PLENARY LECTURES

Dynamic properties of aquatic microbial communities: finding appropriate scales and drivers

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Recent findings have highlighted the dynamic properties of microbial community composition and biogeochemical processes at temporal scales ranging from ephemeral disturbances to long-term gradual changes driven by climate and other environmental change. Here I will use examples from our ongoing research on the ecology of bacterial communities in lakes and brackish waters to illustrate the dynamic properties of microbial community composition, individual microbial populations and microbial-driven biogeochemical processes. I will discuss the main drivers behind observed temporal changes and point to the relevance of studying microbial communities over contrasting timescales in order to gain a more comprehensive understanding of microbial communities and their role in the ecosystem.

Persistent pollutants and the understanding of freshwater pelagic food webs

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During the last decade there has been a renewed interest for food webs due to new tools for both empirical and theoretical studies, such as stable isotope tracers and network numerical analysis. In addition, the two views, traditionally developed in parallel and which focussed respectively on species interactions and energy and matter flows, are merging because of the influence of metabolic and stoichiometric theories. Structure of food web links, modularity, likelihood of trophic cascades, robustness to perturbations, network assembly processes, phylogenetic vs. functional constraints, nestedness, role of the individual's heterogeneity, role of behaviour, seasonality in the strength fo links, temperature effects on food web, individuals vs species food web roles are topics of much interest among others. However, there is still a gap between the dynamic study of trophic models and the static empirical descriptions. Tracers of linkage, metabolic and interaction processes may contribute to reduce the gap. In this presentation I will show some of the potential of persistent pollutants (i.e., metals and organic pollutants) as tracers of some of these processes.

Persistent pollutants bioaccumulate in organisms and, as a consequence, their concentrations increase with the age of the individuals and the trophic level of the species. Fortunately for our interest in understanding food webs, pollutants differ in their physical and chemical properties and local availability. Therefore, we find food web basal resources with distinct pollutant signatures within a lake or a river, and these differences may propagate to higher trophic levels. Primary and secondary consumers biomagnify and biotransform the pollutants uptaken by feeding in different ways and exchange them with the environment according their particular live traits and pollutant characteristics. This general variability of pollutants in food webs is the base for their use as tracers. I will present some examples where persistent pollutants were useful for getting insight into trophic links, metabolic temperature effects, allelopathic interactions, revealing microenvironments, and individuals role in food webs to support the general argument.

Microbial communities in large tropical lakes: response to environmental changes

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Research in the past few years, undertaken in a context of environmental change, allowed us to study phytoplankton and other microorganisms in two large African lakes, Lake Tanganyika and Lake Kivu. Starting from the earlier studies in these lakes, we attempted to assess significant changes in microbial communities related to environmental changes. Despite some controversy still remains, L. Tanganyika has been affected by global warming, which has resulted in decrease in primary productivity, with probable consequences on fisheries. Low primary production in recent years and changes in phytoplankton composition tend to confirm significant, climate-driven, changes in this large lake. Moreover, changes in food web structure may have affected trophic efficiency, to an extent which remains to be evaluated. The story of Lake Kivu is somewhat different: here, the main change was the introduction of a Tanganyika sardine, with the objective of developing the fisheries. Earlier accounts considered this introduction as a catastrophe, resulting in the disappearance of the main grazer and a subsequent probable collapse of the fishery as a result of decreased trophic efficiency. Today's research may lead to different views, although investigations in the food web and the lake ecological functioning remain to be done to substantiate the hypotheses. We stress that microbes, both autotrophic and heterotrophic, may play a very large role in determining productivity and nutrient cycling in these large lakes. We also stress that East African Great Lakes, despite their importance for local populations, are still understudied, and may require more attention from the scientific community worldwide.

