Phytoplankton Community Diversity and Seasonal Variation in the Boukourdane Lake, Northern Algeria

Arab Siham, Hamil Somia, and Arab Adeslem

Keywords
Phytoplankton • Seasonal variation • CCA • Boukourdane lake • Algeria

1 Introduction

Diversity, distribution, and variation in the biotic parameters provide a good indication of energy turnover in aquatic environments (Forsberg 1982). Within these environments phytoplankton are located at the base level and are represented as a major source of organic carbon (Gaikwad et al. 2004). Species diversity responds to changes in environmental gradients and may characterize many interactions that can establish the intricate pattern of community structure. Since, data on the phytoplankton and the physicochemical features of Boukourdane lake are lacking completely. This study was carried out in order to determine some physicochemical features of the water as well as the phytoplankton distribution and diversity in the lake. Seasonal fluctuations in density and composition of seven classes of phytoplankton identified in the Boukourdane lake in relation to the environnemental factors were described in the present study.

2 Materials and Methods

The sampling was carried out monthly, in four stations. In each station two samples were taken one for physicochemical analysis and the second for phytoplankton studies. Five parameters were measured in situ—water temperature, pH, conductivity, and dissolved oxygen, determined using a Multi 340i/SET WTW analyzer, and transparency, which was determined using a Secchi disk. Additionally, nine physicochemical parameters (nitrate, nitrite, ammonium, ortho-phosphate, sulfate, calcium, magnesium, chloride, chlorophyll a and suspended matter) were analysed at the laboratory. A 50-micro meter mesh net was used for phytoplankton sampling.

3 Results and Discussion

A total of 162 phytoplankton were recorded from 192 samples within the study period. The taxa belonging to Chlorophyceae (55), Bacillariophyceae (47), Cyanobacteria (17), Euglenophyceae (15), Dinophyceae (10), Zygnematophyceae (10), Chrysophyceae (6), Xanthophyceae and coccolithophyceae (1). The percentage composition were recorded as Chlorophyceae> Diatomophyceae> Cyanobacteria> Euglenophyceae> Dinophyceae> Zygnematophyceae> Chrysophyceae> Xanthophyceae and coccolithophyceae, respectively.

The study of phytoplankton diversity and its seasonal variation according to the physicochemical parameters was established using Canonical Correspondence Analysis (Fig. 1). This showed that the phytoplankton density was higher when minerals and nutrients increased. Where, Nitzschia acicularis, was the most abundant species in the phytoplankton community.

Phosphate, carbonate, and conductivity ions are physicochemical parameters that influence significantly diatoms (Soininen and Kononen 2004). This is consistent with our results where we recorded these parameters with *Cyclotella*

S. Arab (✉)
LaDyBio, FSB_USTHB/G&G; FSTGAT_USTHB, Alger, Algeria
e-mail: sihemarab@gmail.com

S. Hamil
LaDyBio, FSB_USTHB/L.E.B.A, ENS Kouba, Kouba, Algeria
e-mail: dj.soumia@hotmail.fr

A. Arab
LaDyBio; FSB_USTHB, Alger, Algeria
e-mail: abdeslema@yahoo.fr

A. Kallel et al. (eds.), *Recent Advances in Environmental Science from the Euro-Mediterranean and Surrounding Regions*,
Advances in Science, Technology & Innovation, https://doi.org/10.1007/978-3-319-70548-4_236

