education, since many bachelor, master and phD students can be involved in those projects. Last, but not least, such a public private partnership creates personal and intellectual continuity – probably the main profit for all partners.
In this presentation I'ld like to share our experiences of five years of groundwater ecological work in close association between university and privat consultancy.

31-O Towards a new typology and quality scoring of UK groundwater habitats.

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Although groundwater studies are in their infancy, the factors governing the distribution of subterranean ecosystems are known to mainly relate to geology and the provision of nutrients and oxygen in a heterogenous environment. A satisfactory answer to the question whether geology controls the distribution of groundwater ecosystems is mainly hindered by the broad habitat typologies used in analyses (e.g. karstic, porous, fractured). Many researchers have also called for the incorporation of quantitative hydrogeological and hydrochemical data into habitat frameworks. The primary aim of this paper was to determine a higher resolution typology of geological habitats (geo-habitats) based on lithological and hydrogeological information. To do so, ArcGIS 10.1 was used to group all geological units in England and Wales (1:50k scale) into 11 'geo-habitats'. The study then wanted to determine the hydrogeological (e.g. transmissivity) and hydrochemical (e.g. DO, DOC, Ca, NO3) characteristics of each of these habitats, using data from previously published studies. Furthermore, a quantitative method to assess overall groundwater habitat quality is introduced. The lithological grouping method resulted in 11 distinct geo-habitats, which had significantly different hydrogeological and –chemical conditions. Overall, karstic and porous geo-habitats are characterised by higher concentrations of nutrients, while DO was highest in fractured geo-habitats. Interestingly, all geo-habitats have patches with high and low quality, which may have important implications for ecosystems. Taking into account subterranean heterogeneity, the habitat quality scores indicate that the highest species abundance and diversity can be expected in karstic and porous geo-habitats, whereas fractured habitats should be characterised by depauperate ecosystems. Extensive areas of England and Wales are covered by low-quality fractured habitats, increasing the relative importance of high-quality habitats for groundwater biodiversity. The distribution patterns show that karstic geo-habitats are organised in north-south trending, connected belts, which most likely facilitates faunal dispersal. Using a more detailed framework enables researchers to better analyse the extent of geological control on groundwater ecosystems and species habitat preferences. As a next step the current framework should be set into context of faunal distributions to test its explanatory power.

31-O Trapped in the web of water: springs are island-like ecosystems for the stygobiotic meiofauna.

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Groundwater-fed springs may be considered as island-like systems for obligate aquatic invertebrates that have low capability to cross the surrounding terrestrial landscape and to successfully disperse across the surface hydrological network with little thermal or hydrological buffering. However, springs can be interconnected by contiguous aquifers which may allow dispersal via groundwater pathways. In this research we analysed the copepod meiofauna of 30 springs in the Central Apennines (Italy) to investigate the impact of geographical proximity in determining variations in species richness, overall inter-spring meiofaunal similarity (measured using the Sørensen index, ßsor), pure turnover (measured by Simpson index, ßsim), inter-site nestedness (ßnest = ßsor-ßsim) and matrix nestedness (measured using NODF, spectral radius, temperature and discrepancy). As possible correlates of species richness we considered spring area, discharge and elevation. We conducted separate analyses for the total number of species, and for stygobiotic (obligate groundwater dwellers), non-stygobiotic, cold stenotherm and non-cold-stenotherm species separately. A multimodel selection procedure based on AIC values was applied to select best fit models using both ordinary least squares regressions and autoregressive models that took into account the spatial component (spring latitude and longitude). In general, explicit consideration of spatial correlations reduced the importance of predictors of overall species richness, non-cold stenotherm species (both negatively affected by elevation), cold-stenotherm species, and non-stygobiotic species, but increased the importance of area for the stygobiotic species. We detected significant nested patterns in all

cases, except for the stygobites. Inter-spring distances were positively correlated (Mantel tests) with ßsor and ßnest (but not with ßsim) for the entire data set and for non-stygobiotic, cold-stenotherm and non-cold stenotherm species. In the case of stygobites, inter-spring geographical distances were marginally correlated with ßsor and no correlation was found for ßsim and ßnest. These results suggest that stygobites have a low capability to move even through the aquifers and tend to be mainly confined to the springs where they drifted out and trapped by spring-bed sediments.

31-O Punctual but not minor – contribution of high alpine spring dwelling diatom and nematode communities to biodiversity in glacierized catchments.

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Springs represent important groundwater dependent habitats for freshwater organisms that in turn exert important functions for these systems. Springs are often described as relatively restricted in both space and variability of flow and hydrochemical conditions. But different landscapes and climatic conditions can form highly different spring types, which might be subdivided into highly distinct substrate patches. In this context it seems so that alpine springs above tree line are less well known than their lowland counterparts particularly with regard to their inhabitants of various substrates. In addition, for springs in general, some spring dwellers are better known (i.e. algae, crustaceans, insects and mollusks) than others. Among the latter are for example free-living nematodes that are considered to be of importance to freshwater habitats.
In this regard, we investigated high alpine springs (1880 - 2450 m a.s.l.) in the Eastern alps (Austria) for their diatom and nematode communities. Springs were situated within an area of the penninic Tauern Window consisting mainly of carbonmica-schists of the so called „Schieferhülle“. The aquifers can be characterized as low permeable fractured and only slightly karstified. Groundwater flow is bound to foliation, layer boundaries or small karst conduits. Thus, springs are comparably small and scattered. Mean residence times of the spring water within the aquifers are supposed to reach at least several months or even some years.
15 springs were characterised by basic abiotic parameters (water temperature, conductivity, oxygen content, pH). Epiphytic (partly lacking at some springs; diatoms, nematodes), epilithic (diatoms) and benthic (nematodes) communities are described in terms of α-diversity per spring and per habitat, ß-diversity as descriptor of species turn over between and among respective sites and habitats, and diatom/nematode specific indices (e.g. trophy, feeding type, maturity).
With 167 taxa, diatom overall species richness was distinctly higher than that of nematodes. In general, abundant diatom taxa were *Achnanthidium minutissimum*, *Diatoma mesodon*, *Achnanthidium pyrenaicum* and *Diatoma hyemalis*. Diatom and nematode richness ranged from 20 (epilithic) to 40 (epiphytic) and from 6 (benthic) to 25 (epiphytic) species, respectively. In particular diatom indices were all coherent with the near-pristine, oligotrophic characteristic of these high altitude Alpine sites. Diatom species richness and Trophic Index were slightly higher for epiphytic than epilithic biota. For nematodes no clear preponderance of high species number for either epilithic or epiphytic substrates between respective sites has been observed.
The partly considerable differences that emerged between springs and habitats are discussed with respect to their additive biodiversity value for high alpine, glacially influenced catchments (γ - diversity).

31-O Groundwater warming and threshold values - which temperatures can groundwater invertebrates stand?

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Temperature is one of the most important factors in ecosystems and has a strong influence on metabolism and behavior of organisms. Unlike epigean aquatic habitats, groundwater ecosystems are characterized by constant temperatures. Reflecting the annual mean of the air temperature, groundwater temperatures in Central Europe are thus generally low and vary between 10 and 12 °C. During the last two millions of years, annual mean temperatures didn’t exceed 14 °C. The general expectation is that stygofauna has adapted to these conditions. Groundwater invertebrates are therefore considered to be cold-stenothermous with a critical temperature of 14 °C.