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Sustainable Aquaculture for a Secure Future

Title: Biological assessment of aquaculture effects on effluent-receiving streams in Ghana using structural and functional composition of fish and macroinvertebrate assemblages

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Abstract: Biological assessment of aquatic ecosystems is widely employed as an alternative or complement to chemical and toxicity testing due to numerous advantages of using biota to determine ecosystem condition. These advantages, especially to developing countries, include the relatively low cost and technical requirements. This study was conducted to determine the biological impacts of aquaculture operations on effluent-receiving streams in the Ashanti Region of Ghana. We collected water, fish and benthic macroinvertebrate samples from 12 aquaculture effluent-receiving streams upstream and downstream of fish farms and 12 reference streams between May and August of 2009, and then calculated structural and functional metrics for biotic assemblages. Fish species with non-guarding mode of reproduction were more abundant in reference streams than downstream ($P = 0.0214$) and upstream ($P = 0.0251$), and sand-detritus spawning fish were less predominant in reference stream than upstream ($P = 0.0222$) and marginally less in downstream locations ($P = 0.0539$). A possible subsidy-stress response of macroinvertebrate family richness and abundance was also observed, with nutrient (nitrogen) augmentation from aquaculture and other farming activities likely. Generally, there were no, or only marginal differences among locations downstream and upstream of fish farms and in reference streams in terms of several other biotic metrics considered. Therefore, the scale of impact in the future will depend not only on the management of nutrient augmentation from pond effluents, but also

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on the consideration of nutrient discharges from other industries like fruit and vegetable farming within the study area.

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