Responses of litter decomposition and decomposers to global environmental change

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Environmental changes, many of them man-made, proceed at unprecedented rates at scales ranging from local to global. What are the consequences for the functioning of freshwater ecosystem? I will address this question by focusing on litter decomposition as a critical process in many aquatic environments. Specifically, I will present results from field experiments that explore how three factors of global environmental change may affect decomposition rates in streams and freshwater marshes. Results suggest that sustained nutrient enrichment alters the control of decomposition rate by litter quality; that changes in atmospheric CO2 levels through their influence on litter quality vary with litter type and have significant, although relatively small, effects on decomposition; and that warming accelerates decomposition regardless of whether leaf-shredding detritivores are prevented from feeding on litter, or both microbes and detritivores are present. While some of the apparent mechanisms underlying the observed effects are straightforward, others are unexpected, underscoring the need for manipulative field experiments in the pursuit to forecast ecosystem consequences of future environmental change.

Identifying freshwater organisms using molecular biological techniques - a way to replace traditional monitoring methods?

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Long-term monitoring programmes are an important method to describe and help to understand changes in aquatic ecosystems and the identification and enumeration of its phyto- and zooplankton are integral to most such programmes. The identification of these microscopic organisms is often time-consuming, however, and requires substantial taxonomical skills that are a declining resource, while the demand to analyse samples has grown with the implementation of the European Water Framework Directive and the need to understand changes in aquatic systems caused by climate change. As a result, novel techniques are required that can help to monitor aquatic organisms in a fast and cost-effective manner with a high throughput of samples, and molecular biological methods might be such a detection system.
This talk will give an overview of molecular techniques that have the potential to identify aquatic organisms, e.g. DNA fingerprinting techniques, taxon-specific molecular probes and Polymerase Chain Reaction (PCR) primers coupled with real-time PCR amplification, Fluorescence In Situ Hybridization (FISH) or DNA microarrays, DNA barcoding, etc. The requirements, advantages and disadvantages of these various methods will be discussed as will the question of whether molecular monitoring systems will be able to replace our current traditional monitoring methods.

Shallow lake dynamics in a climate change perspective

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How global warming affect the water clarity of shallow lakes and the consequences for lake restoration is debated intensively. Using data from temperature nutrient experiments in flow-through pond systems studied during 5 years, 18 years time-series from Danish lakes in recovery from eutrophication and cross-comparison of data from lakes from Greenland to Turkey we provide strong evidence for an increase in eutrophication due to climate change in oligo- to hypertrophic lakes, though the climate effects are largest at the higher nutrient loadings. This count for both northern lakes subjected to increasing precipitation and nutrient loading in the future and to arid lakes despite lower loading in the future. Eutrophication is enhanced by better growth conditions for cyanobacteria and dinoflagellates, both potential toxic, and by an increased number of small fish, more annual fish cohorts, more omnivorous feeding by fish and less specialist piscivory. This, in turn, results in lower grazing on phytoplankton due to higher fish predation on zooplankton. Moreover, shallow lakes will have prolonged growth seasons with a higher risk of long-lasting algal blooms, higher risk of being temporally or permanently summer stratified and at places have higher risk of being dominated by floating plant communities and the capacity of submerged macrophytes to maintain high water clarity will decline. The effects of global warming need to be taken into consideration by lake managers when setting future targets for critical loading, as these may well have to be adjusted in the future. They also have important effects on “best management praxis” for restoring lakes following nutrient loading reduction, and such effects will be highlighted.

