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Biotic and abiotic drivers of the burrowing behaviour of invasive signal crayfish (Pacifastacus leniusculus): mesocosm experiments

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The introduction of invasive crayfish to Europe has had significant geomorphic consequences via their burrowing and foraging activities. The signal crayfish (Pacifastacus leniusculus) rarely burrows in its native range in North America, but burrowing is common in invaded rivers in the UK. This causes extensive damage to river banks and increases fine sediment recruitment to rivers, both as a direct result of transferring burrowed sediment into the channel and by promoting mass failure. Quantifying the volume of sediment that signal crayfish contribute to river systems is increasingly important for understanding and managing fine sediment dynamics in invaded catchments. However, we do not know what biotic and abiotic factors control the propensity to burrow or burrowing rates. To complement a large field campaign that is measuring and modelling these variables, a series of hypothesis-driven mesocosm experiments were designed to establish the role of key environmental and biological factors in driving burrowing activity. Two communities of crayfish were investigated, one collected from a site where burrowing is prolific, and one from a site where burrowing does not occur. Factors including the availability of alternative shelters, the composition of bank material, and crayfish population density were investigated by manipulating these variables in mesocosms fitted with simulated river banks. Preliminary results suggest that the availability of an alternative refuge may be a behavioural driver, and that there are differences between the two populations, suggesting that burrowing may be a learned behaviour. Understanding what drives crayfish burrowing will ultimately help to model how the spread of crayfish will affect sediment recruitment, sediment dynamics and channel change in infested rivers. These results also demonstrate that animals have a significant impact on the geomorphic functioning of river systems, and should be considered in future sediment transport and river functioning models.