

EFFECT OF EFFLUENT DISCHARGES ON BENTHIC MACROINVERTEBRATES IN THE NIMA CREEK AND MITIGATIVE MEASURES

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ABSTRACT

The study assessed the impact of effluents on the macroinvertebrate communities within the Nima Creek between September 2005 and February 2006 with the view to measuring the ecological health of the water. The physical habitat quality assessment indicated that the midstream section of the creek was the most degraded compared to the upstream and downstream sections. The chemical water quality of the midstream where the creek received effluents was characterised by high levels of biochemical oxygen demand (BOD=26.1mg/l) compared to the low levels recorded at the upstream (BOD=15.3mg/l) and downstream (BOD=13.3mg/l) sections. The BOD levels observed in the creek showed that the midstream section of the creek had high organic loadings. Generally, high levels of total and faecal coliforms were observed throughout the study period. The highest total and faecal coliforms counts were recorded at the midstream section of the creek (626.0×10^4 cfu/100ml and 75.30×10^4 cfu/100ml respectively) while the lowest counts were observed at the upstream (446.0×10^3 cfu/100ml and 133.0×10^3 cfu/100ml) and the downstream (933.0×10^3 cfu/100ml and 110.0×10^3 cfu/100ml). The high levels of the coliforms at the midstream sections of the creek suggests increased pollution levels compared to the upstream and downstream sections. This poses serious health threats since the water is used for irrigation purposes. Assessment of the quality of water based on the Modified Chutter Biotic Index (CBI) from the various sections of the creek confirmed that the quality of the creek's water was being impacted by effluents at the midstream section. Chironomina and *Physa* were the most abundant taxa within the creek. However, it was observed that the genus *Chironomus* predominated the fauna. The high numbers of Chironomina in the creek confirmed the polluted state of the creek. A baetid belonging to the genus *Cloeon* was also found in the organically polluted Nima Creek. Apparently, both *Cloeon* and *Chironomus formosipennis* may be good indicators of organic pollution in polluted streams in Ghana. Three "Functional Feeding Groups" of the macroinvertebrates were identified (i) the Gathering Collectors which included the Baetidae, Chironomina and Elmidae, (ii) Scrapers which included the genera *Lymnaea* and *Physa* and (iii) Predators which included Odonata, Hemiptera and the families Dytiscidae and Psychodidae. Gathering Collectors were the dominant group and these generally reflected the quality of water at the various sampling stations. In addition, the upstream and downstream sections of the creek recorded higher diversities ($H' = 1.44$ and $H' = 1.38$ respectively) of benthos compared to the lower diversity ($H' = 1.14$) at the midstream section. It can be concluded therefore that effluents from the waste treatment plants of some public houses in the basin of the creek among other unidentified sources largely contributed to

the pollution of the creek. Rigorous and regular monitoring and assessment of effluents from waste treatment plants and other sources that discharged into the creek with the aim of complying with the EPA guidelines are some mitigative measures suggested to protect life in the creek.

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