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"Who's been feeding in my bed?" Benthivorous fish affect fluvial sediment transport – fact or fairy tale?

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Many species of fish are benthivorous – they forage for food in the river bed – and their foraging disturbs, displaces and sorts bed materials with implications for fluvial sediment transport. Flume experiments have confirmed that benthic foraging by Barbel (Barbus barbus (L.)) and Chub (Squalius cephalus (L.)) modifies the structure and topography of water-worked gravels, thereby increasing particle entrainment probabilities and the quantity of sediment mobilised during experimental high flows. Field experiments and observations have demonstrated the impact of foraging on patch-scale bed disturbance, gravel structure, grain displacements and grain-size sorting. Initial ex-situ experiments support the suggestion that in low gradient rivers, shoals of fish like Bream (Abramis brama (L.)) entrain fine bed sediments, adding a biotic surcharge to the suspended sediment flux and modifying bed topography. These results underpin a novel proposal: that there is an aggregate, cumulative effect of benthic foraging on fluvial sediment transport at larger scales, including at scales where the contribution to sediment movement and river channel behaviour generates management concerns. Evaluating this proposal is a long-term goal, which is based on two intermediate objectives: to develop deeper mechanistic understanding of foraging impacts and to establish the spatial and temporal extent of geomorphologically significant feeding behaviours in river systems. The latter is crucial because field data are currently limited to a single reach on one UK river. It is reasonable to hypothesise that foraging impacts are spatially and temporally widespread because obligate and opportunistic benthic feeding is common and fish feed throughout their life. However, the effectiveness of foraging as a geomorphological process is likely to vary with factors including substrate size, fish community composition, food availability, water temperature, river flows and seasonal changes in fish behaviour. A new programme of work therefore aims to establish the distribution of key benthivorous species across the River Trent catchment, UK, measure their impact on bed disturbance, and investigate the spatial and temporal controls of disturbance intensity. In sum, work to date confirms that benthivorous fish affect fluvial processes – this is no fairy tale – but ongoing work is needed to evaluate their large-scale, aggregate significance and their contribution to life's role in driving and moderating sediment movements across Earth's surface.