






Implications of macroinvertebrate taxonomic resolution for freshwater assessments using functional traits: The Paute River Basin (Ecuador) case

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Abstract

Aim: This study aimed at investigating the taxonomic resolutions (TRs) of benthic macroinvertebrates for freshwater assessments in the scope of the functional trait approach (FTA).

Location: Macroinvertebrate samples were collected in 22 locations within the Paute River Basin (PRB), Ecuador, over three years (2010, 2011 and 2012).

Methods: Biological traits were allocated as scores to the macroinvertebrate data (at genus level) through fuzzy coding, using published data. The scores of each genus were used to derive scores for the corresponding family. These two sets of scores were standardized and compared, they were similar in 82% of the cases. Functional diversity (FD) was described by the rRao index, which showed no significant differences between coarse (family level) and fine (genus level) TRs. Cluster analyses using the K-means algorithm were performed to determine similarities between both rRao data sets. The WQ cluster number (K) was varied between 2 and 5 to determine a threshold K value (K_{th}), after which a WQ assessment differed as a function of the TR being used.

Results: K_{th} was 3. Family-level identification in the framework of the FTA in the PRB was suitable in detecting changes of macroinvertebrate assemblages (until $K_{th} = 3$).

Main conclusions: The proposed methodology could be implemented in other basins where decision-makers could decide whether the level of functional trait data similarity is sufficient for WQ management purposes and whether the defined K_{th} is acceptable. The reliability of the key methodological steps was assessed using performance statistics that have rarely been applied to ecological studies. Despite related research performed in other regions, the present study is the first South American attempt to investigate the effects of TR of benthic macroinvertebrates on freshwater bioassessments using functional traits.

KEYWORDS

Andean basin, cluster analysis, functional traits, rRao index, taxonomic resolution

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