Europe-wide perceptions of water quality and sensitivities to global change

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We need to distinguish between the technical and sanitary water quality on one hand if water is considered as a substance or resource for various uses, and ecological water quality on the other hand, which is a broad concept where the undisturbed structure and functioning of aquatic ecosystems are the main assessment criteria.
The protection and quality of Europe's water is generally improving. The annual bathing water report in 2009 presented by the European Commission and the European Environment Agency revealed that bathing water quality shows a long-term upward trend. Still there is little or no progress in combating some types of pollution or overuse of water in certain regions, both issues that are linked particularly to agriculture. Climate change adds a new pressure to aquatic ecosystems. A climate-related warming of lakes and rivers has been observed over recent decades. As a result, freshwater ecosystems have shown changes in species composition, organism abundance, productivity and phenology. Prolonged thermal stratification of lakes decreases nutrient concentration in surface layer, and prolongs depletion of oxygen in deeper layers. Due to strong anthropogenic impacts not related to climate change, there is no clear evidence yet for consistent climate-related trends in other water quality parameters in lakes, rivers and groundwater. However, if river flows are reduced as a consequence of less rainfall, their ability to dilute effluent is also reduced leading to increased pathogen or chemical loading. In semi-arid and arid areas, climate change is likely to increase salinization of shallow groundwater due to increased evapo-transpiration. More frequent and intense torrential rainfalls increase the risk of soil erosion, siltation of lakes and reservoirs, urban flash floods and related sewer overflows. In coastal areas, rising sea levels may have negative effects on storm-water drainage and sewage disposal and increase the potential for the intrusion of saline water into coastal aquifers, thus adversely affecting groundwater resources. The results to date indicate that the impact of climate change on water quality cannot be generalized and should be assessed on a case by case basis.

Thermal landscapes in alpine river corridors

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Temperature is a key characteristic of aquatic ecosystems that is gaining scientific and managerial relevance as maximum temperatures increase worldwide. Temperature is indeed a key factor that determines ecosystem processes and biodiversity patterns in aquatic and terrestrial landscapes. However, few studies have studied the temporal and spatial variation of temperature in aquatic ecosystems and none of those included the terrestrial component of aquatic ecosystems in the analysis.
Temporal series of thermal images of 2 entire floodplains in Italy and Switzerland were used to characterize the spatial and temporal variation of temperature in the aquatic and terrestrial components of river corridors. Thus, river corridor thermal images were obtained with a ground-based IR camera every 15 min, with a resolution of 1.5 x 1.5 m in systems of ca 2 x 1km. Furthermore, the vertical component was also included in the analysis by measuring temperature at different depths in the floodplains terrestrial habitats.
The analysis of the temperature temporal variation of the entire river corridors allowed the differentiation of distinct spatial thermal patches. These spatial patches could be mainly differentiated by the thermal daily amplitude and the maximum rates of cooling or heating (rates of temporal temperature change). Accordingly, three main groups of spatial patches could be distinguished: thermal neutral, thermal amplifiers and thermal buffers.
The coupling between terrestrial and aquatic components in river corridors and the different thermal behavior of different patches allows the consideration of landscape management within river corridors to mitigate the harmful effects of extreme water temperatures in aquatic ecosystems during heatwaves or prolonged low-flow episodes. Management strategies might involve the enhancement of thermal buffer patches at the river segment scale, or at the habitat scale as providers of cold-water refugia.

Environmental factors affecting geosmin and 2-methylisoborneol production in Sapanca Lake, Türkiye

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Geosmin (trans-1,10-dimethyl-trans-9-decalol) and MIB (2-methylisoborneol) are the two major causes of earthy-musty tastes and odours in water. These volatile organic compounds (VOCs) have odour threshold concentrations at ng/L levels. They can be detected at very low concentrations. In the present study, vertical distribution of cyanobacterial abundance, selected physical and chemical parameters and Geosmin and MIB concentrations were measured in the meso-oligotrophic freshwater lake, Sapanca, where the water is used for drinking water for city of Sakarya. Concentrations of geosmin ranged 0.82 ng/L to 14.31 ng/L and MIB ranged 0.16 ng/L to 27.33 ng/L. It is found that nutrient levels, temperature and light availability are correlated with the Geosmin and MIB production.

