sources including chemical fertilizers and animal wastes applied to croplands using the statistical approaches of PCA. In this respect, over 100 groundwater samples were collected from pre-existing wells, situated mainly in rural agricultural area from Romania, between September and November 2014. Sampling was performed in according with EPA Guide for Ground-Water Sampling. Dissolved cations including Ca, Mg, Cr, Fe, and Mn, were analysed using an iCAP™ Q ICP-MS. Dissolved anions (i.e. SO42-, NO3- and Cl-) were determined using ion chromatography. Alkalinity of groundwater samples was measured by titration method to quantify the carbonate species (mainly HCO3-). Quality control (QC) of chemical analyses was achieved by analyzing blanks duplicate samples as well as by calculating charge-balance error (CBE). A statistical analysis of quantitative source apportionment for the chemical investigated elements was performed. The chemical parameters were interpreted with Principal Component Analysis (PCA). Pearson correlation coefficient matrix using a Student's t distribution in MatLab is used to determine the linear dependence between the analysed parameters. Schoeller diagram achieved with the RockWare AqQA program is presented for analysed ions (SO42-, HCO3-, Cl-, Ca2+, Mg2+) behaviour interpretation.

31-P   Development of a full-life cycle and reproduction bioassay with the freshwater cyclopoid

Eucyclops serrulatus.   *Marco Cifoni* [1] *- Diana M.P. Galassi* [1] *- Cecilia Faraloni* [2] *- Barbara Fiasca* [1] *- Tiziana Di Lorenzo* [2]

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Groundwater dependent ecosystems (GDEs) worldwide are endangered by frequent and intense, large-scale disturbances due to chemical stressors. Toxicity tests are essential tools for biomonitoring and risk evaluation of chemical substances released in these environments.

Due to their dominance in aquatic environments, crustacean species (especially the Copepoda, that is the most abundant meiofaunal group in GDEs) are emphasized as target taxa in acute and chronic ecotoxicological bioassays. However, the attention on copepods in ecotoxicology had concerned almost exclusively marine or brackish species up to now. Only few ecotoxicological full life-cycle bioassays with freshwater copepods are available due to laboratory handling. Aside the requirement of experience and technical proficiency in handling these small-sized organisms, problems arise in selecting the most appropriate diet and temperature that assure at least 70% of survival in the control (test acceptability criteria) and minimize the developmental rates. Moreover, much relevance must be addressed to set up the conditions that maximize the fertility and reproduction of the target species.

This study was aimed at developing a full-life cycle (egg to adult to egg) and reproduction bioassay with the freshwater cyclopoid *Eucyclops serrulatus*. To this end, the effect of four different diets (two microalgae species: *Chlorella sorokiniana, Scenedesmus dimorphus*; a mix of the two algae and a prokaryotic diet) on the development and reproduction of E. serrulatus was investigated in two different culturing cells namely, glass vials (2 mL) and 96-polystyrene microwell plates (0.2 mL), at two diverse temperatures (18° and 25°C). Culturing cell water renewal and feeding were done every 3 days. We selected E. serrulatus since it is one of the most abundant epigean cyclopoids in GDEs and fulfils the requirements to be a good indicator such as a wide geographic distribution, resistance to manipulation, simple maintenance in the laboratory, short development, short life-span and high fecundity.

Survival (%) and developmental endpoints (days) were assessed monitoring the growth of newly hatched nauplii (1152), aged 24 hours, individually. Reproduction endpoints were assessed as: number of clutches, number of eggs, number of hatched nauplii/clutch. Estimations of population growth rates (λ) were modelled by a Lefkovich matrix. Survival, developmental and reproduction endpoints, as well as λs, were compared across treatments using permutational analyses of variance (PERMANOVA). Post hoc t-tests were applied when appropriate.

The results of this study showed that the bioassay performed with the algal mix diet, in 2-mL glass vials and at 25°C, assures the highest survival rates (88%), the shortest developmental rate (25 days), the maximum lifetime reproductive success and the highest population growth rate.

