令和元年度　環境科学院　修士論文内容の要旨

Leaf decomposition and macroinvertebrate assemblages: Does geological difference matter?
(葉分解過程と無脊椎分解群集：地質環境の違いは重要か？)

Hokkaido University, Graduate School of Environmental Science,
Division of Environmental Science Development, Course in Human and Ecological Systems
Janine Tolod

Underlying geology of riverine systems contribute to the existing abiotic and biotic characteristics of streams. Porous underlying volcanic rocks enable greater influx of groundwater, thereby ensuring a relatively more stable surface water temperature. On the other hand, non-porous underlying rocks restrict the influence of groundwater to surface water temperature, resulting to greater effect of atmospheric temperature to surface water, with seasonal variations in surface water temperature particularly observable in streams from temperate areas. Temperature regulates many chemical and physiological processes and is historically documented to alter insect growth, life histories, stream metabolism, and water quality. Moreover, geology has been documented to affect other water quality parameters, eventually affecting macroinvertebrates. One of the major instream processes that could be indirectly affected by geology is leaf litter (Coarse Particulate Organic Matter/CPOM) decomposition by means of temperature and water quality effect on decomposers. This study was conducted in 10 headwater streams (5 per stream type) in central Hokkaido during summer and winter time. Significant difference in water temperature, electric conductivity, and total phosphorous between the stream types were documented. Large difference of water temperature between two stream types can confirm the probable influence of underlying geology in the study area.

Macroinvertebrate communities are structurally different between stream types, having higher total abundance, shredder abundance, and diversity in volcanic streams, particularly during winter. NMDS also showed difference in macroinvertebrate communities for both seasons. Consequently, difference in the invertebrate-associated (over-all minus microorganism-mediated) fraction of decomposition was different between stream types for both seasons. Path analysis showed that geology is a strong predictor of temperature which in turn is a strong predictor of microbial decomposition. Contrast to hypothesis, over-all decomposition seems to be strongly influenced by microbial conditioning more than macroinvertebrate communities. Temperature was also found to influence macroinvertebrate community composition. Results of path analysis, however, showed that the relationships mentioned are only significant during summer time, concluding that geological effect to decomposition is important during summer, but diminishes on winter. The results of this study are aimed to generate further understanding on the importance of considering geology in limnological studies as well as assessing the probable importance of conservation of streams with porous underlying systems in the face of projected increase in global atmospheric temperature.