

# PHYTOPLANKTON COMMUNITY COMPOSITION AND STRUCTURE OF THE BRESTOVAC RESERVOIR (SERBIA)

Aleksandra ĐURKOVIĆ, Snežana ČAĐO, Boris NOVAKOVIĆ, Zoran STOJANOVIĆ,

Tatjana Dopuđa-Glišić and Ljubiša DENIĆ



The Serbian Environmental Protection Agency, Ministry of Environmental Protection, Belgrade, Serbia

aleksandra.djurkovic@sepa.gov.rs



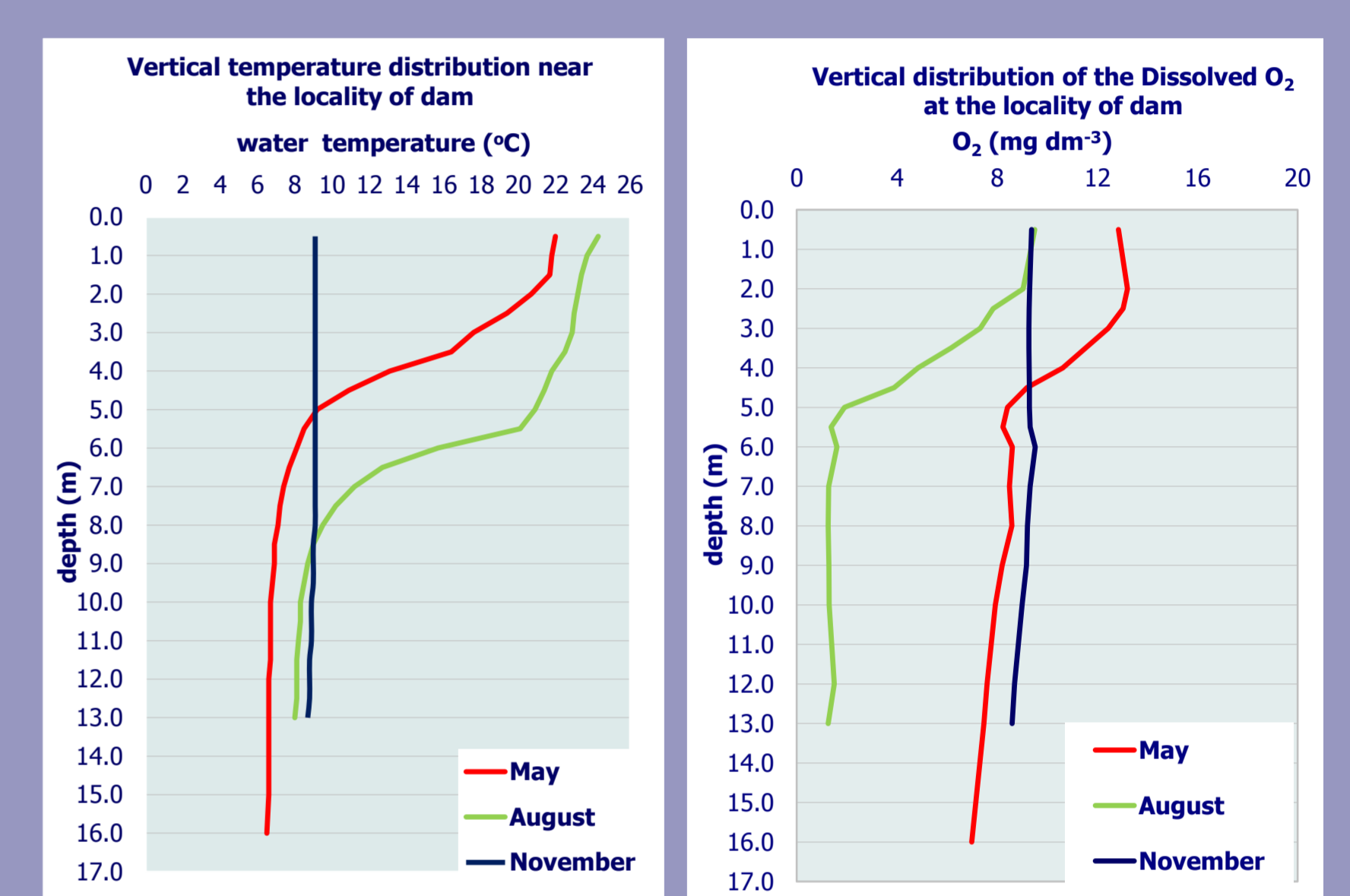
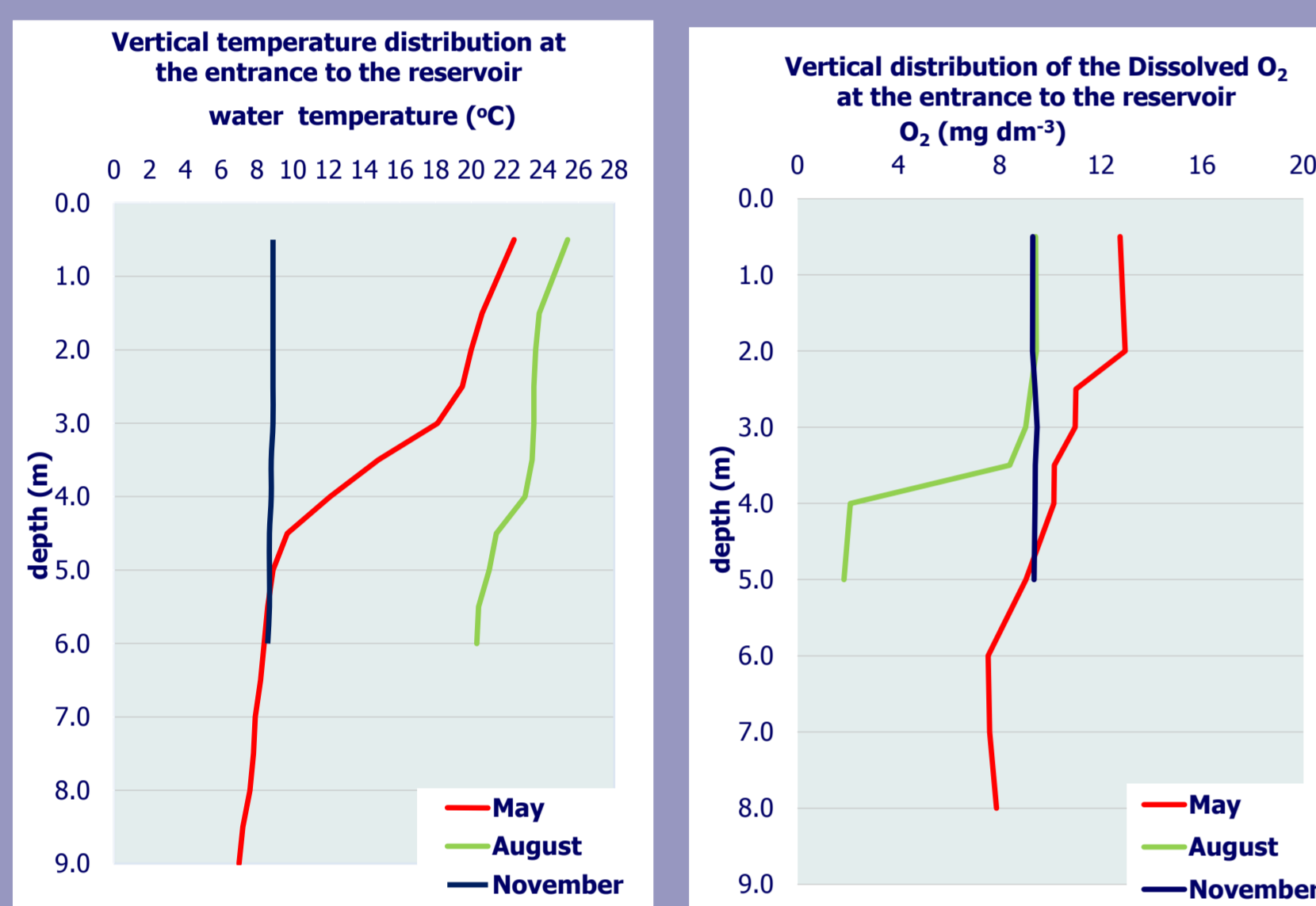
## Introduction

The Brestovac Reservoir is situated in Southern Serbia and it is primarily intended to provide a sufficient amount of drinking water for the population of its surrounding. The reservoir is 2.8 km long and 500 m wide with an average depth of about 12 m. The paper presents the seasonal and spatial variability of phytoplankton with supporting physico-chemical parameters: water temperature, Dissolved Oxygen (DO) and chlorophyll *a* concentration. The aim of the study is to determine structure and seasonal dynamics of phytoplankton in the Brestovac Reservoir as well as the influence of physico-chemical parameters on variability of phytoplankton community during the investigated period.



