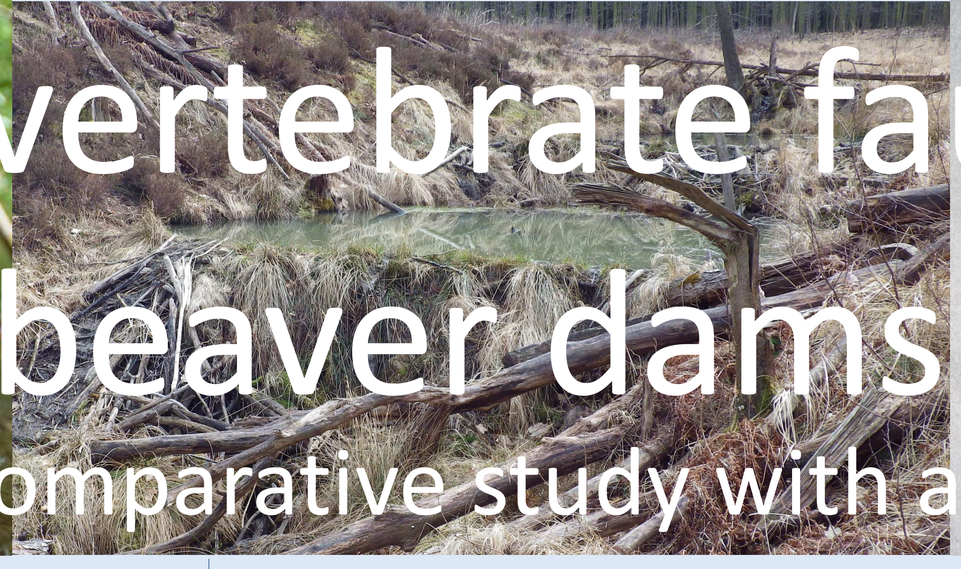

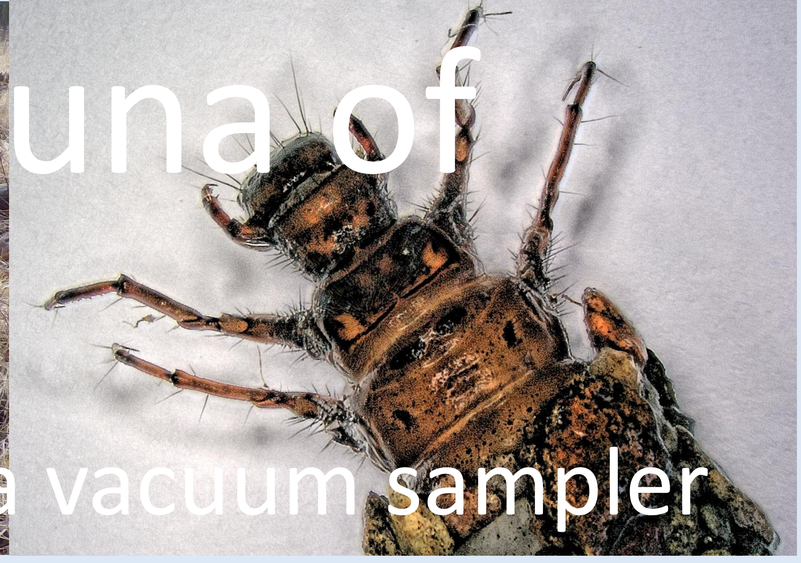

The invertebrate fauna of beaver dams

First results of a comparative study with a vacuum sampler

Foto: Christian und Bettina Kutschenreiter

Introduction

Beaver dams are influential structures in streams, since they are able to create multi-habitat-patterns who influence stream ecosystems in many ways. These beaver generic landscapes are described and explored by many scholars. Nevertheless, we are still lacking data on the faunal composition of beaver dams themselves, because common water ecological sampling methods do not allow for encompassing investigations. Thus, it is hardly surprising that the present data regarding this topic is comprised of two studies worldwide (Clifford et al. 1993; Rolauffs et al. 2001).