The "age effect" on the zooplankton community structure

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The knowledge and forecast of how many species can be hosted in each kind of environment has always attracted the attention of many scientists. A lot of limnological studies tried to relate species diversity to different factors (lake morphology, geographical position, chemical/physical characteristics, biotic interactions). Many researches have already investigated on the influence of time on a single environment using long temporal data series. But few studies have considered the role of time, in terms of age of the system, comparing zooplankton community of different lakes.
In the Southern Italian mainland there are several dams (most of which were built in different years of the last century) that offer the chance to evaluate a possible "age effect" on the zooplankton community structure. 16 lakes were selected for this study in addition to 5 natural lakes in the same area. They were sampled in 4 different times (1 time every 3 months at least) each time with 3 replicates per lake. 98 species of zooplankton (4 Calanoida, 15 Cyclopoida, 22 Cladocera, 57 Rotifera) were identified from all samples with two new records for Italian Fauna. Only the youngest lakes appeared suitable for non-indigenous species. First of all this research represents a remarkable contribute to knowledge on fauna of an unknown geographic area. The multivariate analysis of quantitative data on species abundances revealed a significant main effect of the age factor on the zooplankton community structure in a brief temporal scale (between 3 and 80 years of lake's age). The youngest lakes show a massive presence of Rotifera both in terms of species and abundances, and few Crustacean filterers. With the increase of the age of systems (between 20 and 50 years) also predators/gatherers and cladocerans filterers abundances increase; on the contrary Rotifera decrease. A progressive increase of Crustacean species was recorded until the age of 50 years together with repartition and diversity indexes; but there is a reduction of the same values towards the 80 years.

Algal productivity and diversity in shallow lakes: the role of nutrients

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Based on the analysis of the different physical and biological compartments of the ecosystem, a 3 year study is carried out on shallow lakes used for producing fish in Dombes (France). The objective is to define how agricultural practices rule biodiversity and the ecological functioning of these ecosystems. For understanding the links between productivity and biodiversity of primary producers in shallow lakes, we need to determine firstly the relationship between potential productivity and phytoplankton communities and second how nutrients and microphytes rule macrophyte communities. The aim of the present talk is to focus on the links between nutrient content of the lakes and productivity, diversity and taxonomic composition of phytoplankton communities. The phytoplankton communities and chlorophyll-a were sampled weekly from mid-April to mid-October in 2007 (30 sites) and 2008 (35 others). Water and substrate nutrient content (P and N) were also measured simultaneously, weekly for water, two times for substrate (in spring and in autumn). Chlorophyll-a is a better indicator of trophic level than nutrient parameters of water, which are immediately consumed by phytoplankton. The plankton biomass (ie realized productivity) allowed discriminating several types of shallow lakes, from those with a low productivity during all the sampling period to those having a very high productivity all the time. The total generic richness was not correlated with productivity. For a same total generic richness, shallow lakes with a low productivity have differed from shallow lakes with high productivity in terms of community composition. The chlorophyceae and especially the cyanobacteria were responsible of the higher productivities observed. This work put in evidence that i) a functional typology of phytoplanktonic communities could be elaborated based on the trophic level of shallow lakes, estimated by the chlorophyll-a concentration, ii) the composition of phytoplankton communities influences the algal productivity regardless of the specific richness. In the future of this research work, we will analyse the richness and biodiversity of macrophyte communities and the links with microphyte communities and trophic level.

Genetic differentiation of aquatic insects in the Carpathians: how different can aquatic and terrestrial organisms be?

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The identification of population genetic structures of species became a major concern in the protection and management of natural habitats in Europe. Large numbers of studies focus on terrestrial organisms. In comparison, there are only a handful of works investigating the genetic diversity of mountain freshwater organisms. These studies suggest that species inhabiting aquatic habitats of the European mountains may have very different history compared to terrestrial organisms. We demonstrate this by case studies of three model species (a cranefly, a caddisfly and a stonefly) employing population genetic and traditional morphometric methods. Differentiation among neighboring populations of the model species may be very strong and ancient despite the reduced geographic distances. This is in contrast with the patterns found in many terrestrial species, where existing population genetic structures seem to be much younger. The findings suggest very old speciation events which usually outdate the last glaciation. The levels of differentiation observed within the three model species suggest that other wide-spread aquatic taxa may present strong cryptic taxonomic structures. The results of the case studies underline the importance of mountain aquatic habitats in the preservation of genetic diversity. They also emphasize the role of the Carpathian Mountains as speciation centers of aquatic organisms. More studies focusing on the population genetic structures of aquatic species are necessary for a better understanding of the processes shaping the formation and present-day distribution of European species.

