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Water and its biological resources sustainability in tropical developing countries: Aquatic ecosystems health assessment

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Abstract

To response to ongoing threats from human pressures and climate changes, water managers and users need a visual tool that provide accurate information of waterbodies health for decision making to promote sustainable management practices. However, there is a lack of less sophisticated tools, such as biotic score, to assess the health of aquatic ecosystems, especially in Burkina Faso. To fill this gap, we developed an approach based on a macroinvertebrates scoring system to monitor the aquatic ecosystems health. Following a multi-habitat sampling approach, macroinvertebrates were collected with a hand net, and identified using taxonomic manuals and keys. Key environmental parameters, both physico-chemical and hydro-morphologic, were recorded. For data analysis, benthic macroinvertebrates were scored following guide scores and experts' consensus. In total, more than 70 taxa of macroinvertebrates were recorded. Most of these taxa were identified at family level, and taxa scores sensitivity to human disturbances ranged from 1 (very tolerant) to 10 (highly sensitive). We found that all taxa found are well represented in western African freshwaters. The Burkina Botic Scores (BBIOS) and Burkina Biotic Score Average Per Taxa (BBIOS/ASPT) revealed a strong and significant correlation with environmental variables including anthropogenic pressures types ($r=|0.6|$; $p<0.01$) rending it more robust for monitoring aquatic ecosystems. With this effective and comprehensive tool, we encourage West African local water managers to use macroinvertebrates at family taxonomy resolution for bioassessment and biomonitoring programmes due to its cost-benefits (e.g. ease of sampling and identification of specimens) and its limited taxonomic knowledge. This study yielded an unprecedented tool that can be used or adapted to monitor also other tropical aquatic environments in West Africa, and may help to preserve water as biological resource for future generations.

Keywords: Aquatic ecosystems, biotic indices, dryland, ecological integrity, sustainability