

Sticky sediment: quantifying the morphological significance of biofilms

Mark Ledger and Greg Sambrook Smith



Benthic algae form part of the biofilm that coats the surfaces of substrata in running waters. Although often dominant, algae are only part of a mixed assemblage which can also include autotrophic and heterotrophic bacteria, fungi, protozoa, and fine detritus. Biofilms are thus ubiquitous in river systems, and play an important role in river ecology, both as key processors of nutrients and contaminants, and as key resources for a range of invertebrates and fish. Less is known about interactions with the physical environment, although biofilm is thought to influence sediment transport and resultant bed morphology. While it is known that biofilms can bind sediment together inhibiting entrainment, the mechanics of this process and how it varies with sediment size, sorting, biofilm type and seasonality are unknown. Likewise, the feedback between sediment mobility and biofilm growth remain unclear, for example, we do not know how substratum stability varies through the biofilm growth cycle. The purpose of this project is to meet this grand challenge using the new Environmental Change Outdoor Laboratory (ECO-LAB) at the University of Birmingham. The successful candidate will use the flumes in the ECO-LAB to elucidate the mechanisms by which biofilms mediate sediment entrainment processes and are in turn modified by those processes. Once these basic principles have been established further experiments will explore how these processes might be modified by varying sediment characteristics, biofilm type and seasonality. This project also benefits from being closely linked with a NERC grant investigating 'the hydrodynamics of microbial landscapes'. The successful candidate will also benefit from being part of a large, supra-disciplinary, international research team with the possibility of collaborating with colleagues at the University of Illinois.

Relevant references

Ledger, M.E. & Hildrew, A.G. (1998) Spatial and temporal variation in the epilithic biofilm of an acid stream. *Freshwater Biology*, 40, 655-671.

Ledger, M.E., Harris, R.M.L., Armitage, P.D. & Milner, A.M.M. (2008) Disturbance frequency influences patch dynamics in stream benthic algal communities. *Oecologia*, 155, 809-819.

Applicants should apply via <http://www.birmingham.ac.uk/postgraduate/courses/research/gees/geog-environ-sciences.aspx> where they should click on 'Apply now' and choose the option 'PhD in Department of Geography and Environmental Science (Physical Geography)' and give the PhD title in the 'Funding details' section of the online application.