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RESEARCH REPORTS

Sustainable Aquaculture for a Secure Future

Title: Monitoring the effects of aquaculture effluents on benthic macroinvertebrate populations and functional feeding responses in a tropical highland headwater stream (Kenya)

Author(s): Carolyne Musyoki Minoo[1], Charles C. Ngugi[2], Elijah Oyoo-Okoth[3], Agnes Muthumbi[1], Dorcus Sigana[1], Rich Mulwa[4], and Emily Jepyegon Chemoiwa[5]

1. School of Biological Sciences, University of Nairobi, P.O. Box 30197, Nairobi, Kenya
2. Kenyatta University, School of Agriculture and Enterprise Development, Department of Agricultural Resource Management, P.O. Box 43844-00100, Nairobi, Kenya
3. School of Natural Resources and Environmental Studies, Department of Natural Resources, Karatina University, P.O. Box 1957-10101, Karatina, Kenya
4. Caselap, Environmental Policy Division, University of Nairobi, Nairobi, Kenya
5. Department of Biological Sciences, University of Eldoret, P.O. Box 1125-30100, Eldoret,

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Abstract: Intensification of aquaculture may result in more fish culture waste being discharged into adjacent rivers and streams. Due to composition of such wastes, ecological conditions in waterbodies may be adversely affected. We determined the ecological consequences of freshwater land-based Tilapia farms on headwater streams using macroinvertebrate community attributes and functional feeding response in an upstream tributaries of a highland stream in Kenya. Nine aquaculture sites adjacent to tributaries of three headwater streams with different fish production volumes were sampled and monitored for macroinvertebrate abundance, richness, composition of Ephemeroptera, Plecoptera and Trichoptera, Oligochaetes and Chironomids (percentage Oligochaetes and Chironomids), species diversity as well as the functional feeding group responses. The total abundance of benthic macroinvertebrate consistently increased near discharge points and immediately downstream of the effluent outlets near the aquaculture farms. We observed positive correlations between macroinvertebrate attributes (except Ephemeroptera, Plecoptera and Trichoptera) with fish production at aquaculture facilities adjacent to the tributaries of the headwater streams. The proportion of Oligochaetes and Chironomids (percentage Oligochaetes and Chironomids) increased while that of Ephemeroptera, Plecoptera and

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Trichoptera at discharge points and downstream of the farms decreased. Also, relative abundance of scrapers and shredders decreased significantly, while significant increase of abundance was observed for deposit feeders, filter feeders and parasites with low predator population at discharge and downstream points. These consistent patterns indicated changes in ecosystem integrity and functioning, due to aquaculture effluents with particulate organic matter from fish food-derived wastes becoming a central source of energy in river benthic food webs.

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