Role of nutrients and climate on functioning of the Turkish shallow lake

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Food web structure and lake functioning of shallow lakes in the North Temperate Zone are sensitive to nutrient level. The ecology of semi-arid to arid shallow Mediterranean lakes experiencing large variations in hydraulic loading and drought, is, however, less well understood. We studied effects of changes in climate and climate variability on eutrophication by sampling 26 Anatolian shallow Turkish lakes covering semi-arid to arid Mediterranean climate zones from the very north (410 52´ N, 270 58´E) to the south (370 06´N 290 36´E). The lakes were sampled ones in late summer for nutrients, phytoplankton, zooplankton and fish, macrophytes coverage and PVI% using a standardized snap-shot sampling protocol developed as part of the EU project Eurolimpacs. Furthermore, to determine the food web structure, the entire food web of four of these lakes were also analysed for carbon (δ13C) and nitrogen (δ15N) stable isotopes. Several-fold higher concentrations of chlorophyll-a and major cyanobacteria blooming occurred during the very dry years 2006 and 2007 compared to more normal years, such as 2001. Concentrations of TP and TN were significantly higher in southern lakes than that of northern ones. Furthermore, for the same level of phosphorus significantly higher concentration of chl-a was recorded in the souther lakes. In nutrient rich turbid lakes, submerged macrophyte coverage declined and the fish became dominated by small-sized omnivorous cyprinids. The results indicate truncated food web structure: The population of potential piscivorous perch (*Perca fluvialities*) were dominated by small size classes and had δ15N levels similiar to omnivorous roach and rudd in these summer warm lakes. The change in functioning of these lakes along the latitudual gradient will be discussed, focussing on both top-down and bottom-up control.

Phosphorus flux by bottom macroinvertebrates in lakes

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Trophic status of freshwater ecosystems increases due to high input of nutrients and organic matter. Nutrient cycling may be defined as the transformation of nutrients from one chemical form to another, and/or the flux of nutrients between organisms, habitats, or ecosystems. Nutrients can be released from sediments through a variety of mechanisms, including the activities of benthic animals. The study focuses on evaluation of benthic invertebrates role in phosphorus cycling by bioturbation, vertical migration, feeding/defecation and excretion. Digestion and subsequent excretion of nutrients by benthic invertebrates play a large role in regulating nutrient release from sediments. The spatial and interspecific variation in phosphorus flux by benthic invertebrates in model ecosystem (Lake Krivoe, Northern Karelia, Russia) showed that five invertebrate taxa such as amphipods, aquatic insects, molluscs, oligochaetes and chironomids constituting 70-100% in total benthic biomass released main part of phosphorus (dissolved inorganic P). The mass-specific excretion rates (P excreted mg dry mass^{-1} hour^{-1}) by the benthic invertebrates measured experimentally (by the standard molybdenum blue technique) support the important contribution of benthic invertebrate excretion to total P flux from sediments to water. Benthic invertebrates constituted above 20 % of total concentration of phosphorus in Lake Krivoe and reached the level of P cycling rate by zooplankton and ½ to the rate by phytoplankton. The phosphorus regeneration is most intensive during summer in littoral area of the lake as a result of maximum biomass consentration. Amphipods tended to show higher excretion rate than oligochaetes and chironomids. In coastal zone the total P flux by invertebrate at least 7 times higher than in the deeper zone (>3 m). Amphipods constituted the greatest fraction (40-90%) to total phosphorus flux due to their high excretion rate and high abundance in the lake. Differences in flux rates among sites are mainly results of variation in taxonomical composition and invertebrate biomass.