For a new approach in surveying this well-hidden species community within beaver dams the author constructed a vacuum sampler. As part of a PhD project, this sampler was used for the investigation of 16 beaver dams in the spring of 2018.

In consideration of the different successional stages of beaver dams, eight active (Fig. 5) and eight abandoned (Fig. 6) beaver dams where sampled in two streams of the Hürtgenwald/Nordeifel (Fig. 1).

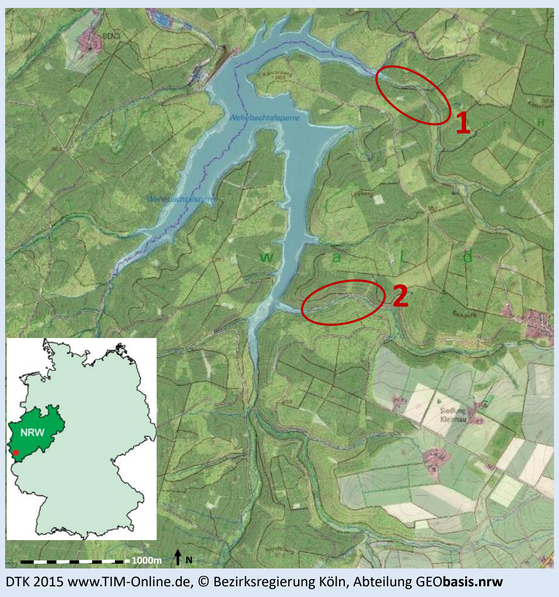

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Figure 1: Investigation area
Two streams (Thönbach[1] and Weberbach[2]) in the basin of the Wehebachtalsperre (Hürtgenwald, Nordeifel)

Technology

The vacuum sampler consists of the three basic components (Figures 2, 3):

1. An airtight-locking collecting vessel ("ash filter", manufactured by Kärcher) with two connection points on the lid in which the suction to intake organisms is generated.

2. A battery operated wet-/dry vacuum (28 V, manufactured by Milwaukee), which generates the vacuum in the collecting vessel.

3. A transparent PVC-hose (Ø 3 cm, length: 3 m). The transparency of the hose allows for a visual inspection of the soaked material during the sampling process. Additionally, the smooth hose wall prevents the possibility of trapping organisms in the hose.

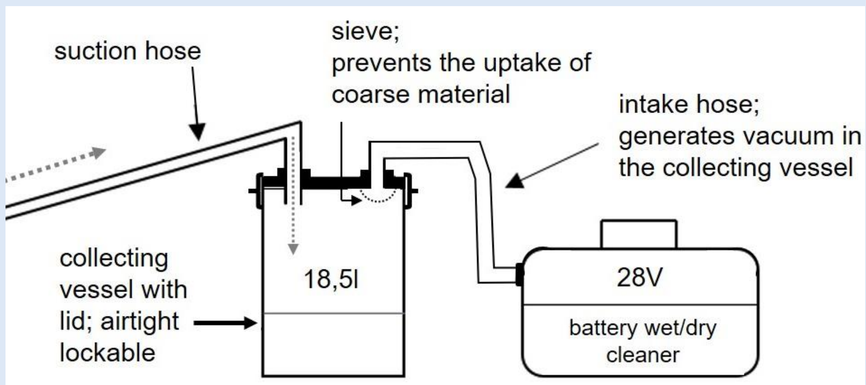


Figure 2: Functional structure of the vacuum sampler

Figure 3: Picture of the vacuum sampler in the field

Method

Nine different areas on the beaver dam were defined (Fig. 4) and each of them was sampled for three minutes. The distribution of the sample areas cover the top and the base area of a beaver dam, as well as the middle and the fringe sections. The dam crest was treated as one sample point and includes middle and fringe areas. With a simple definition, active and abandoned beaver dams where distinguished:

1. Active beaver dams are showing signs of active maintenance. Fresh branches are installed and there is a fresh and intact mud layer on the crest.
2. Abandoned beaver dams are lacking these signs. Here, both the mud layer and fresh installed branches are lacking.