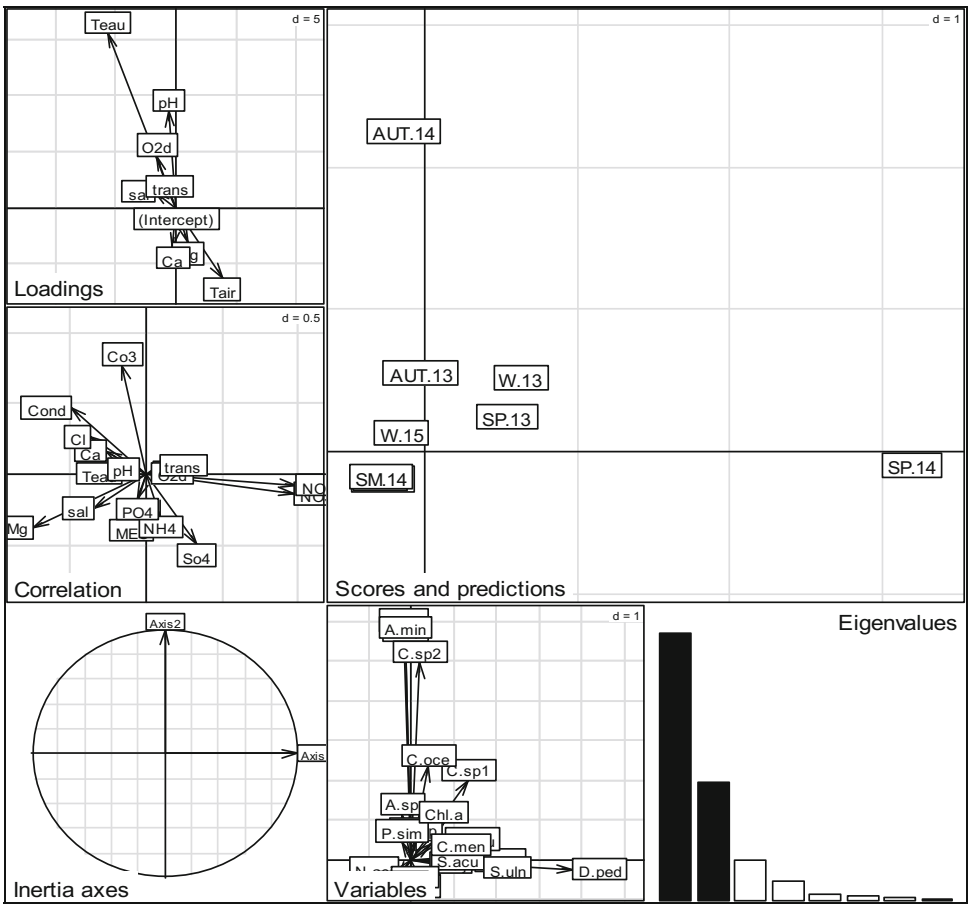

Fig. 1 Factorial representation of the seasons of study, the phytoplankton and the environmental variables on the plane (F1 × F2) of the CCA

sp1, *Cyclotella menegheniana*, *Nitzschia acicularis* and *Synedra acus*. We also found that different species of Cyclotella and Nitzschia were strongly related to conductivity and phosphate ions. This result corroborates that of El Haouati et al. (2015). The chlorophyceae (*Scenedesmus bijugatus*, *Tetraedron minimum*) that were found to be related to the chlorophyll a. Atanle et al. (2013) found a strong correlation between dinophyceae and mineralized water, which corroborates our result, where we found the *Dinobryon pediform* species in a water rich in carbonates and with a high conductivity. *Anabaena* sp, *Cylindrspermopsis raciborskii* and *Microcystis aeroginosa* appeared in the autumn of 2013 and 2014. These results corroborate those of Radji et al. (2013).

4 Conclusion

Due to their significant capacity to respond to environmental changes, the phytoplankton have long been used as biological indicators of aquatic environment quality. In this study, these compartments were used to determine the ecological status of a lake located in the Northern Algeria.

References

Atanle K, Bawa LM, Kokou K, Djaneye-boundjou G, Edorh MT, Distribution saisonnière du phytoplancton en fonction des caractéristiques physico-chimiques du lac de Zowla. J Appl Biosci. (2013);64:4847–57.

EL Haouati H, Arab A, Tudesque L, Lek S, Samraoui B. Study of the diatoms of Reghaia lake, northern Algeria. Rev Ecol. (Terre Vie). (2015);70:44–75.

Forsberg C. Limnological research can improve and reduce the cost of monitoring and control of water quality. Hydrobiol. 1982;86:143–6.

Gaikwad SR, Tarot SR, Chavan TP. Diversity of Phytoplankton and zooplankton with respect to pollution status of river Tapi in North Maharastra region. J Curr Sci. 2004;5:749–54.

Radji R, Bandje A, Issifou L, Edorh T, Kokou K. Diversité et dynamique des assemblages phytoplanctoniques dans les écosystèmes aquatiques au Sud du Togo. Science: Afrique; 2013. 66–77.

Soininen J, Kononen K. Comparative study of monitoring South-Finnish rivers and streams using macroinvertebrate and benthic diatom community structure. Aquat Ecol. 2004;38:63–75.