



Effects of hydropeaking on the hyporheos of an Alpine stream: preliminary results

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In Alpine regions, intermittent hydropower generation has high economical relevance in comparison with other power generation sources. This, however, is often counter-balanced by a strong impact on the ecological integrity of aquatic ecosystems. Flow regime alteration due to hydropeaking is associated with sharp water level fluctuations, which occur when the water is discharged into the river from the power plant, and have cascading effects on the ecological integrity of riverine ecosystems. The impact of such releases on the hyporheic zone depends on the size distribution of the released sediments, the rate of release (gradual and steady versus pulse releases), bed porosity and roughness, and the tractive force of water. If too little sediment is released, or the water is too fast, then sediment scouring and depletion may occur. If the opposite occurs, existing hyporheic zones can be colmated and smothered, or there could be too little water to properly sort the sediments, globally leading to clogging.

From June 2006, the Adige Water Authority has promoted and co-funded the multi-disciplinary research project REPORT which focuses on the hydrological, physical, chemical and biological effects of the rate of increase and decrease of flow during hydropeaking. Among the other objectives, the project aims to investigate the effects of hydropeaking on clogging of river beds, and the subsequent effects on the hyporheic fauna by quantifying:

- the extent of faunal exchanges between surface- and ground-water;
- the use of hyporheic habitats by surface water organisms as a refuge from the adverse effects of hydropeaking.

The study area is located on the Noce Bianco (3^o order stream, Trentino, Italy), a

main tributary to the Adige River (the second longest river of Italy), which is largely responsible for hydropеaking in the Adige watershed, and where a typical alpine impoundment hydropower plant operates.

Faunal samples of occasional and permanent hyporheos have been collected using a Bou-Rouch pump seasonally from September 2006 upstream of the hydropower station, immediately downstream from the water release point, and 10 km downstream from the plant. In autumn 2006, an experimental release corresponding to “ideal” conditions (no release for some hours, followed by a release at maximum turbines capacity in order to reach the hydropеaking in the shortest time interval) was arranged with the managing agency (ENEL). Hyporheic fauna samples were collected before and during the release of water; drifting invertebrates were collected with drift nets before and during the same event and the benthic community assessed by kick sampling. Similarly, environmental (water temperature, conductivity, turbidity, hardness, nutrients) and hydraulic (water level, flow) parameters were measured before and during the hydropеaking event.

The abundance and diversity of the faunal samples showed how:

- The hydropеaking-impacted stations had reduce faunal abundances, typical hyporheic organisms were very rare, probably due to the reduced space available (clogging);
- Benthic organisms tended to use the hyporheic habitat as refuge to avoid the catastrophic drift induced by the hydropеaking wave, with different strategies for different faunal groups.