31-P   Earthquake-related changes in species niche overlaps in a karstic springwater copepod

community.   *Barbara Fiasca* [1] *- Alessia Di Cioccio* [1] *- Tiziana Di Lorenzo* [2] *- Silvano Porfirio* [1] *- Diana M.P. Galassi* [1] *- Simone Fattorini* [1]

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We analysed niche overlap (Pianka's α index based on species abundance across sites) in the subsurface copepod community sampled in the springs of the River Tirino (Central Italy) at the boundary of the Gran Sasso aquifer (central Italy) in low-discharge (1997), high-discharge (2005), and post-seismic, very high-discharge (2012) hydrological years. The aquifer was hit by a 6.3-Mw earthquake in April 2009. To assess if the year-specific mean niche overlap values differed from those expected by chance, we compared the observed values with the expected means obtained from simulated null-assemblages using the RA3 and RA2 algorithms. We considered both pairwise overlap (α) and species mean overlap (αsp, calculated as the average of the pairwise α values of all couples in which a certain species was involved), analysed with repeated measures ANOVAs. For the analysis of pairwise α values, we grouped species pairs into three types: 1 pairs in which both species were stygobites, 2 pairs in which one species was a stygobite, and 3 pairs in which both species were not stygobites. We divided species into stygobites and non-stygobites also for the analysis of αsp. Deviations of niche overlap values from null expectations suggest that the stygobiotic community in 1997 was influenced by interspecific interactions. Results for 2005 were inconclusive, because the two algorithms produced contrasting results, but results for post-seismic 2012 clearly indicated an unusually large mean niche overlap, especially for non-stygobiotic species, which is suggestive of strong interspecific interactions. Thus, environmental changes responsible for the increase of mean species niche overlaps affected stygobites and non-stygobites in a similar way. However, when species pairs were analysed, we found significant differences also between 1997 and 2005. These results suggest that differences in mean aquifer discharge may generate strong temporal fluctuations in species abundance at the spring outlets, with changes in the niche overlap between species pairs (α) even when the mean interaction of a species with the others taken together (αsp) remains similar. This is what happened between 1997 and 2005, but the 2012 scenario was different, because mean species niche overlaps increased significantly in 2012. This suggests that this increase cannot be due to natural changes in species abundances driven by differences in aquifer discharge, but could be associated with the exceptional high-discharge of the Gran Sasso karstic aquifer triggered by the 2009 earthquake. An analysis of co-occurrences revealed that increases in niche overlap were paralleled by a reduction in species segregation. Our investigation suggests that the increase in niche overlap may be related to an increase in interspecific interactions in turn determined by changes in species fine-scale distribution among subsurface spring microhabitats

31-P   Preliminary data on microbiological and biotic monitoring in Romanian show caves.   *Ruxandra Nastase-Bucur [1] - Silviu Bercea [1] - Marius Kenesz [1] - Oana Teodora Moldovan [1]*

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The present study is part of an ongoing project, CAVEMONITOR, including five Romanian show caves; the main idea is that no protocols were yet compiled for monitoring cave fauna for longer periods of time (two years). Aquatic invertebrates were collected from percolating water, while terrestrial invertebrates were monitored in situ. Also, a novelty element is that we have taken in consideration the microbial monitoring both of the pools water and cave air, correlated with a series of abiotic features of the caves, such as temperature, air relative humidity, number of particles in the air. Two of the investigated caves, Ursilor Cave and Muierilor Cave, were studied on a monthly basis, other two caves, Meziad Cave and Polovragi Cave, once in two months and, finally, one cave, Fundata Cave, on a semestrial basis. For fauna we installed 1-2 stations/cave. Cave air microbiological monitoring consisted in a various number of stations along the touristic path, but also 1-2 stations in the non-touristic part of the caves. Pools water was microbiologically monitored in 1-2 stations in each cave. We used RIDA@COUNT plates exposed either to cave air or water as a very easy method and counted the number of microorganisms for five days at 24h interval. Five types of mediums were used: total counts of bacteria, Yeast&Molds, *E.coli*/Coliforms and Enteriobacteracaea. We will present the preliminary results of the first year of biological and microbiological monitoring, with indications on seasonal variation in fauna abundance, as well as differences in microbial counts between stations of the same cave and between the five caves.

31-P   Groundwater fauna and how to teach in biology lessons.   *Julia Domberger [1] - Sylke Hilberg [2] - Ursula Eisendle-Flöckner [3]*

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