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Seasonal dynamics of the surface:volume ratio of phytoplankton assemblages in several lakes of different trophies

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Abstract

The seasonal dynamics of the relationship between the total-surface (mm^2 L^{-1}) and the total-volume (mm^3 L^{-1}) of phytoplankton were investigated for 11 meso- to hypertrophic lakes over a period of 4 years. High surface:volume ratios indicate the dominance of small unicellular algae in phytoplankton communities, while low ratios indicate large or colonial algal dominance. Despite differences in phytoplankton assemblages, the dynamics of surface:volume ratios were similar in all lakes for most of the year. High ratios prevailing during winter and spring changed to lower levels at the onset of the summer bloom in all lakes. This corresponds to significant changes in the diatom and cyanobacterial species composition during the transition from spring to summer (Teubner 1999). *Limnothrix redekei*, *Nitzschia acicularis* and *Stephanodiscus neoastraea* had individually low surface:volume ratios but had a higher share of the total biovolume of the phytoplankton in winter/spring as opposed to summer/autumn. In contrast, several species which characterise the summer/autumn period, such as *Aphanizomenon flos-aquae*, *Microcystis* spp., *Actinocyclus normanii* and *Aulacoseira granulata* are responsible for low surface:volume ratios during the rest of the year. The annual fluctuations of surface:volume ratios, however, vary considerably from lake to lake and from year to year. The surface:volume ratio in hypertrophic riverine lakes in summer, for instance, depends on the species involved in summer blooms. Ratios are higher during the dominance of *Planktothrix agardhii* when compared to the blooms of *Aphanizomenon flos-aquae*/*Microcystis* spp. (Teubner 1996, 1999, Teubner et al. 1999).

The long-term averages of the surface:volume ratios of the 11 lakes are shown in Table 1. The lakes are ordered according to decreasing mean surface:volume ratios. A non-significant trend of the means emerges, because the ranges of the surface:volume ratios are almost identical in the investigated lakes (see minimum and maximum). Nevertheless, these lakes vary greatly in their trophic level, which can be seen from the average chlorophyll *a* concentrations. Therefore, the mean surface:volume ratios of all lakes are remarkably similar and not related to the trophic level. The full paper will be published elsewhere.

References

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Table 1: Surface:volume (s:v) ratios (mean s:v, maximum s:v, minimum s:v) and average chlorophyll *a* concentrations of the 11 investigated waters. (s:v in mm^2 L^{-1}/mm^3 L^{-1}; chlorophyll *a* in µg L^{-1}; n, number of measurements; water abbr. (from left to right): Krumme Lake, Kiessee, Grosser Plagesee, Langer See, inlet of Flakensee (Löcknitz), inlet of Grosser Müggelsee, Flakensee, inlet of Flakensee (Woltersdorfer Schleuse), Rosinsee, Müggelsee, Parsteiner See).

	KRUL	KIES	GPLA	LANS	FLZL	MUEZ	FLAS	FLZW	ROSS	MUES	PARS
Mean s:v	1013	999	977	929	860	855	806	766	666	635	623
Max s:v	1541	2059	2174	1448	1329	1590	1227	1472	1500	1330	1151
Min s:v	402	117	260	469	568	303	262	328	274	191	336
Chlorophyll *a*	29	14	9.3	61	11	40	18	11	8.2	44	3.9
n	19	29	19	29	34	58	59	59	29	59	28

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