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Dispersal dynamic of the zoobenthos within the bed sediments of an alpine stream

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The aim of the study was to investigate the dispersal dynamic of the zoobenthos within the bed sediments of an alpine brook. The study was done in the Oberer Seebach, a flashy second-order stream in the northern limestone formation of the alps between the Mittersee (766 ma.s.l) and the Untersee (608 m a. s. l) near Lunz/See, Lower Austria.

Accordingly to the objective, a new sampler, the cage-pipe, was specially designed. It allows sampling in different sediment depths as well as in all horizontal directions without disturbance. The interstitial waterflow and the transport of fine sediment through the interstices was therefore recorded together with the animals. Twelve cage-pipes were exposed in three topographically different areas. The cages (mean volume 150 cm^3) - filled with substrate - were exposed for three days in the cage-pipes. Thus, 6780 samples were taken from February 1988 to February 1989.

The mean waterflow through the interstices is 0.2 l(min, which is equal to a mean velocity of0.4 cm/s. The waterflow near the sediment surface is about ten times higher than in the deeper layers. The highest mean interstitial flow was recorded under the right bank, and the lowest under the gravel bank. The highest fluctuation was observed under the gravel bank during the flooding period in spring. On the other hand the mean waterflow decreases with sediment depth. Different types of vertical profiles of waterflow could be distinguished; some types are particulary related to different areas and/or discharge situations.

The mean quantity of interstitial sediment, which was carried into the cages, is about 170 mg/3d for the fine (< 1 mm) and 200 mg/3d for the coarse fraction)> 1 mm). The highest mean quantity was measured under the gravel bank, while the lowest quantity was observed under the right bank. The amount of transported interstitial sediment increases with sediment depth. In -70 cm the amount is about ten times higher than on the sediment surface. The quantity of interstital sediment was not correlated to discharge.

To descrbe the dispersal activity of the zoobenthos, an activity rate was calculated by deviding the relative abundance of different taxa in cage-pipe-samples by the relative abundance in freeze-core-samples. Higher activity rates are more likely for larger animals

according to their locomotion efficiency. The high activity rate found in Bythinella austriaca FRAUENFELD (Hydrobiidae, Gastropoda) is suggested to be a consequence of a particular grazing behaviour. Generally, the activity rate increases with sediment depth. Low activity rates of all taxa were found in the sediment layers of highest abundance. Consequently, dispersal activity tends to accumulate the fauna in the preferred sediment depths.

The activity rate is influenced by the interstitial waterflow as well as by the transport of fine interstitial sediment. Decreasing waterflow and/or increasing amount of transported fine sediment cause increasing activity rates. This correlation explains the depth boundary of the bedsediment. Higher activity increases the probability to leave a certain area. Because of the worsening conditions respect of waterflow and interstitial sediment below – 50 cm, high activity rates keep the emphasis of the abundance of the epigaeic fauna above 50 cm.

Over the whole sampling period no significant differences were found between the four immigration directions, upstream, downstream, laterally left and right. Observed preferences of directions are restricted in time and space and superimposed by the total recorded immigration activity. These findings remarkably contrast the idea of compensatory upstream movement. If a compensation mechanism based on upstream movement had existed, dominating upstream movement would have been found at least for homotopic species. Since the benthic community is not endagered by drift, the hypothesis of a colonization cycle is rejected within the conditions of the Oberer Seebach.

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