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Investigating the influence of heavy metals on macro-invertebrate assemblages using Partial Cononical Correspondence Analysis (pCCA)

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Abstract. This paper defines the spectrum of impairment to stream macroinvertebrates arising from urban runoff. Field sampling of stream sediments at 62 sites across Yorkshire, UK was used to investigate the influence of heavy metals and habitat on macroinvertebrate family distribution using partial Canonical Correspondence Analysis (pCCA). Increasing urbanization and trafficking was associated with increasing levels of metal pollution but, even when traffic is light, family numbers can be reduced by 50%. Industrial areas and motorway runoff depress macroinvertebrate numbers but drainage from streets with no off-road parking in residential areas can have similar impacts. The heavy metals in the sediment accounted for approximately 24% of the variation in macroinvertebrate community composition while the physical habitat variables used in RIVPACS (River InVertebrate Prediction And Classification System) (Wright, 2000) accounted for an additional 30%. Zinc and nickel were the main metal influences regardless of the time of sampling; at these sites copper is less than critical. Results agree with those reported in other studies in which families mainly from the orders Ephemeroptera (mayfly), Plecoptera (stonefly) and Tricoptera (caddisfly) displayed metal sensitivity in that they were absent from metal polluted streams. However, within each of these orders, a continuum of sensitivity is evident: this highlights the risks of generalising on orders rather than using family or indeed species data.

Keywords: macroinvertebrates, heavy metals, urban streams, tolerance, sensitivity

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