

Endospores in sediment as a proxy for 20th century environmental lake history

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Eutrophication as a common consequence of anthropogenic pressure has been observed in many lakes around the world and is acknowledged as a pressing environmental issue that threatens water supply and health of aquatic ecosystems. Solving these issues requires the implementation of measures for ecosystem management. For this, an inventory of conditions (i.e. local biodiversity and ecosystem response) pre and post disturbance should be established. An ideal environmental archive of the lake history can be found in the sediments. Here, we use bacterial endospores that are present in the sediment as natural time capsules to unveil lake history and the effect of anthropogenic pressure on the sediment microbiota of the last hundred years. We show that variations in community structure, determined by 454 sequencing, are linked not only to eutrophication, but also to sulphate metabolism, input of terrestrial organic matter, and climatic events. Furthermore, a treatment prior to DNA extraction of the samples allowed the separation between endospores and vegetative cells in the sediment. Subsequent sequencing (of the endospore fraction) provides additional information on the dormant bacterial remains in sediments. This additional information was key to reveal the “seed bank” component of the microbial pool and demonstrated its importance in the community response to changes in environmental conditions. Our studies show that bacterial endospores can be used as a paleoecological proxy for ecosystem prospection in aquatic ecosystems.