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Trajectories of microbial communities during colonization of newly impounded freshwater macrocosms: Effects of phosphorus addition

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Microbial communities are key components in aquatic food webs through their integral role in nutrient cycling. Indeed, they both influence and are influenced by nutrient concentrations and their relative ratios. Although a considerable body of work now exists on the structure of aquatic microbial communities, little is known on how newly formed aquatic systems are colonized. Moreover, even less is known on how nutrient availability influences these colonization trajectories. Thus, we investigated the microbial structure of artificial lake macrocosms (PLANAQUA Aquacosm network, approx. 650m3), during the first year after impoundment. After 5 months, a simulation of eutrophication via addition of soluble P was performed (8 out of 16 lakes). We analyzed the genetic (high-throughput sequencing) and functional (Biolog-Ecoplate®) diversity of bacterioplankton. We did not observe an algal bloom during the first year, nor did we observe a significant impact of P enrichment on ChlA concentration. However, we did observe a temporal dynamic of bacterial diversity, with compositional shifts within bacterial phyla mainly correlated to Temperature. In parallel, we also found a significant effect of P enrichment that mainly resulted in OTUs (Operational taxonomic Units) abundance variation, highlighting a stable core-community with only 2 phyla being treatment-specific: Chlorobi (only in P lakes) and Spirochaetae (only in control lakes). In order to further describe these mechanisms, co-occurrence networks will be tested. Our results underline the necessity to characterize these putative indicator bacteria as possible sentinels for increased P concentrations in freshwater ecosystems.