



Conference Abstract

Evaluating the ecological status of mountain streams from a megacity (Mexico City) with diatoms: development and implementation of morphological and eDNA-based methods

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Abstract

In central Mexico, streams flow from mountain protected areas at high elevations, i.e. above 2,400 m a.s.l., being exposed to different human activities along their course. The main human threats of these aquatic ecosystems include the presence of hydraulic infrastructure (e.g. canals and dams), the construction of bridges or roads, fish farming, agriculture, livestock, unregulated tourism or irregular human settlements, resulting in nutrient enrichment, organic pollution and low hydromorphological quality. Diatoms, widely recognized as valuable indicators of environmental conditions, offer a unique opportunity to assess the ecological quality of the streams in and around this megacity, as they respond directly and sensitively to specific physical, chemical and biological changes. To conduct ecological assessment, the composition of diatom communities has traditionally been characterized by morphological methods and most recently by environmental DNA (eDNA) metabarcoding. However, the diatom communities of only a few of these streams in the Basin of Mexico have been characterized morphologically at low resolution light

microscopy (LM), and no eDNA-based studies have been conducted yet. In this context, our aims are to 1) implement morphological and eDNA metabarcoding methods for the identification and quantification of epilithic diatoms and to assess their seasonal and spatial response in three peri-urban mountain streams from the Basin of Mexico, and 2) develop a metric to assess and monitor the ecological quality in these streams. For this purpose, we characterized a) the physical, environmental and hydro-morphological conditions related to ecosystem quality, and b) the diatom diversity and community structure of nine sites per stream (27 sites). The sites include headwaters, as well as middle and lower reaches with different land-use and anthropologic pressures, and were investigated over three hydrological periods, i.e. post-rainy, dry-cold and dry-warm. Species identification was first conducted under LM and scanning electron microscopy (SEM), and is currently been done by eDNA metabarcoding of the V4 region of the 18S rRNA gene and a fragment of the chloroplast marker *rbcl*. Our study has resulted in 520 infrageneric taxa identified by LM and SEM, the largest diversity ever found for freshwater diatoms of Mexico. From this data, we found a clear environmental gradient from almost pristine conditions towards heavily polluted states as the streams enter the city. These changes are well reflected by variations in the diatom community structure, as revealed by the Diatom Ecological Quality Index (DEQI), newly developed to evaluate the ecological quality of the streams in and around this megacity.

Keywords

Diatoms, ecological quality, *rbcl*, 18S V4, mountain streams, Mexico

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