



A Global and Unified Trait Database for Aquatic Macroinvertebrates: The Missing Piece in a Global Approach

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Traits of an organism define its relationship to local biotic and abiotic environmental factors. They offer an understanding of mechanistic and selective processes that link species to their environment. Traits have been presented as an alternative way to explore biodiversity and to predict changes in communities across environmental gradients. This led to increasing research on trait-based ecology and trait analyses have undoubtedly proven efficiency in both basic and applied aquatic ecology. Thus, much interest in how traits are to be analyzed has been given. Among those the development of a taxa-specific combination of variables described as a taxon's functional trait niche (see, Poff et al., 2006), and the development of multiple functional-diversity analytic methodologies (see review, Schmera et al., 2017).

Using traits instead of species diversity initially limits probabilities on which many analytic tools are based. The number of species to be found in a certain biotope surpasses often the number of traits expressed by these species, the later being predefined by scientists. However, the use of a predefined and often variable number of descriptive traits and trait modalities is widely accepted in the scientific community and has undoubtedly a direct impact on many research outcomes. When converting a theoretically larger number of taxa to a reduced number of traits, the method used to determine and describe these traits in different modalities gain automatically paramount importance. For instance, when considering the North American trait database (Poff et al., 2006; Vieira et al., 2006), 20 traits for lotic macroinvertebrates described in 54 modalities are available. The European database (Charvet et al., 2000; Usseglio Polatera et al., 2000) displays 22 traits (20 when removing geographically bound traits, and traits of macroinvertebrates from non-lotic habitats) described in 119 modalities (108 when describing 20 traits). Most often similar traits, destined to describe a similar biological or ecological feature of an organism, are not described in a similar way across these two databases. The number of modalities used to describe each trait can vary substantially (**Figure 1**). For example, when considering the dispersal of aquatic macroinvertebrates, the European database categorizes dispersal in four modalities: active-aquatic, active-aerial, passive-aquatic, passive-aerial. The corresponding trait in the North American database displays a distinct set of modalities that are not completely comparable with their European equivalents. These can include, low and high female dispersal; weak and strong adult flight, and occurrence in drift categorized as rare, common, and strong. This is one of many examples that illustrate the divergence between the two most extensively used trait databases describing the Palearctic and Nearctic aquatic macroinvertebrate fauna.

The proposed unified terminology by Schmera et al. (2015) constitutes certainly a milestone in the advancement toward an appropriate and unified algebraically correct treatment of traits in aquatic ecology. The unified terminology and more importantly the transformation of ordinal and nominal data scales into a nominal scale with two states (yes or no) will facilitate the interpretation results across scientific studies. However, this alone will not solve the distortion developed in multiple functional-diversity indices when using the North American trait database

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