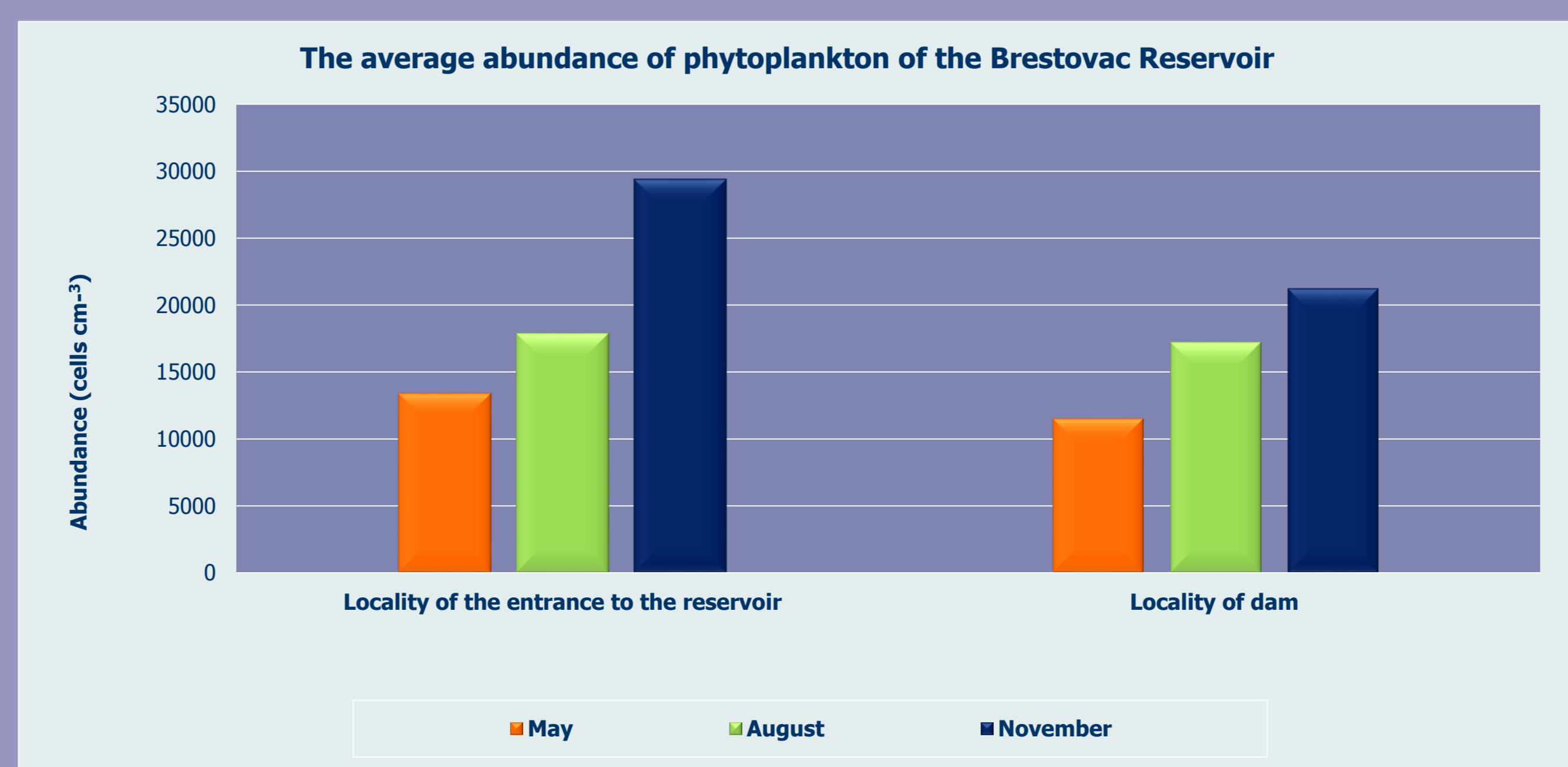
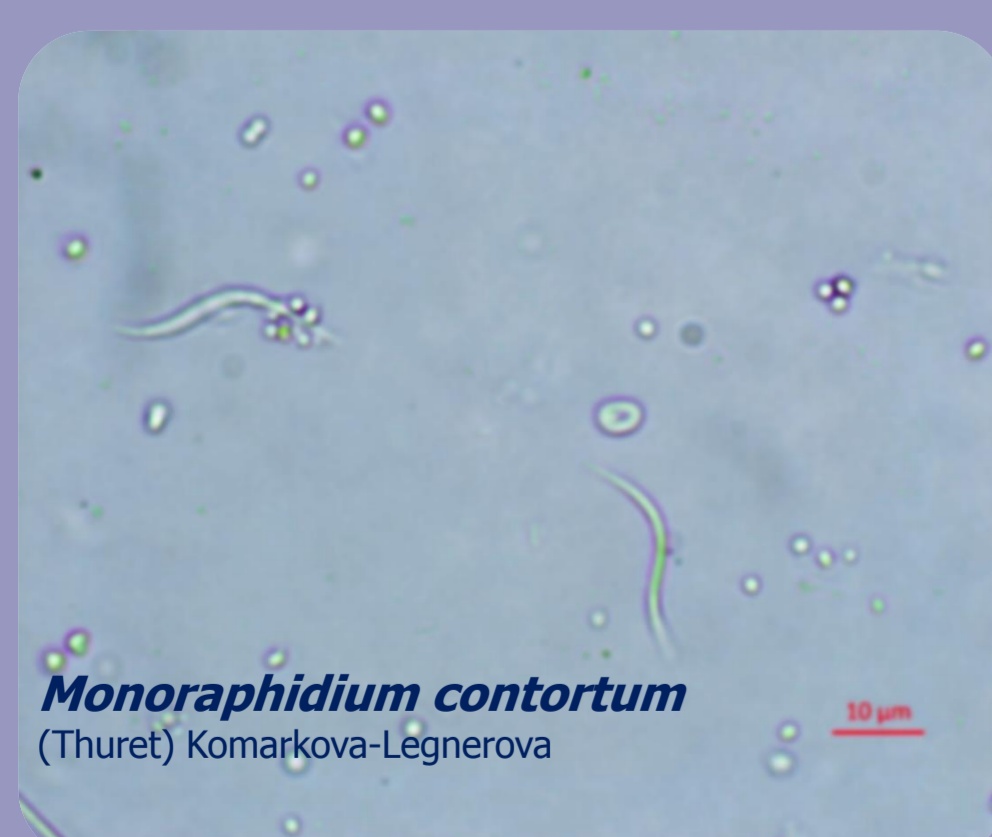
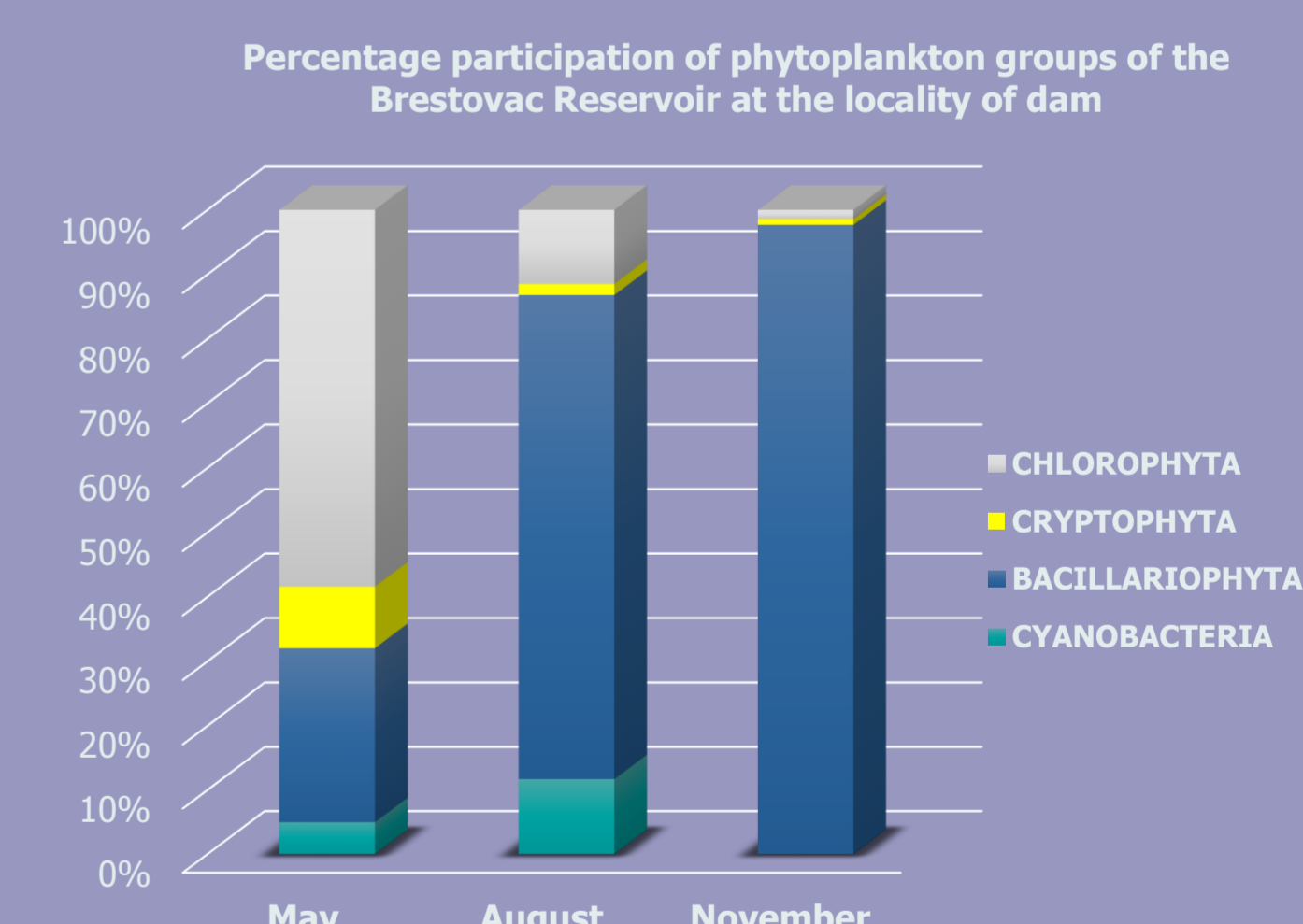
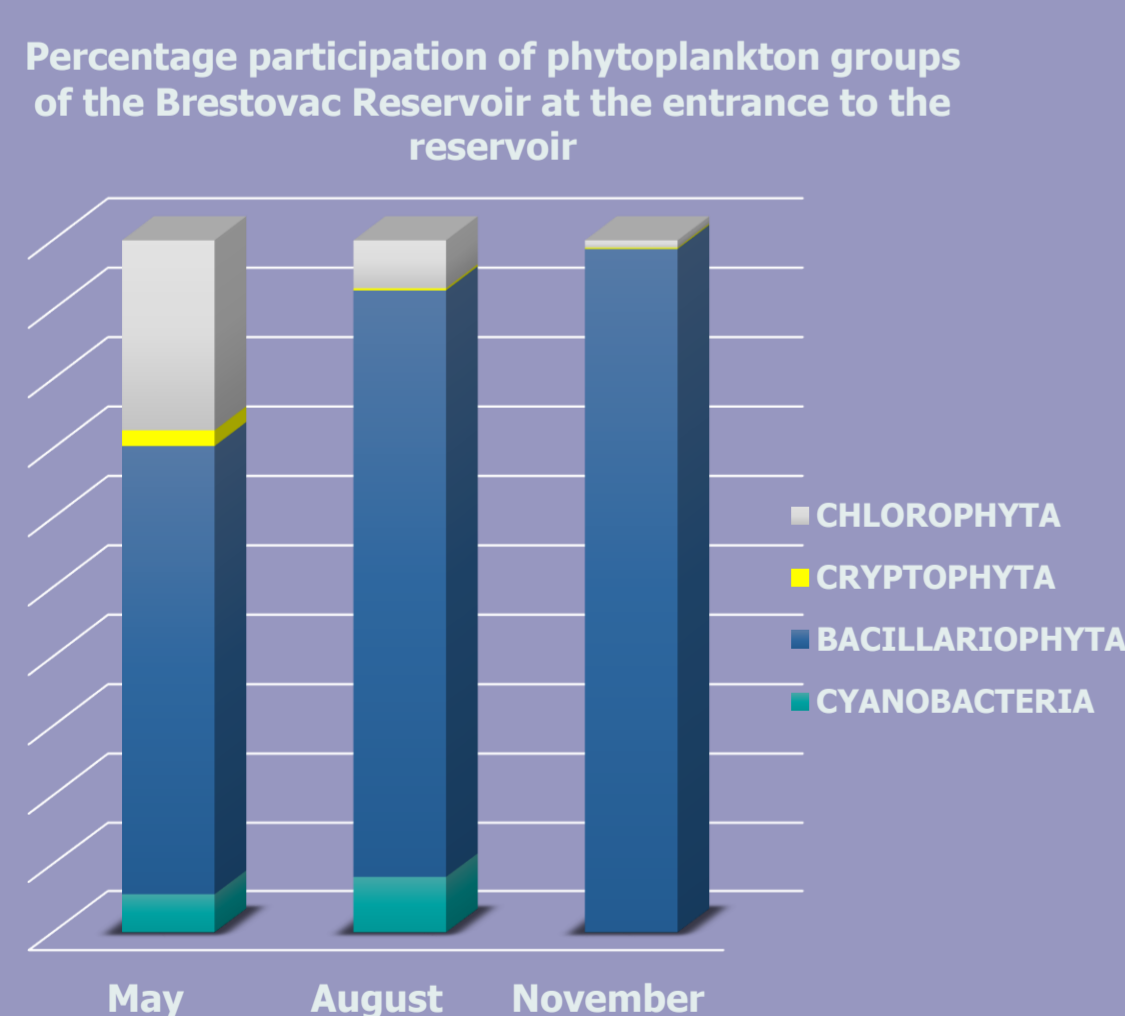
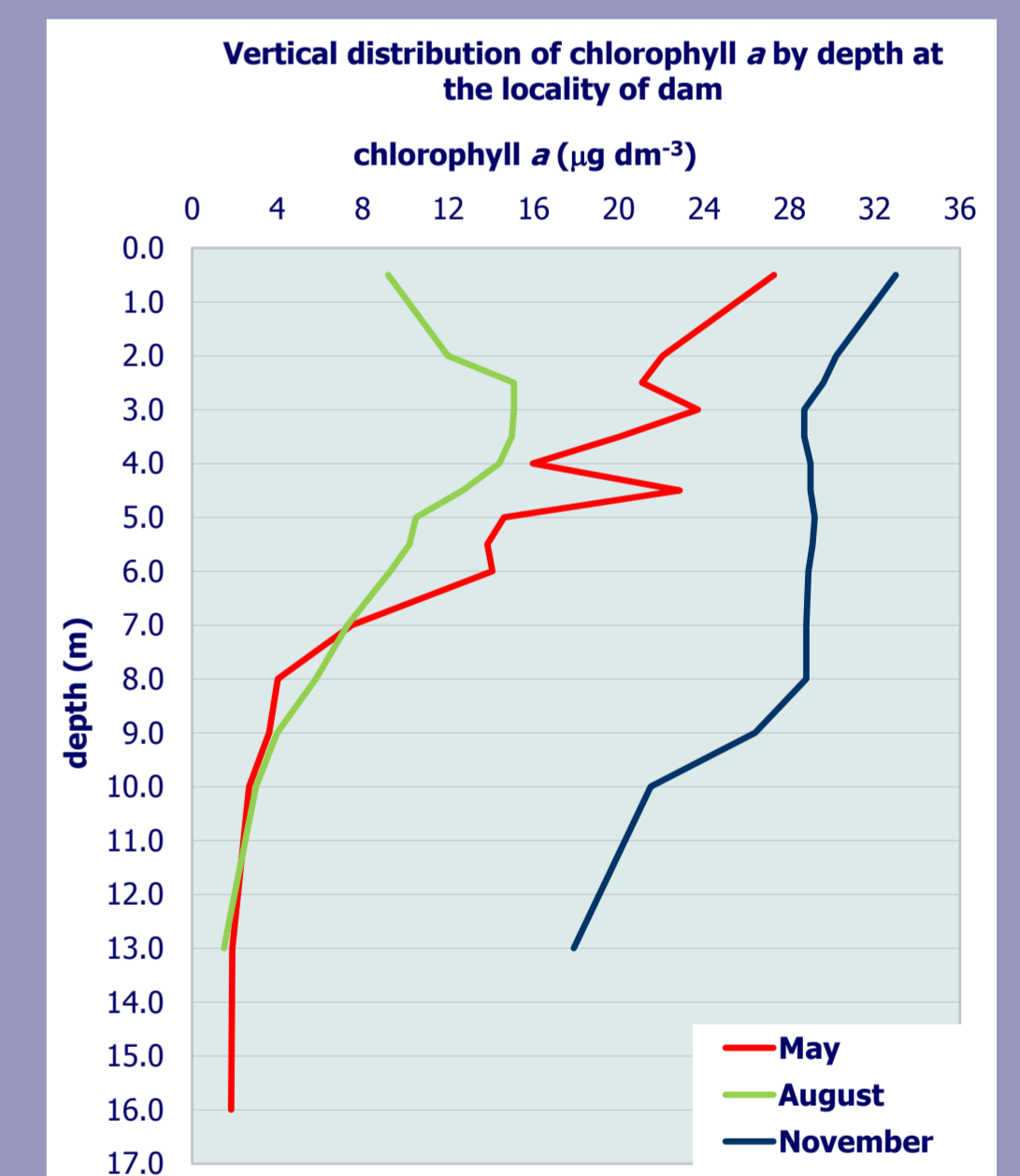
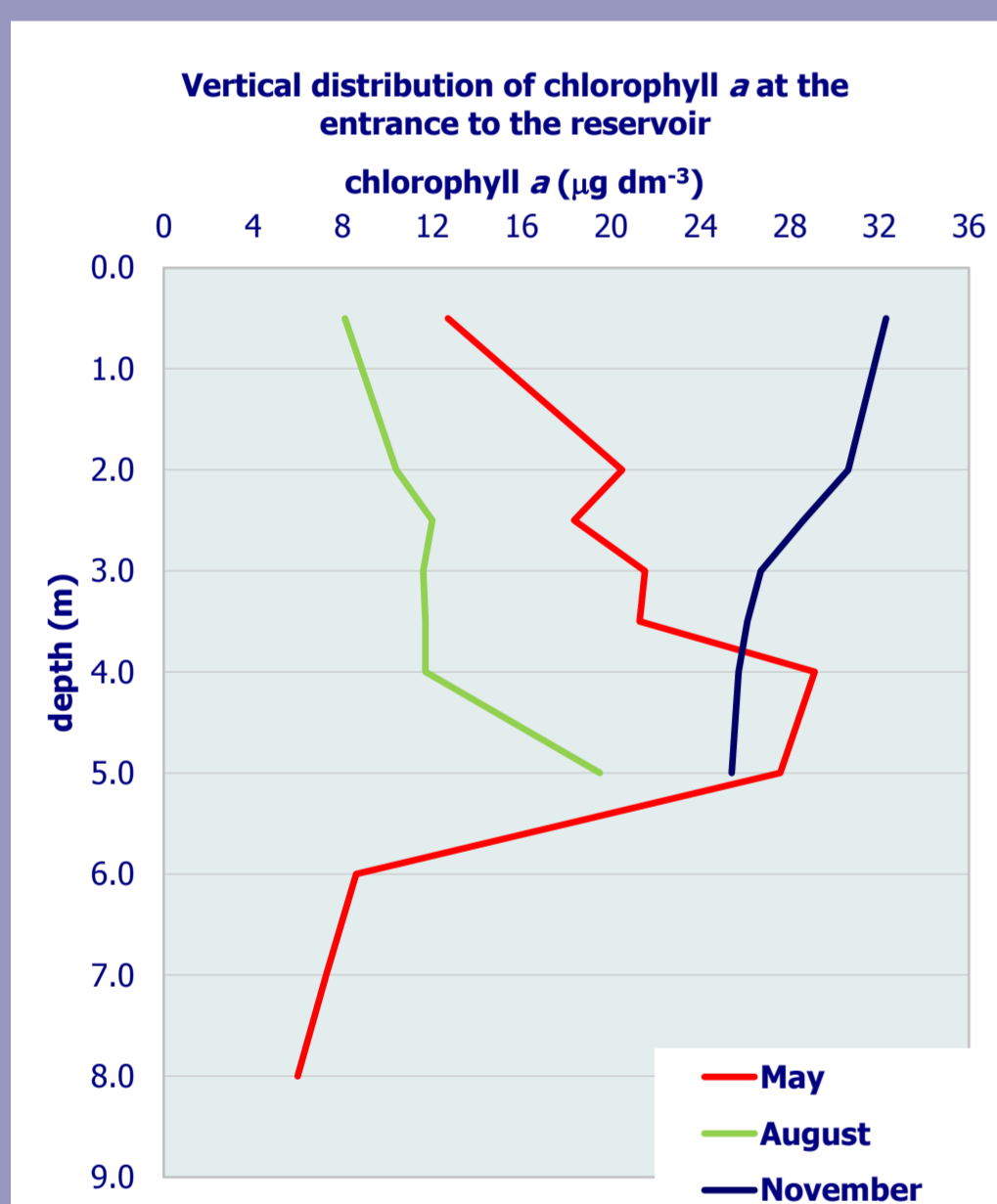
## Materials and Methods

Water sampling was carried out in 2015 at two sampling sites: at the entrance to the reservoir and near the dam. The first two investigations were performed during the period of thermal stratification, in May and August, whilst the third in November, in the period of autumn circulation. The algal material was collected using plankton nets (25  $\mu\text{m}$  mesh size) and hydrobiological bottles. At each sampling site, after measuring water temperature, at three to four points by depth, the samples were taken for quantitative and qualitative analysis of phytoplankton. The material was preserved with 4% formaldehyde. The phytoplankton analysis was done on inverted microscopes: Nikon TE-2000U with DS-5M camera and NIS-Elements D software and Zeiss Axiovert with AxioCam HRC camera and AxioVision 4.8 software. Quantitative analysis of phytoplankton was performed using Utermöhl method (1958), according to the SRPS EN 15204: 2008. For qualitative analysis of phytoplankton appropriate identification keys were used. The analysis of physico-chemical parameters was conducted according to proposed SRPS ISO standards.



