

Spatial and temporal variations in TP-phytoplankton relation in German rivers and its consequences for the implementation of the WFD

Gregor Ollesch¹, Ute Mischke², Ralph Meissner¹

¹ Helmholtz Centre for Environmental Research – UFZ

² Leibniz-Institute for Freshwater ecology and Inland Fisheries
gregor.ollesch@ufz.de

The implementation of the European Water Framework Directive (WFD) requires an evaluation of watercourses which also includes a recording of phytoplankton characteristics. The phytoplankton growth is controlled by the nutrient status of the water bodies and abiotic factors like water retention time or shadow effects. Thus, an evaluation has to consider the specific conditions of each type of water body. However, in Germany more than 20 major types of watercourses exist due to climate and landscape differentiation.

Chlorophyll_a (chl_a) and total phosphorus (TP) concentration are key parameters to estimate the (auto-) trophic status of water bodies. The relationship of these two key parameters is positively correlated also in rivers, if environmental conditions are comparable to lake systems. However, in almost all small creeks and rivers the physical conditions limit algal growth, so the empirically observed chl_a/TP ratio is lower and varies considerably. Therefore phytoplankton assessment is restricted to few German river types, which exhibit an increasing trend of phytoplankton biomass with increasing nutrients and which are plankton-rich (>20µg/l chl_a in seasonal mean). Subtypes are established to take differences in phytoplankton response into account. For example, the average biomass production differs strongly in large streams in south-western Germany from those in the eastern part, independently if they are dominated by gravel (type 10) or sand (type 20). More relevant for phytoplankton growth is the fact that these regions differ very much in mean precipitation. So, an area specific discharge of 10 l s⁻¹ km² was identified as a threshold value, which explains the lower chl_a production in the streams like Rhine and Danube by dilution effects in comparison to Elbe or Odra. Based on this river type-specific trophic status system, a procedure was developed to assess the ecological status based on biomass and indicator taxa of phytoplankton (Mischke & Behrendt 2007). The software “PhytoFluss” with user interface was developed for environmental authorities to apply this procedure in practice.