Influence of land-use patterns on benthic diatom communities and water quality in the tropical Monjolinho hydrological basin, São Carlos-SP, Brazil

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Abstract

The objective of this study was to determine the effects of land-use patterns on both diatom community composition and water quality in tropical streams during the dry season. Benthic diatom collections and water quality sampling were done 4 times at 10 sites. A suite of environmental variables that varied with human land-use pattern was assessed to find the combination of variables that best explained patterns of diatom community composition. Canonical Correspondence Analysis (CCA) was used to determine environmental gradients along which species were distributed. A clear relationship between both benthic diatom communities and water quality and land-use pattern was observed with species richness, diversity and evenness, decreasing significantly from the agricultural and forest area to the urban area. Upstream, forested, agricultural sites, with good water quality (BOD_5 = 0.9 to 2.6 mg·ℓ^{-1}, DO = 6.8 to 8.2 mg·ℓ^{-1}, phosphate = >2 to 4.7 µg·ℓ^{-1}), were characterised by *Thalassiosira weissflogii, Orthoseira dentroteres, Meridion anceps, Melosira varians, Diatoma spp, Diadesmis contenta, Eunotia papillo, E. bilunaris, E. intermedia, E. sudetica, Aulacoseira alpigena, A. ambigua, Cymbopleura naviculiformis* and *Stauroneis phoenicenteron*. Urban sites, with medium to bad water quality (BOD_5 = ~7 mg·ℓ^{-1}, DO = ~7 mg·ℓ^{-1}, phosphate = 12.6 to 83.1 µg·ℓ^{-1}), were characterised by *Diadesmis dissimilis, Frustulia rhomboids, Nitzschia scalaris, Nitzschia linearis, Cyclotella pseudostelligera Neidium ampliatum, N. affine, Encyonema silesiacum, E. neomesianum, Aulacoseira granulata, Navicula cryptotenella, Pinnularia legumen, P. gibba, P. divergens, Surirella linearis, S. robusta,* and *Achnanthidium minutissimum*. Downstream urban sites, with very bad water quality ($BOD5$ = 19.5 to 26.2 mg·ℓ^{-1}, DO = 0.4 to 1.9 mg·ℓ^{-1}, phosphate = 142.5 to 248.7 µg·ℓ^{-1}), were characterised by *Gomphonema parvulum, G. accuminatum, Nitzschia palea, Nupela praecipua, Sellaphora pupula, Planotidium lanceolata, Fallacia monoculata* and *Pinnularia subcapitata*. Diatom communities demonstrated potential for acting as indicators of changes in water quality due to changes in catchment land-use patterns.

Keywords: land-use, benthic diatoms, environmental gradient, agricultural, forests, urban