Phytoplankton and phytobenthos as biological quality elements along karstic river

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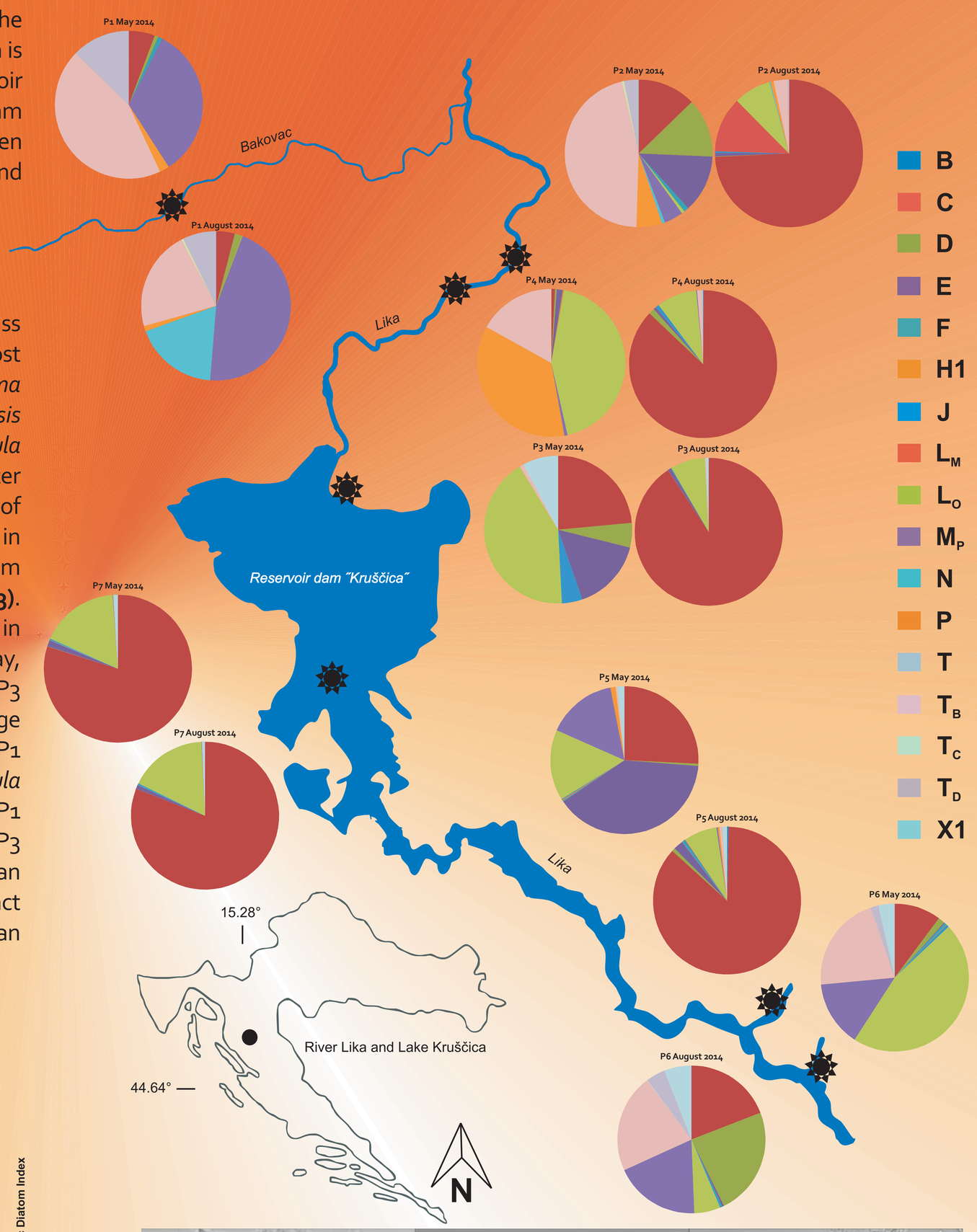
INTRODUCTION & AIMS

Phytoplankton (potamoplankton), same as phytobenthos, is important biological element required for monitoring in rivers. One of methods in ecology and river quality management is method of grouping phytoplankton in functional groups (FG) and their comparison. The main objectives of this study are to provide longitudinal description of potamoplankton functional groups and comparison with benthic diatom composition along karstic river Lika on two instances. Actual estimation of ecological status of the river is based on phytoplankton Qr index and benthic Croatian Trophic Diatom Index. Additionally, special attention was paid to the diatoms in the plankton and benthos which represent to specific descriptors of this particular karstic ecosystem.

