Choice of benthic macroinvertebrate-based metrics for assessing water quality in the littoral zone under anthropogenic disturbance in southern Lake Kivu (Central Africa)

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Abstract

Benthic macroinvertebrates are widely used to assess the ecological quality of fresh waters. This is because they are in direct contact with the aquatic environment and respond differently to pollutants and changes in the watershed, which are difficult to assess by toxicological or chemical monitoring alone. this study used benthic macroinvertebrate parameters to assess the quality of the nearshore waters of lake Kivu. Twenty-six metrics covering various aspects of the community were tested using whisker plots to compare their sensitivity in discriminating between reference and disturbed stations. Nine parameters (% EPT taxa, % Diptera taxa, % Chironomid taxa, % Insect taxa; % no Insects taxa, ratio EPT/Chironomid taxa, % moderate tolerant taxa, % very moderate tolerant taxa, Family Biotic Index) were found to be sensitive and were able to discriminate between reference and disturbed stations. All sensitive metrics, with the exception of the percentage of EPT taxa, were positively and/or negatively correlated with the physico-chemical parameters affected by the changes in the littoral zone. The combined values of the three calculated biotic indices (ASPT, BMWP and FBI) showed that the biological water quality varies from moderate to good in the reference stations and from average to poor in the disturbed stations. It is concluded that metrics based on benthic macroinvertebrates are effective for assessing water quality in the littoral zone of Lake Kivu in the context of the lack of historical water quality databases and specific tools for toxicological assessment. It is suggested to compare the performance of this approach with others currently used in bio-indication.

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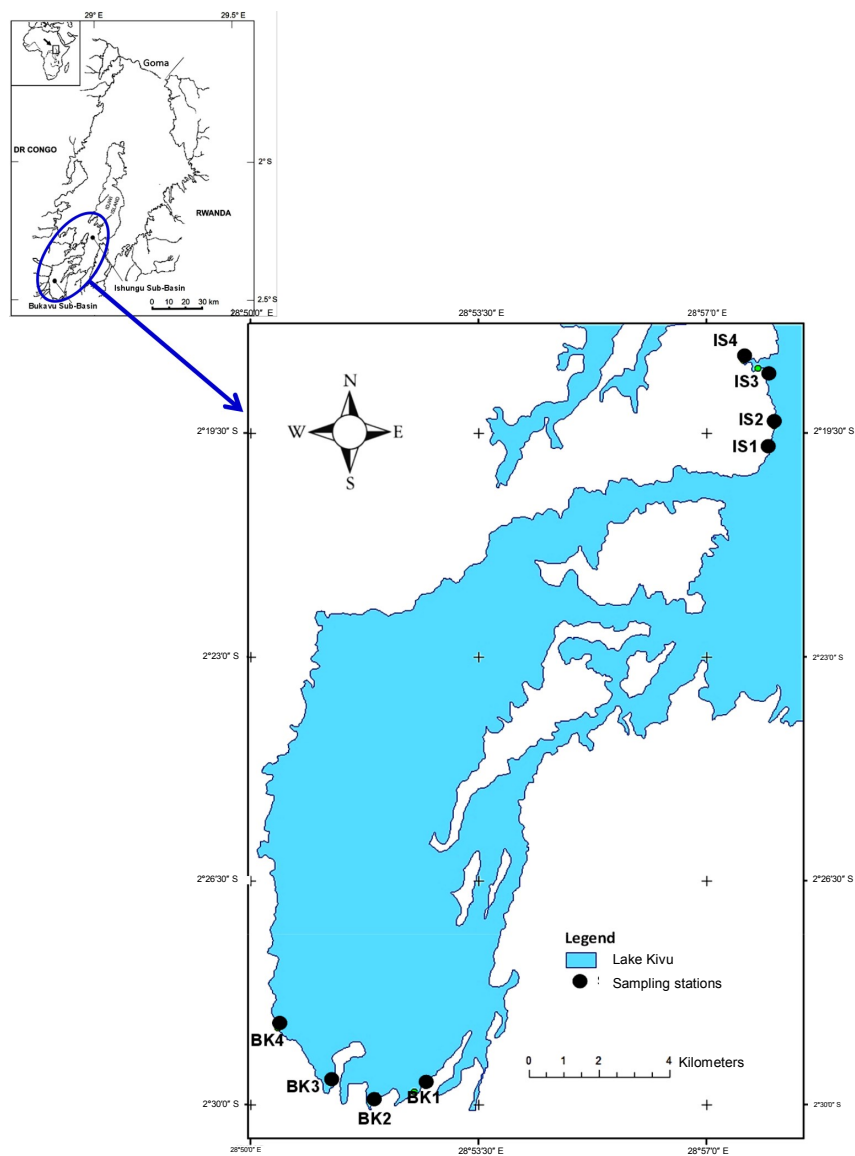
Figure 1. Lake Kivu map and location of sampling stations in the Bukavu and Ishungu sub-basins (BK=Bukavu, IS=Ishungu)
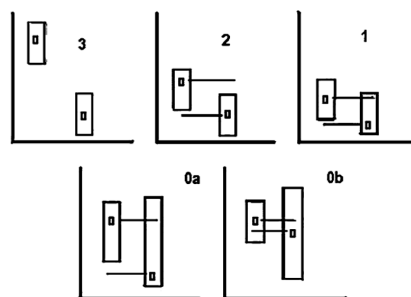
Figure 2. Evaluation of metrics sensitivity, according to Barbour et al. (1996), Baptista et al. (2007). Small squares represent median numbers and boxes represent inter-quartile ranges (25–75% percentiles)

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