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Invertebrate drift during in-channel gravel mining: the Upper River Cinca (Southern Pyrenees)

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Invertebrate drift has been widely studied as an important mechanism to structure the benthic assemblages and as a part of invertebrate behavior in fluvial systems. River channel disturbance is considered the main factor affecting the organization of riverine communities and contributes to key ecological processes. However, little is known about involuntary drift associated to bed disturbance due to the difficulties associated with sampling during floods. In-channel gravel mining offers an opportunity to study involuntary drift associated not only to local bed disturbances but also to sudden changes on suspended sediment concentrations and flow. High suspended sediment concentrations and sudden changes in flow also prompt drift due to the limiting conditions (i.e. lack of oxygen, hydric stress).

Within this context, invertebrate drift was monitored in the Upper River Cinca (Southern Pyrenees) during two gravel mining activities performed in summer 2014. The data acquisition design includes: drift, suspended sediment, bedload, bed mobility and flow. Data was acquired before, during and after mining at different sampling locations located upstream and downstream the perturbation. Drift and suspended sediment transport were sampled at 5 sections: 1 control site upstream the mining and 4 downstream. Bedload samples were collected just downstream the channel where gravels were extracted. Bed mobility and changes on topography were assessed by means of GPS-aDcp and repeat topographic surveys. Discharge was continuously recorded 2.5 km downstream the mining location. Additionally, two turbidity meters registered water turbidity at 15 minute intervals in two of the four sampling sections located downstream. This experimental design provides data on the spatial and temporal variability of drift associated to a local bed disturbance that (i) changes the distribution of flow across the section where mining was performed, (ii) increase substantially suspended sediment transport, and (iii) generates bed mobility and changes on local morphology and roughness that, ultimately, modify channel topography.

Samples are being post-processed. Preliminary results show markedly differences in drift in terms of densities and species at different temporal and spatial scales. These differences can be attributed to the type of disturbance during mining: (i) hydric stress associated to changes on the distribution of flows, (ii) the sudden increase of suspended sediment concentrations, or (iii) high bed mobility just downstream from the mining location. These results will provide: (a) a new framework to understand ecological responses during river disturbances and (b) key information or guidelines for an appropriate management in human stressed fluvial systems.