity of alpine plant communities due to strong shading effect by dwarf bamboos. On the other hand, alpine vegetation successfully recovered by the bamboo removal treatment. Thus, the bamboo removal may be a useful management to conserve biodiversity of alpine ecosystems. For the practical and effective conservation of alpine ecosystems under warming climate, long-term ecosystem monitoring and experimental approaches are necessary to construct the adaptive management protocol of the alpine ecosystem conservation.

Keywords: alpine ecosystem, climate change, alpine plants