Geophysical Research Abstracts
Vol. 15, EGU2013-10457, 2013
EGU General Assembly 2013

Signal crayfish as zoogeomorphic agents: diel patterns of fine sediment suspension in a crayfish-affected river and the implications for fine sediment fluxes and dynamics

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The signal crayfish (Pacifasticus leniusculus) is a formidable invasive species that has had a deleterious impact on native freshwater fauna across Europe. We contend that the impact of this animal extends beyond ecology into geomorphology and hypothesise that crayfish are significant agents of fine sediment recruitment and mobilisation, with potentially profound impacts on water quality, substrate quality and fine sediment fluxes. Building on pioneering work by colleagues at Queen Mary University, London this poster considers the role of crayfish in fine sediment suspension in a lowland, gravel-bed river. The hypothesis that nocturnal increases in crayfish activity are associated with a greater frequency of sediment suspension events and increases in ambient turbidity, is tested. Strong diel fluctuations in water turbidity were recorded at several sites on the Brampton Arm of the River Nene in England, a river heavily populated by signal crayfish, during August and September 2012. With the exception of three summer flood events, stage measurements during the same period were essentially flat, ruling out a hydraulic cause for overnight rises in turbidity. Water samples collected at midnight and at midday at one site confirm this diel pattern for suspended sediment concentration. Higher mean turbidity values overnight are associated with an increase in the magnitude and frequency of isolated turbidity spikes or events and this is consistent with crayfish nocturnalism. In particular, we suspect that turbidity events are caused by the construction and maintenenance of burrows and by interactions between crayfish and the river bed while foraging, fighting and avoiding each other. Tying the diel SSC signal directly to crayfish activity proved difficult, but several lines of argument presented here suggest that crayfish are the most likely cause of the diel pattern. These results provide substantial support for the idea that signal crayfish are important zoogeomorphic agents that accelerate fine sediment recruitment and promote the mobility and turnover of fine sediments once they are in the channel network, with potential implications for the management of fine sediment pressures in European rivers. Moreover, crayfish are probably one of thousands of species that may, cumulatively, have a substantial impact on river sediment dynamics. The tantalizing possibility that these animals are significant actors in catchment-scale sediment dynamics challenges the conventional view that sediment systems are abiotic and warrants greater scientific attention.