The River Lika is the largest underground river in Croatia with a length of 78 km. In the canyon of River Lika (Lika Field) is the reservoir dam Kruščica. Along the river Lika is well known cave park Grabovača. We investigated area of the River Lika – reservoir dam Kruščica with upper and downstream sections and one tributary (stream Bakovac). Sampling of potamoplankton and phytobenthos was conducted at seven main points and additionally two secondary points for phytobenthos during May and August 2014.



RESULTS

A total of 45 species contributed more than 2% to the total phytoplankton biomass and presented 17 FG. A total of 122 species was recorded in benthic samples. The most frequent species were *Achnanthidium minutissimum* (Kützing) Czarnecki, *Diatoma ehrenbergii* Kützing, *Encyonopsis cesatii* (Rabenhorst) Krammer, *Encyonopsis microcephala* (Grunow) Krammer, *Fragilaria capucina* Desmazieres and*Navicula antonii* Lange-Bertalot **(Fig. 1.)**. As expected, benthic samples showed a greater number of species, and further, benthic samples in May showed a greater number of species compared to August **(Fig. 2)**. In May, Qr index showed smaller variation in values (0.37 - 0.69), while in August varied from. 0.30 - 0.75. Croatian Trophic Diatom Index was in the range from 1.7 to 2.5 indicating good to moderate conditions **(Fig. 3)**. Shannon-Wiener diversity index for phytoplankton samples varied from 0.55 - 2.30 in sample from P5 (upperstream area) and P2 (downstream area) collected in May, respectively **(Fig 4)**. Benthic samples showed variations from 0.69 - 2.39 from P3 (epipelon) and P3 (epiphyton) collected in May, respectively **(Fig. 4)**. Evenness (range 0 - 1) for phytoplankton samples showed variations from 0.18 - 0.86 for P5 and P1 collected in May, respectively which is supported by dominance of diatom *Navicula* spp. in P1 sample **(Fig. 5)**. Evenness for benthic samples varied from 0.35 - 1.0 for P1 (epilithon) and P3 (epipelon) respectively, indicating dominance of two species in P3 sample: *Encyonopsis cesatii* and *Fragilaria capucina* **(Fig. 5)**. As expected, Croatian Trophic Diatom Index generated acceptable values for investigated area owing to fact it is developed on Croatian species and data. Disagreements of Qr index and Croatian Trophic Index highlighted the need to normalise the assessment values.

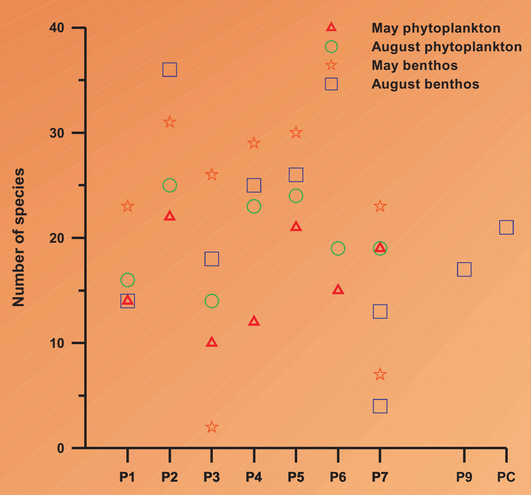


Fig. 2. Number of species for phytoplankton and phytobenthos samples according to sampling sites.

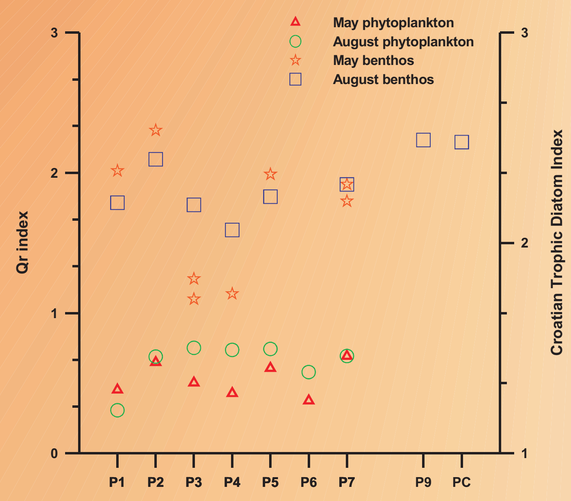


Fig. 3. Qr and Croatian Trophic Diatom index for phytoplankton and phytobenthos samples respectivey according to sampling sites.

