Saidenbach-Phytoplankton&APP

Methodological aspects of sampling and counting

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Phytoplankton

Research on phytoplankton of the Saidenbach Reservoir at the Neunzehnhain Ecological Station of the Dresden University of Technology was done and guided by the working group Reservoir Limnology of the Saxon Academy of Sciences at Leipzig in person of Dr. Heidemarie Horn (horn.hw@t-online.de) continuously throughout all the years since the early 1970s until 2013.

Water for phytoplankton analysis was regularly taken near the deepest point in the main basin of the Saidenbach Reservoir (approximately 100 m in front of the dam) from at least 6 (during full circulation) to 14 depths using a Ruttner-sampler, filled into 100 mL bottles and fixed with Lugol's solution. Counting was performed within two weeks after sampling with an inverted microscope using the sedimentation technique developed by UTERMÖHL (1958). In order to keep the counting error small, at least 400 cells, usually many more, were counted per sample, giving a counting accuracy of 95 % with confidence better than ± 10% (CAVALLI-SFORZA, 1965). A detailed study on the reproducibility of the plankton counts showed that the total error (i.e., sampling, subsampling and counting errors) only rarely reached or even exceeded the maximum counting error given by the statistics alone (HORN et al., 1987).

Since 1990, a modern microscope allowed a separate and more precise acquisition of smaller organisms at a higher magnification. Three counts per sample were then performed: (i) nanoplankton at 400x magnification, (ii) microplankton at 200x magnification, and (iii) at 100x magnification for particularly large, easily detectable algae that significantly influence the total phytoplankton biovolume. The respective "detection limits" were about (i) 5000, (ii) 2500, and (iii) 750 cells/L. These limits were higher at high algae densities when smaller sedimentation chambers were used. Preferably, single cells were counted, more rarely colonies.

Specific cell volumes were calculated using simple geometric approximations after measuring cell dimensions. This allowed for a conversion from cell numbers to phytoplankton biovolume. The size of many species, especially colony-forming, fluctuated so much that they were measured at each count.

Data files

- **Saidenbach-Phytoplankton_1975-2013.xlsx**: Counting results (dates with positive findings)
- **Saidenbach-Phytoplankton_Sampl-dates&Surf_1975-2013.xlsx**: Sampling dates and respective surface elevations; ground elevation at sampling point is 393.8 m.a.s.l.
- **Saidenbach-Phytoplankton_Species_1975-2013.xlsx**: Species found

Data were transformed in such way that integers resulted.

Autotrophic picoplankton (APP)

Water sampled for the analysis of autotrophic picoplankton (APP) was poured into dark bottles, fixed with formalin (final concentration approx. 1 %), and immediately stored cool and dark in the laboratory. Counting was usually done within 4 days following sampling. For this purpose, a maximum of 20 ml of the sample were filtered through a polycarbonate filter (pore size 0.2 microns) and counted at 500x magnification with a fluorescence microscope. Each sample was counted under

blue (395 - 500 nm) and under green excitation (520 - 560 nm), using the filter sets proposed by MAC ISAAC and STOCKNER (1993), which enabled a safe detection and better separation of the eukaryotic picoplankton due to the expansion of the wavelength range into the violet part.

The APP-species found in the Saidenbach Reservoir and their characteristics are given in Table 1.

Table 1: Characteristics of autotrophic picoplankton species found in Saidenbach Reservoir by fluorescence microscopy (all fluorescent organisms and particles that were identifiable and countable; APP – autotrophic picoplankton, CB – cyanobacteria, CE – Chl-a-excitation, PE – phycoerythrin-bearing, PC – phycocyanin-bearing).

Species acronym	Species characteristics	Colour at blue excitation	Colour at green excitation	Counted under blue (b) or green (g) excitation	Size (µm; diameter or width * length	Shape	Biovolume (µm³)	Main group	Sub-group
Ch1	Eukaryotic APP, single cells	red	dim red	b	1.5 ... 2.5	round	4.2	Eukaryotic	CE
Ch_K1	Eukaryotic APP, small colonies of 3 … 15 cells	red	dim red	b	1.5 ... 2.5	round	4.2	Eukaryotic	CE
PE1	APP, small single cells	yellow	orange	g	0.8 * 1.6	oval … elongated oval	0.54	Prokaryotic	PE
PE2	APP, large single cells	yellow	orange	g	1 * 2	cylindrical … elongated oval	1.05	Prokaryotic	PE
PE3	APP, large single round cells	yellow	orange	g	2 ... 2.5	round	4.85	Prokaryotic	PE
PE_K1	APP, colonies of 2 … 50 cells, 0.8 * 1.6 µm	yellow	orange	g	0.8 * 1.6	oval	0.54	Prokaryotic	PE
PE_K2	APP, colonies of 2 … 50 cells, 1 * 2µm	yellow	orange	g	1 * 2	cylindrical … elongated oval	1.05	Prokaryotic	PE
Rods	Rod-shaped CB (Synechococcus capitatus)	yellow	orange	b	0.8 * 15	rod-shaped	8	Prokaryotic	PE
Osc1	Filamentous CB	yellow	orange		1 * (10 ... 40)	filamentous	2.65	Prokaryotic	PE
PC1	APP, single cells	dim red	bright red	g	1 * 1.5	oval	0.8	Prokaryotic	PC
PC2	APP, single cells, large	dim red	bright red	g	1.5 * 2	elongated oval … oval	2.05	Prokaryotic	PC
PC3	APP, single cells, large and round	dim red	bright red	g	2 … 2,5	round	4.85	Prokaryotic	PC
PC_K1	APP, colonies of 2 … 50 cells, 1 * 1.5 µm	dim red	bright red	g	1 * 1.5	oval	0.8	Prokaryotic	PC
PC_K2	APP, colonies of 2 … 50 cells, 1.5 * 2 µm	dim red	bright red	g	1.5 * 2	oval	2.05	Prokaryotic	PC
PC_K3	APP, colonies of > 50 cells	dim red	bright red		1 * 1.5	oval	0.8	Prokaryotic	PC
Osc2	Filamentous CB	dim red	bright red		1 * (10 ... 40)	filamentous	2.65	Prokaryotic	PC

References

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Additional information

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