

Cold-stenothermic spring fauna in mountainous headwaters of the National Park Kellerwald-Edersee in Germany

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Since 2002, spring habitat investigations and mapping campaigns were executed in the National Park Kellerwald-Edersee (Central Germany, Federal State of Hesse). 693 springs are currently assessed within an ongoing ecological-faunistic inventory with additional data about physico-chemical properties and hydrological conditions of the spring water (e.g. pH value, electrical conductivity, water temperature and flow velocity). 1029 taxa are found so far, whereby, springs are investigated as a land-water ecotone where aquatic and terrestrial fauna was detected. Data continuously stored in the data base of the Hesse Biospeleological Register (Reiss, Steiner, Zaenker 2009) coupled with a Geographical Information System. Spring habitats can be characterized as mostly undisturbed, oligotrophic and near natural structured with heterogenous microhabitat conditions. Nearly 90 percentages of the springs are helocrenic habitats with a diffuse and low discharge, temporally dried out, but staying under wet substrate conditions. 85 percentages of the springs occurring under forests without any cultivation or forest management use. Coarse mineral substrate dominating slightly, followed up by fine mineral substrate types. Most common mineral related microhabitats are microlithal (coarse gravel) and psammopel (fine silt). The high microhabitat diversity depends mostly to forest correlated organic substrate types. Here, most dominant are CPOM (leaf litter) and woody debris (deadwood). Substrate richness is significantly correlated to preferential fauna colonization of different, partly rare or endangered species. Undisturbed conditions are also characterized by relative cold stenothermy and oligotrophy. The latter is indicated by a very low electrical conductivity (Mean: $236 \mu\text{S} \cdot \text{cm}^{-1}$). The mean annual water temperature is 9° Celsius with low amplitudes of max. and min. values. Spring water is nearly neutral and there is no identifiable trend in acidification (mean pH value of 6,9). Due to nearly unaffected ecohydrological properties, in particular: relative consistently cold water temperature with low amplitudes (cold stenothermy), mostly low flow velocity and an intermittent discharge regime a very unique and specific adapted spring fauna composition for the German low mountain ranges can be characterized. Cold stenothermic and spring related species are very frequent in relative occurrence and abundance. We analyzed a map based and representative distribution for the entire large-scale protected area of the National Park Kellerwald-Edersee according to *Bythinella dunkeri* (spring snail), *Crenobia alpina* (planarian), *Crunoecia irrorata* (caddisfly) and *Niphargus schellenbergi* (groundwater amphipod). We discuss the potential of ecohydrological research on possible climate change predictions and consequences on the distribution of cold stenothermic and spring dwelling species within the special context of research goals in National Parks. Here, an idea of a new approach for an ecohydrological assessment by indicating cold stenothermic taxa is given as an outlook.

References

Reiss, M., Steiner, H. & S. Zaenker (2009): The Biospeleological Register of the Hesse Federation for Cave and Karst Research (Germany). Cave and Karst Science 35(1), pp.25-34.