



## Temporal mapping of phytoplankton assemblages in Lake Geneva: Annual and interannual changes in their patterns of succession

Anneville, Orlane, Sami Souissi, Frédéric Ibanez, Vincent Ginot, Jean Claude Druart, Nadine Angeli

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**ABSTRACT:** The implementation of a conservation program since the early 1980s resulted in a reduction in phosphorus concentrations in Lake Geneva. However, in the 1990s, phytoplankton biomass increased again, almost reaching the high values recorded during the period of greatest P loading. The structural changes in the phytoplankton of Lake Geneva over the past 25 yr have been analyzed using a recently developed statistical method based on hierarchical clustering and Bayesian probabilities. This method has been used to identify phytoplankton assemblages and to map annual and interannual successional patterns simultaneously. Characteristic species were identified for each cluster after calculation of their relative species fidelity and specificity indices. Six distinct phytoplankton assemblages were identified, and although the way species are organized into communities remains unclear, the seasonal patterns of succession are consistent with the C-S-R adaptive strategies and are characteristic of temperate lakes. This pattern broadly recurred over the years, but was markedly influenced by both human activity and regional climatic changes: The warmer winters and springs recorded in Europe since 1988 led to an earlier clear-water phase. In the 1990s, the earlier and deeper depletion of dissolved inorganic phosphorus led to colonization in the summer by large species tolerant of low light levels and that could develop deeper in the water column, where phosphorus was still abundant. Their size made them less vulnerable to grazing losses, which favors their accumulation and lead to an unexpected high biomass in recent years.

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