

**The Effect of Landscape Protection on Microbial Assemblages Associated with Leaf Decomposition
in Selected Streams in Expanded NIPAS-declared Areas in Luzon Island, Philippines**

Jayson S. del Rosario

MS Environmental Science Student
Institute of Environmental Science and Meteorology
College of Science, UP Diliman

Abstract

Freshwater ecosystem is one of the most important resource for both human and natural environment; yet, it is also among the most undermined and vulnerable ecosystems. Anthropogenic activities such as agriculture, industrialization and urbanization are among the major threats to freshwater resources. In order to protect these systems, the National Integrated Protected Areas System (NIPAS) Act of 1992, which was recently amended as Expanded NIPAS Act of 2018, has been passed identifying terrestrial and aquatic areas with unique physical and biological significance. However, several studies reported that conservation of freshwater systems are given less priority in the management of protected areas. The integrity of streams and rivers in a protected area can be assessed by its structural composition and ecosystem processes. Leaf decomposition is an ecosystem process that supports the detrital food web in streams, most especially in the headwaters. The breakdown of leaves in streams are mainly driven by biological actions of microbial community and invertebrates. Leaves are actively consumed by shredder invertebrates, which fragments the leaves into smaller and finer particulate matter. Despite the large contribution of shredders to leaf breakdown, microbial action is vital in the decomposition of leaf litter. Leaves that enter the streams are immediately colonized by aquatic bacterial and fungal communities. Aquatic microorganisms release enzymes that degrades the chemical and physical defenses of leaves and increases its palatability to shredders. Several studies highlighted the preference of shredders to leaves colonized by microorganisms, hence their presence is important to leaf breakdown. This study aims to assess if the protection offered by the expanded NIPAS-declared areas have improved the health of stream ecosystems. Specifically, the goal of the study is to compare the conditions of streams inside a protected area and adjacent non-protected area in terms of : (1) water physicochemical parameters (temperature, dissolved oxygen, pH, conductivity, total dissolved solids, phosphate-phosphorus, nitrate-nitrogen, ammonium nitrogen, and total suspended solids), (2) microbial community assemblage in decomposing leaf litter, (3) rate of leaf litter decomposition as an ecosystem function, and (4) rate of cotton strip mass and tensile strength loss. The result of this study will also evaluate leaf litter decomposition experiments as a tool in assessing the ecological condition of streams. Furthermore, this study will also explore the linkage leaf litter decomposition in streams with microbial community composition and as well as physical and chemical features of the streams in the tropical region.

Keywords: protected areas, aquatic microorganism, leaf litter decomposition, cotton strip experiment