Testing the evolution of increased competitive ability hypothesis with two generalist herbivores on two exotic macrophyte species

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Aquatic herbivory remains poorly known, particularly in the context of introduced exotic species. Our goal was to test the palatability of two genetically separated populations of two close north-american macrophyte species, *Elodea canadensis* and *Elodea nuttallii* differing in their history of introduction. We collected the populations in two French locations: in Alsace, where *E. nuttallii* is established since the early 1970' and *E. canadensis* since the 19th century, and in Rhône where *E. nuttallii* is established since 1995 and *E. canadensis* since the 19th century. To test the palatability, we chose two generalist herbivores with different feeding habits, *Lymnaea stagnalis* (scraper) and *Gammarus roeseli* (shredder). The Evolution of Increased Competitive Ability (EICA) hypothesis stated that, within a newly introduced plant population, the more vigorous genotypes would be selected since natural enemies are absent and native herbivore are not adapted to recognize the plant as suitable resource. During the integration of the plant in the food web, genotypes with high defensive potential against native herbivores would be favoured. Our hypothesis is that the palatability of the less-defended newly introduced populations will be higher than the well-defended older population for a given plant species in no choice experiments. For each population of each Elodea species, we conducted laboratory experiments to assess the daily consumption rate of the macrophytes by the two herbivores. Dry matter content (integrative factor of the palatability), C:N ratio (nutritive qualities) and total phenolic content (chemical defences) were also measured. *Lymnaea stagnalis* highly consumed Rhône population of *E. nuttallii* whereas the other populations were weakly consumed. *Gammarus roeseli* highly consumed *E. nuttallii* whatever the origin of the population while *E. canadensis* was poorly consumed. Overall consumption rate of *G. roeseli* is higher than *L. stagnalis*. *E. canadensis* had a higher dry matter content than *E. nuttallii* and there was no difference of C:N ratio between the macrophytes. We observed an application of the EICA theory with generalist herbivores in our study. Indeed, *L. stagnalis* highly consumed recently introduced populations, and *G. roeseli* preferred recently introduced species. We also pointed out the importance of the feeding behaviour of the herbivores.

Approaching real complexity: toxic impact of a mixture of diuron and propranolol on fluvial biofilm communities

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The efforts done in water resource management have allowed to reduce concentrations of priority pollutants in rivers; however an increasing number of chemicals can now be found at low concentrations in the aquatic environment. Where agricultural lands are next to urban areas, it is not rare to find known chemicals (herbicides, pesticides, etc) in mixture with emerging pollutants (pharmaceuticals, personal care products or nanoparticules). To approach such a complexity it is essential to assess mixtures toxicity on multi-species systems rather than assessing toxicity of single substances on single species. Within aquatic ecosystems, fluvial biofilm communities have been shown to be good indicators of toxicity and so represent a pertinent multi-species system for detection of the effects of toxicants. From this perspective, acute toxicity of the herbicide diuron (photosynthesis inhibitor) and of the β-blocker propranolol (pharmaceutical product included in the list of emerging pollutants) towards fluvial biofilms has been assessed, both singles substances were tested as well as an equitoxic mixture. To detect direct and indirect effects on the "health" status of biofilms, a set of biomarkers has been developed: photosynthetic efficiency and capacity, antioxidant enzyme activities and leucine-aminopeptidase extracellular enzyme activity were therefore measured. For both propranolol and diuron acute toxicity tests, photosynthetic efficiency was the most sensitive biomarker, diuron was found to be more toxic (EC50=8.11 µg/L) than propranolol (EC50= 3.1 mg/L). Mixture toxicity followed the Concentration Addition concept, then even if propranolol is present at very low concentration in a river, it would participate in the photosynthesis inhibition due to a mixture of diuron-propranolol. Moreover, this result suggests that propranolol may have a similar mode of action as diuron. Acute exposure tests did not lead to any significant effects on leucine-aminopeptidase extracellular enzyme activity whereas exposure to the mixture led to indirect effects. Leucine-aminopeptidase extracellular enzyme activity increased with mixture gradient, reaching 140% of control activity at the highest concentration tested. This study illustrates that even at low concentrations emerging pollutants can participate to the overall toxicity; moreover this study emphasizes the importance of a biomarker approach which allowed to point out the indirect effects due to mixture exposure.