## Results and Discussion

In the spring period, the heating of surface water layer was observed and growth of phytoplankton was intensified which caused the Dissolved Oxygen (DO) concentration in the surface layer of water to be higher compared to the deeper layer of water. The summer period of investigation was characterised by suddenly decreased the DO concentration ( $1.60 \text{ mg dm}^{-3}$ ) in the lower layer of metalimnion (thermocline) and hypolimnion ( $1.25 \text{ mg dm}^{-3}$ ), which was probably the consequence of oxygen consumption of the organic matter decomposition and plant and animal respiration as well. In August 2015, due to the low depth at the entrance to the reservoir, the thermal stratification was not established. The spring period of investigation is characterised by the high pH value in epilimnion ( $>9$ ) at both sampling sites. By qualitative analysis of the phytoplankton community, a total of 64 taxa from 6 algal divisions were identified: Cyanobacteria (4 taxa), Bacillariophyta (19 taxa), Cryptophyta (2 taxa), Dinophyta (5 taxa), Euglenophyta (2 taxa) and Chlorophyta (32 taxa). In the spring period (May), at both sampling sites, the high floristic diversity and abundance as well had green algae with the dominance of *Monoraphidium contortum* (Thurs.) Komarkova-Legn., *Kirchneriella diana* (Bohlin) Comas Gonzales and *Monoraphidium arcuatum* (Koršikov) Hindák. In the subsequent investigation (August, November), the dominance of green algae was replaced by diatoms. The highest abundance had the species *Aulacoseira granulata* (Ehrenberg) Simonsen, *Stephanodiscus minutulus* (Kützing) Cleve & Möller and *Ulnaria delicatissima var. angustissima* (Grunow) Aboal & P.C. Silva. The percentage participation of *Aulacoseira granulata* (Ehrenberg) Simonsen in the total abundance in November 2015 was over 70%. In the spring and summer period, the presence of Cyanobacteria: *Aphanocapsa holsatica* (Lemmermann) Cronberg & J. Komárek, *Leptolyngbya angustissima* (West & G.S. West) Anagn. & Kom., *Cuspidothrix issatschenko* (Usachev) P. Rajaniemi, Komárek, R. Willame, P. Hrouzek, K. Kastovská, L. Hoffmann & K. Sivonen and *Dolichospermum flosaquae* (Brébisson ex Bornet & Flahault) P. Wacklin, L. Hoffmann & J. Komárek was also significant. This algal group was represented more than 34% in the total phytoplankton taxa abundance in August 2015, in the surface layer of water at the sampling site near the dam. The total number of phytoplankton was increased in the surface layer during whole period of investigation. Near the dam of the reservoir, at a depth of 3m, the maximum number of phytoplankton was measured and it was  $36\,879 \text{ cells cm}^{-3}$ . The lowest number of algae was found at the maximum depth (16 m) at the sampling site near the dam ( $660 \text{ cells cm}^{-3}$ ). The obtained values of chlorophyll *a* concentration were highest in the surface water layer and these values ranged from  $15.1 \mu\text{g dm}^{-3}$  to  $33 \mu\text{g dm}^{-3}$ , whilst the lowest values of chlorophyll *a* were found only in the deepest layer of water near at the dam ( $1.83 \mu\text{g dm}^{-3}$ ).



## Conclusion

- In the phytoplankton of the Brestovac Reservoir the highest floristic diversity and the highest abundance as well had algal taxa from Bacillariophyta and Chlorophyta division
- The highest total phytoplankton abundance and the highest chlorophyll *a* concentration were measured in the summer period in metalimnion
- During all three investigation of the Brestovac Reservoir in 2015 cyanobacterial taxa were found