UNIVERSITY OF THE PHILIPPINES

Master of Science in Environmental Science

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Fecal Enterococci Levels in Selected Tributaries of the Pampanga River Basin and its Relation to Land Use

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ABSTRACT

The Manila Bay is one of the most important embayment in the Philippines. Unfortunately, it is currently characterized by fecal contamination which endangers the adjacent populace through a higher risk of gastrointestinal diseases, among other vulnerabilities. This study determines the fecal enterococci levels in the water bodies to determine the extent and potential origin of the contamination considering different land uses in the selected tributaries of Pampanga River Basin, which is the largest sub-watershed of Manila Bay. The study was conducted in 2021 covering March, May, June, July, September to represent the dry (March and May) and wet (June, July, and September) seasons. The thermotolerant coliform, *E. coli*, and enterococci counts were qualitatively correlated with the results of ocular survey and key informant interview based on known fecal contributors and their relevant rainfall data.

Results showed that the agricultural and residential land use categories had Geometric Mean (GM) counts that are statistically greater than the representative forest/woodland (control) for thermotolerant coliforms, *E. coli*, and enterococci regardless of the season ($p = 0.0003$, $p = 0.0006$, and $p = 0.0005$, respectively). The agricultural sites ($n = 3$) registered the following GM values for the 2021 dry (March and May) and wet (June, July, September) season, respectively: 2.3×10^4 MPN/100 ml and 1.8×10^4 MPN/100 ml for thermotolerant coliforms, 1.8×10^4 MPN/100 ml, and 7.6×10^3 MPN/100 ml for *E. coli*, and 560.0 MPN/100 ml and 79.0 MPN/100 ml for enterococci. On the other hand, the residential sites ($n = 3$) had these respective GM counts: 1.3×10^4 MPN/100 ml and 1.6×10^4 MPN/100 ml for thermotolerant coliforms, 8.3×10^3 MPN/100 ml and 6.5×10^3 MPN/100 ml for *E. coli*, and 1.0×10^3 MPN/100 ml and 340.0 MPN/100 ml for

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enterococci. Lastly, the forest/woodland (control) sites (n = 3) have these results: 190.0 MPN/100 ml and 110.0 MPN/100 ml for thermotolerant coliforms, 72.0 MPN/100 ml and 38.0 MPN/100 ml for *E. coli*, and 190.0 MPN/100 ml and 15.0 MPN/100 ml for enterococci. Notably, the agricultural and residential land use categories exceeded the acceptable GM criteria of all measured FIB parameters (100.0-400.0 MPN/100 ml thermotolerant coliforms, 126 MPN/100 ml *E. coli*; 200.0 MPN/100 ml enterococci) also irrespective of the season. The forest/woodland (control) land use had GM values that passed the water quality criteria for all the measured FIB parameters for both seasons. Further, its enterococci levels were statistically lower during the wet season (190.0 MPN/100 ml vs. 15.0 MPN/100 ml, $p = 0.0002$). These initial findings showed that agricultural and residential land use categories contribute the most to the unacceptable water quality of tributaries of the Pampanga River Basin, and that natural presence of thermotolerant coliforms and *E. coli* were noted regardless of rainfall and land use, making them inadequate fecal microbial indicators as compared to the enterococci group.