

The influence of coastal production on Nutrient Dynamics benthic macro Intertebrates community structure in the shrimp farm and its outflow creek in Mafia Tanzania

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This thesis examined the influence of a semi-intensive coastal shrimp production system on water quality and benthic macro-invertebrates communities in the effluent-receiving ecosystem in Mafia Island, Tanzania. Monthly sampling was conducted from aquaculture ponds and, along the inlet and outlet creeks. The DO, salinity, NH₂-N, NO₂-N, PO₄-P and TP concentrations in aquaculture ponds and, NO₃-N and TN concentrations in effluent creek were found to be significantly affected by shrimp farming activities. No significant differences in EC, pH, turbidity and chlorophyll-a values were found among sampling stations. Moreover, variations of all inorganic nutrients were found to be non-significant between dry and rainy seasons. Concentrations of most inorganic nutrients decreased downstream of the effluent creek implicating the capacity of running water in self-purification mechanisms of the pollutants. Strong positive correlations between EC and, inorganic nutrients and salinity suggest the common source of these parameters that is, mineralization of organic materials. Variations in sediment pore-water between stations were significantly different for TN and non-significant for TP concentrations. Sediment texture was dominated by sand particles with varying proportions of silt/clay. A significantly high content of sediment organic matter in the inlet creek was related to decomposition of mangrove remains. A total of 338 benthic macro-invertebrates belonging to seventeen taxonomic families and two major taxa of annelids and arthropods were recorded from the sampling stations. The highest number of macro-invertebrates (294 individuals) was recorded in the effluent creek, of which a large number were members of the annelid families. The inlet creek (control station) was mainly dominated with local taxa of the mangrove ecosystem such as crustaceans and gastropods whereas, aquaculture ponds recorded negligible abundance. Most ecological diversity indices revealed non-significant differences both across the stations and between the two seasons. The higher and lower Sorensen similarities in taxa composition were recorded among stations in the effluent creek (QS=80%), and in the aquaculture ponds and effluent creek (QS=18.18%), respectively.

The spatial variations in diversity indices and similarities were mainly determined by differences in sediment texture and the content of organic materials between stations. This study has revealed insignificant deterioration of water and sediment quality parameters since most values fell within acceptable limits for protecting coastal ecosystems. However, the occurrence of pollution-tolerant taxa such as polychaetes and disappearance of pollution-sensitive taxa including crustaceans along the effluent creek is a classic indication or sign of a potential ecologically unhealthy status starting to develop in the area due to shrimp farming activities. Thus, these preliminary data recommend further studies in order to have sufficient knowledge for identifying and solving environmental concerns with regard to coastal marine aquaculture development.