Using cameras to study drift patterns – RODI: Riverine Organism Drift Imager

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The downstream dispersal of aquatic organisms in riverine systems is a frequent event mediated by the current. Both micro (< 0.5 mm) and macro (>0.5 mm) organisms will drift. The latter is mainly composed of benthic invertebrates and the early development stages of fish (e.g. eggs and larvae). The drift of benthic invertebrates can be a process of individual micro-habitat selection to optimize resource acquisition, a population density-dependent self-thinning process. Moreover, invertebrate drift is a key indicator of the productive capacity of riverine habitats to support focal point drift-foraging specialized guilds of fish. The drift of eggs or larval fish is an integral component of the life cycle of many riverine species and provides the means to disperse from spawning or nursery habitats to suitable rearing habitats. Although a natural process, invertebrate and fish drift can happen accidentally because of an increase in flow discharge due to spates or hydropeaking events. Studies on the natural and accidental drift of riverine organisms have traditionally been carried out using drift nets. Various intrinsic factors associated with this sampling method (e.g. limited soaking time, high sampling effort, sampling triage) limits the spatial and temporal applicability of net-based approaches. The Riverine Organism Drift Imager (RODI) is under development to overcome this bottleneck, leveraging recent developments in imaging and machine learning technologies. Recently, we have successfully completed initial laboratory trials, in which the ability of various components (e.g. light, camera and objectives) to image invertebrates flowing through a transparent tube up to speeds of 2 m/s was tested. These results allowed us to continue with building the prototype of RODI. Upon completion, RODI will allow for near-continuous, non-invasive monitoring with unparalleled temporal resolution. Machine learning techniques will provide taxonomic information, although probably at a lower level of resolution compared to net-based sampling, making the two methods complementary.