

Community, population and genetic structures of benthic invertebrates in alpine and sub-alpine ponds of the Kamikochi area and the Yari-Hotaka Mountain Ranges

*Keisuke Inoue¹, Koji Tojo¹

1. Biology Department, Faculty of Science, Shinshu University

Alpine and sub-alpine ponds are considered that they play some roles as important habitats and /or environments in mountain ecosystem. For example, they have functions as water resources for terrestrial organisms, and habitats for aquatic animals. Alpine and sub-alpine ponds have various origins, and their environments differ greatly for each origin. For aquatic animals inhabiting these ponds, differences in their environments are thought to directly effect in biota, so their environments' diversity may contribute to the creation of mountainous biodiversity. However, despite the importance of alpine and sub-alpine ponds, studies focusing on the relationship between the ponds' environments and their biodiversity have only a few cases even in high mountainous areas of Europe. Especially in the Japanese alpine ponds, there are no yet study cases. There are natural ponds, natural dammed ponds, glacier and volcanic origin ponds, and so on in the Japanese Alps, and there are good research fields for investigating the relationship between diversity of the environments and their biodiversity.

Under these circumstances, in the present study, we focused on the Kamikochi area and the Yari-Hotaka Mountain Ranges in the Japan Alps, and we have conducted analyses for the relationship between their aquatic insect fauna and the ponds' environments in alpine and sub-alpine ponds. In addition to comparing and examining the obtained community, population structure data and environmental data as habitats, the cluster analysis, the NMDS analysis, and the CCA analysis were also performed. As the result of conducting our studies of 23 ponds in total, community structures were categorized into 4 groups largely in all of our analyses. Also it was suggested that the alpine and sub-alpine aquatic insects' fauna is influenced by altitude, abundance of herbaceous plants around the shore, amount of gravels, sands and soil at the bottom of ponds. In addition, the ponds categorized into the same group, tended to be similar environments. Thus, alpine ponds with divergent environments may have important roles in the creation of mountainous biodiversity.

In addition, we also focused on the dispersal of aquatic insects inhabiting the mountain ponds. In alpine and sub-alpine mountain areas, ponds are isolated and scattered distribution. We would like to try to investigate the direction and frequency of movement and dispersion of aquatic insects between these ponds using molecular markers. As the first step, genetic analysis of the mtDNA COI region (DNA barcoding region) was performed on two caddiesflies *Pseudostenophylax ondakensis* and *Oligotricha fluvipes*, and a small diving beetle *Agabus japonicus*. As a result, in addition to that we could understand the genetic relationships in this mountain areas of *P. ondakensis*, the existence of the new haplotype which had not been observe in this area so far has been detected. Also in *A. japonicus*, in addition to that we observed individuals of the same lineage as widely distributed (i.e., from Hokkaido to Nagano), we revealed that individuals of largely genetically different lineage inhabit some alpine ponds.

Keywords: Alpine pond, Biodiversity, Community ecology