



Conference Abstract

# Morphotaxonomy- and metabarcoding-based ecological assessment of Cyprus streams' diatom communities and correlation with environmental and anthropogenic influences

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## Abstract

In freshwater ecosystems, periphytic biofilms include diatom assemblages that depend on environmental conditions (e.g., nutrient concentrations, salinity, temperature etc.). These assemblages respond rapidly to environmental changes, which makes diatoms valuable bioindicators. For this reason, they are currently used in freshwater biomonitoring programs (e.g., EU Water Framework Directive - WFD) (Foster et al., 2000). To date, diatom taxonomic identification is based on morphological criteria, which requires high

taxonomic expertise to identify them to the species level needed for biomonitoring. Having this in mind, new strategies have been examined for the development of high-throughput, non-biased identification approaches. Human activities are the leading cause of environmental impairments and appropriate biomonitoring of ecosystems is needed to effectively assess the impact of their activities. In the last ten years, DNA metabarcoding combined with next-generation sequencing and bioinformatics, have been proposed as a complementary approach to morphological identification. In the past ten years, DNA metabarcoding coupled with next-generation sequencing and bioinformatics represents a complementary approach for diatom biomonitoring (Vasselon et al., 2019). In this study, this approach was used for the first time in Cyprus considering the association of environmental and anthropogenic pressures to diatom assemblages using the *rbcL* 312 bp barcode, next-generation sequencing (MiSeq Illumina), and bioinformatic evaluation (Mothur Software). Statistical analysis was then applied to identify the environmental (i.e., river types, geo-morphological) and anthropogenic (i.e., physical, chemical, human land-use pressures) variables' role in the observed diatom diversity. The Indice de Polluosensibilité Spécifique (IPS) index was used as it was shown to better respond to pressures that affect water quality in Cyprus rivers (WDD, 2014). Results indicate differences in diatom assemblages between intermittent and perennial rivers. *Achnanthydium minutissimum* was more abundant in intermittent rivers; whereas *Amphora pediculus* and *Planothidium victorii* (*P. caputium*) in perennial ones. Furthermore, we could demonstrate the correlation between nutrients (e.g., nitrogen, phosphorus), characteristics of the individual sampling sites (e.g., elevation), and land use activities on the observed differences in diatom diversity (Pissaridou, 2021). Additionally, results were compared to the morphotaxonomy-based approach which was conducted microscopically. Results show a positive correlation between morphological and molecular IPS scores. Points deviating from the norm are influenced by the limitations of both techniques. *Fistulifera saprophila* had a key role in this observation, as it negatively influences IPS scores. All in all, we conclude that DNA metabarcoding complements the morphological methodology for the ecological quality assessment of freshwaters in Cyprus. Multi-stressors and anthropogenic pressures have a significant statistical relationship to the observed diatom diversity and play a pivotal role in determining Cyprus' rivers' ecological status (Fig. 1).

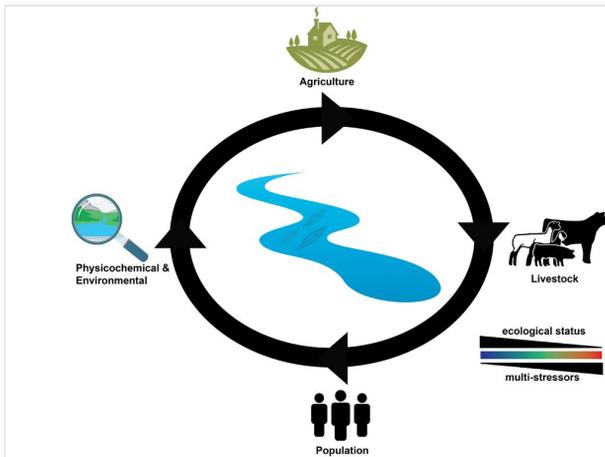


Figure 1. [doi](#)

Figure 1: Multi-stressors affect the ecological status of Cyprus' rivers.

Foster, D., Wood, A., Griffiths, M., 2000. The Water Framework Directive (2000/60/EC) – An introduction Dave Foster – Policy Advisor (Europe), Aram Wood EP Scientist (Water), Dr Martin Griffiths – Head of Water Quality, Environment Agency, Head Office, Rio House, Waterside Drive, Aztec West, Almon 7–9.

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WDD, 2014. Review and update of article 5 of Directive 2000/60/EC (Water reservoirs) & Classification of water status (Rivers, natural lakes and water reservoirs), That will establish baseline information and data for the 2nd cyprus river basin management plan.

## Keywords

diatom; ecological assessment; DNA metabarcoding; multiple pressure; intermittent; perennial

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## Author contributions

**Pissaridou P.:** Validation, Formal analysis, Data Curation, Writing, Visualization, **Vasselon V.:** Methodology, Software, **Christou A.:** Investigation, **Chonova T.:** Data Curation, Validation, **Papatheodoulou A.:** Investigation, **Drakou K.:** Investigation, Methodology, **Tziortzis I.:** Resources, **Dörflinger G.:** Resources, **Rimet F.:** Supervision, **Cantonati M.:** Methodology, Supervision, Investigation, Data Curation, **Bouchez A.:** Supervision, Conceptualization, Funding and **Vasquez Ml:** Supervision, Resources, Conceptualization, Funding.

## Conflicts of interest

No Conflicts of interest