

Benthic macroinvertebrates response to water quality and canopy cover of a heavily impacted tropical subwatershed

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Benthic macroinvertebrates have been shown to respond to varying degrees of physicochemical changes in freshwater ecosystems. However, studies on the assemblages and how these macroinvertebrates respond to changes in environmental factors are poorly understood in a tropical, archipelagic setting. Such changes have potential adverse effects on stream macroinvertebrates but we do not know if the same pattern may be observed in the streams of Silang-Santa Rosa Subwatershed (SSRS). Thus, we are testing this hypothesis in the SSRS which is an ideal representative for the tropical scenario. This study investigated stream benthic macroinvertebrates in the SSRS, which has recently been shown to have changed its land cover due to conversion of farmlands into non-agricultural uses and further urbanization. On November 2015, 13 sites were sampled for benthic macroinvertebrates and monitored for environmental variables such as canopy openness, pH, water temperature, dissolved oxygen (DO), total dissolved solids (TDS), conductivity, salinity, nitrates, ammonia, dissolved inorganic phosphates (DIP), and total phosphorus (TP). Biodiversity indices and biomonitoring metrics were calculated and analyzed along with environmental variables. Results of both principal component analysis and hierarchical cluster analysis indicated differences in environmental variables among land cover categories. First principal component described a gradient from primarily vegetated sites (agricultural or residential land uses) with relatively good water quality to primarily non-vegetated sites (residential or industrial land uses) with poor water quality. Primarily vegetated sites generally exhibited relatively high DO and nitrates while primarily non-vegetated sites showed high canopy openness, ammonia, TP, conductivity, salinity and TDS. Canopy openness, conductivity, DO, and water nutrients appeared to be the most important factors predicting benthic macroinvertebrate assemblages. Sensitive genera from Ephemeroptera, Trichoptera, and Coleoptera dominated primarily vegetated sites while tolerant blood worms, *Chironomus* sp., were abundant in primarily non-vegetated sites. Benthic macroinvertebrate assemblages respond to anthropogenic changes which can be observed among nutrient-dense tropical stream ecosystems such as Silang-Santa Rosa Subwatershed. This paper highlights the potential of these macroinvertebrates together with water quality parameters for biomonitoring purposes and conservation initiatives in such heavily impacted subwatershed.

Keywords: Philippines, biomonitoring, canopy openness, land use, water chemistry, tropical streams