



Ecological Status of Chilaw Lagoon, Sri Lanka, Assessed Using Macrobenthic Community and Biotic Indices

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Coastal lagoons are ecologically significant yet highly threatened transitional ecosystems, increasingly impacted by urbanisation and aquaculture. Macrobenthic communities serve as reliable bioindicators of environmental degradation, making them effective tools for ecological status assessment. The ecological status of Chilaw Lagoon, Sri Lanka, was evaluated by analysing macrobenthic community composition and applying macrobenthos based biotic indices in relation to environmental parameters. This study aimed to: (i) examine the macrobenthic community structure and environmental variables, and (ii) evaluate lagoon ecological health using biotic indices. Four sampling sites were selected based on morphology and anthropogenic activities: a shrimp farm area (L1), a control site (L2), a bridge area (L3), and a mangrove site (L4), each sampled with four replicates. In situ water quality parameters and soil physicochemical properties were analysed across sites. L1 recorded the highest phosphorus (4.3 ppm) and exchangeable potassium (239.3 ppm), reflecting aquaculture nutrient enrichment, while L3 exhibited the highest soil organic matter (3.35%) and the most acidic soil pH (3.2), indicative of urban pollution loading. Thirty macrobenthic species from Mollusca, Crustacea, and Polychaeta were recorded, with species richness ranging from 9 (L3) to 15 (L1) and Shannon diversity (H') from 1.211 (L3) to 1.944 (L4). All sites fell within the unpolluted category of the AZTI Marine Biotic Index (AMBI). L1 achieved the lowest score (0.479) with 80.9% sensitive taxa, demonstrating outstanding benthic health sustained by mangrove buffering against aquaculture inputs, while L3 recorded the highest score (0.810), reflecting urban organic pollution stress. Multivariate AMBI (M-AMBI) confirmed high ecological status at mangrove-associated sites L4 (0.982) and L1 (0.898), and good status at L2 (0.709). These findings demonstrate that aquaculture and urban pollution are key drivers of benthic stress, while mangrove-adjacent zones retain higher ecological resilience, underscoring the importance of mangrove conservation and integrated coastal management for sustaining lagoon ecosystem health.

Keywords: *AZTI Marine Biotic Index, Bioindicator, Chilaw Lagoon, Macrobenthos, Sediment analysis*