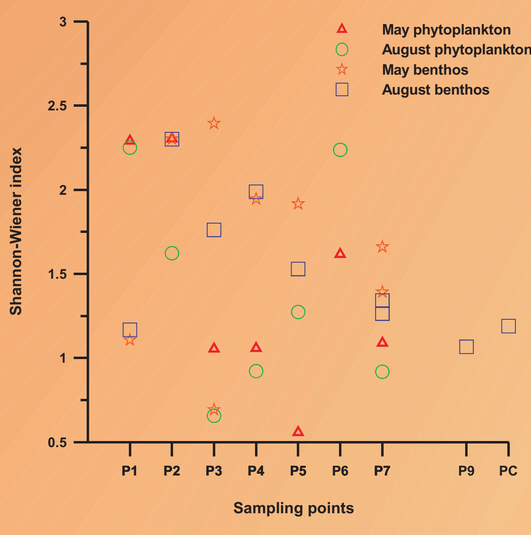


Fig. 4. Shannon-Wiener index for phytoplankton and phytobenthos samples according to sampling sites.

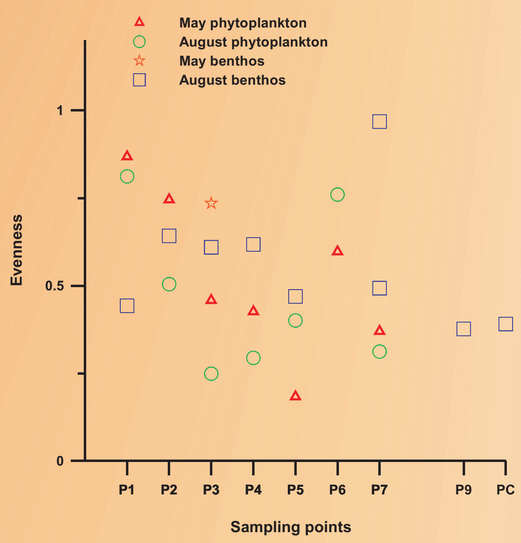


Fig. 5. Evenness values for phytoplankton and phytobenthos samples according to sampling sites.

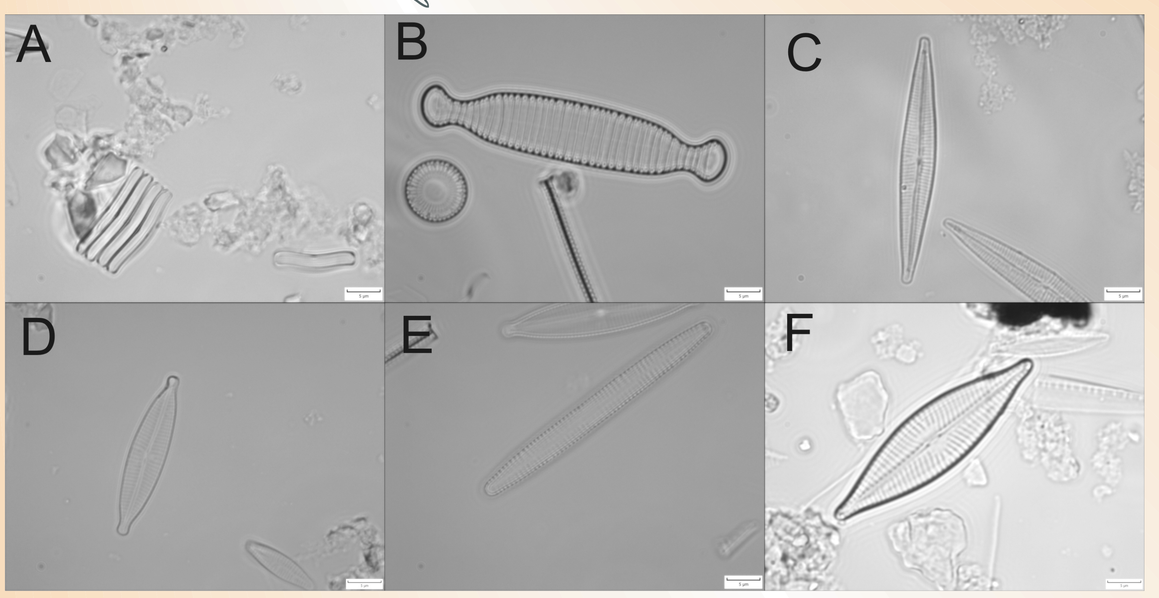


Fig. 1. Light micrographs of dominant species according to seven main sampling points: A - *Achnanthidium minutissimum* (Kützing) Czarnecki; B - *Diatoma ehrenbergii* Kützing 1844; C - *Encyonopsis cesatii* (Rabenhorst) Krammer; D - *Encyonopsis microcephala* (Grunow) Krammer; E - *Fragilaria capucina* Desmazieres; F - *Navicula antonii* Lange-Bertalot.

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