Figure 4: Distribution of the sampling points.

Figure 5: Active beaver dam

Figure 6: Abandoned beaver dam

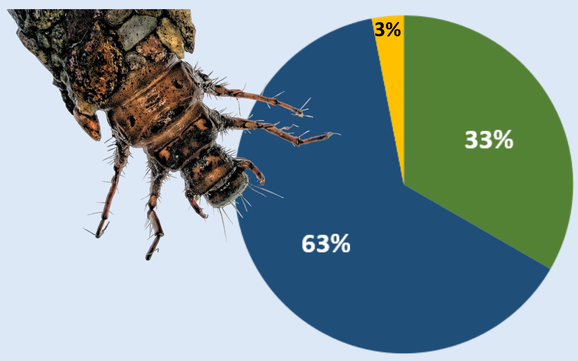
Initial results

In order to gain a first insight, the fauna of the order Trichoptera and Coleoptera of one active and one abandoned beaver dam was chosen. The Trichoptera community mainly consists of typical representatives of low order streams of the low mountain area such as *Agapetus fuscipes, Halesus radiatus, Diplectrona felix and Philopotamus montanus*. On the contrary, the Coleoptera fauna was more diverse and includes species that indicate running waters (*Elodes minuta*), still waters (*Hydrochus angustatus*), terrestrial (*Octotemnus glabriculus*) and transitional (*Dianous coerulescens*) habitats.

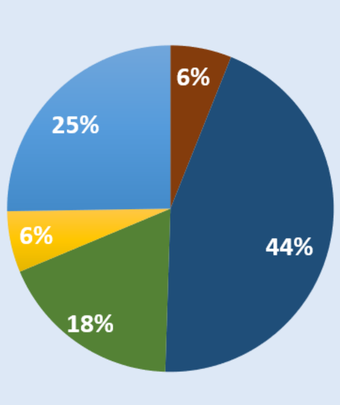
Table 1: Number of species and individuals for the order Trichoptera and Coleoptera

	Trichoptera	Coleoptera
Total number of species	**27**	**15**
Number of species in the active beaver dam	15	6
Number of species in the abandoned beaver dam	23	13
Total number of Individuals	**625**	**919**
Number of individuals in the active beaver dam	346	823
Number of individuals in the abandoned beaver dam	279	96

Current preference of 27 Trichoptera species in both dam categories



Current preference of 15 Coleoptera species in both dam categories



Dianous coerulescens

Rheophil | Limnophil | Indifferent | Transitional | Terrestrial

Noteable is the beetle *Dianous coerulescens* which the author already observed during a pilot study in Bavaria. This observation represented the first record of this species in a beaver dam. *Dianous coerulescens* is known as a species living in the splash zone of waterfalls (fauna hygropetrica) or weirs and mill wheels. *Dianous coerulescens* was observed in every of the 16 investigated beaver dams in the northern Eifel!

Discussion and Outlook

The results show a diverse community of the Trichoptera and Coleoptera fauna, with typical representatives of species from low order streams of the low mountain area. Further data analyses will reveal if the valued differences regarding the number of species and individuals of both dam categories is a general trend. Still, the taxa of 14 more dams need to be analyzed before the data can be evaluated and discussed. In 2019, the investigation will be continued and will include other beaver induced habitats such as food caches, and secondary streams that evolve through the anabranching effect of the beaver dams. Also, stream reaches without beaver dams will be investigated as a reference. The goal of the PhD project is to assess the influence of beaver dams in streams of low mountain areas. This will enhance the predictability of the influence of european beavers on stream ecosystems in which this native key stone species will expand in the next decades.

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