INFLUENCE OF STREAM HEADWATER FLOW BIOTOPES ON WITHIN-REACH VARIABILITY IN BENTHIC DIATOM ASSEMBLAGES

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Benthic biofilms in headwater streams play a critical role in river ecosystems, for example through the fixing, cycling and retention of nutrients and energy. However, headwater streams are also spatially and temporally dynamic systems. This dynamism extends to benthic biofilms, potentially confounding relationships between biofilms and in-stream or broader catchment characteristics such as land use. One approach to constraining and understanding this dynamism involves drawing on the concept of physical biotopes: flow-defined units of in-stream habitat that are hypothesised to strongly influence lotic biodiversity and function. This meso-scale approach to analysis is important for enhanced understanding of benthic ecology. In this paper, emphasis is placed on benthic diatom communities as indicators of system integrity due to their sensitivity to a range of water quality conditions and response to physical habitat characteristics. This study tests the hypothesis that distinct diatom communities are associated with physical biotopes, and that these relationships persist between seasons making physical biotopes a useful component of ecological assessment tools. Our research draws on the catchment of the River Eden, Cumbria, UK, a DEFRA Demonstration Test Catchment. The research addresses the spatial variability of headwater benthic diatom communities in terms of both their structure and function, and the physicochemical parameters that drive this variability.

In this paper we present preliminary data concerning the structural and functional attributes of benthic biofilms, including community composition and benthic chlorophyll a, at the physical biotope scale. The study focuses on a 10 km^2 sub-catchment, Morland Beck, part of the River Eden and assesses within-reach variability in the benthic diatom community. Our results suggest that riffles are areas of higher productivity and lower biodiversity compared to pools. It is thought that the intermediate disturbance hypothesis is likely to underpin the observed productivity-diversity relationship for this headwater system with near-bed scouring re-setting benthic communities. The Trophic Diatom Index demonstrated little variation among biotopes within the reach, but does discriminate between three headwater catchments. The TDI is an effective biomonitoring tool which encapsulates within-reach headwater variability. This study, provides an assessment of the use of specific physical biotopes for biomonitoring, integrating physical and chemical parameters and explores their effects on benthic structure, process and function.