Composition and abundance of meiofauna and macroinvertebrate in mountain streams of northern Italy

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Ecological research in stream systems have traditionally focused on macroinvertebrates, while scarce attention has been paid to meiofauna, in spite of its fundamental role in lotic food webs. The present study was carried out in upland streams in the Parma River catchment (Northern Apennines, Italy). Sampling activities were carried out seasonally in 2008 in five sites characterised by different levels of environmental stress. Macro- and meiofauna were collected simultaneously using a modified Surber sampler equipped with two nets (mesh size of 255 and 50 µm, respectively). A total of 65490 individuals belonging to 15 major taxonomic groups were gathered. On the whole, over 90% of individuals belonged to meiofauna, which outnumbered macrofauna by 4 to 39 times in different seasons. The highest meiofaunal abundances were observed in spring, when early development stages of macroinvertebrates accounted for over 98% of the total individuals. Meiofauna was overwhelmingly dominantin a sampling station affected by frequent hydropeaking, where macroinvertebrates were probably tore off by water flow and smaller animals could use sediment interstices as a refuge. Our results confirm that meiofauna is a major component in invertebrate assemblages of mountain rivers in terms of both numbers and biomass of the river, and that it must be considered in ecological study to better understand the functioning of these lotic systems.

River (dis) continuity in the Italian Alps

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The EU Water Framework Directive 2000/60 has set the ambitious target of achieving good ecological status for all Europe's rivers by 2015. The use of water resources is growingly shifting towards restoration of ecological health in order to optimize the benefits and goods that rivers deliver to other ecosystems and to the benefit of human society.
The two main causes of unsatisfactory water quality in Europe are nutrient enrichment and physical interventions including river regulation, comprising the construction of dams and reservoirs for hydropower production and channelization. Such measures may result in a disconnection of the rivers from floodplains and groundwater, with negative impacts on the structure and dynamics of the biological communities and on the flow of organic and inorganic matter. Among the most relevant causes of river fragmentation in the Alps is hydropower production, by means of water abstraction, dammed reservoirs and hydropeaking below power plants. Results from a specific project in the Adige River system are presented, highlighting the main problems and possible emendations in the headwaters and in the main stem of Italy's second longest river. Discharge patterns were analysed at multiple time scales and water temperature recorded for several years at different levels of the Adige system. Effects on the biota were studied for the benthic and hyporheic communities. Furthermore we present an overview of the level of fragmentation of the other Italian Alpine river systems.

The seasonality of nutrient dynamics in two parts of large shallow Lake Peipsi

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This study aimed to compare the seasonal variability of nutrient content in two differing parts of L. Peipsi, the fourth largest European lake. We used long time series (1997-2008) of nutrient concentrations in L. Peipsi sensu stricto (mean depth 8.3 m, area 2611 km2) and L. Lämmijärv (mean depth 2.5 m, area 236 km2). The water samples were taken on a monthly basis from March till November. The survey revealed great within-year variation in the nutrient concentrations. Total phosphorus (TP) concentrations displayed a marked seasonal pattern in both L. Peipsi sensu stricto and L. Lämmijärv with lower levels in winter when compared to summer and autumn (the highest concentrations in August). In late summer, TP was high due to internal loading. Biouptake and active transport of phosphorus in the cells of cyanobacteria (e.g. *Gloeotrichia echinulata*) from bottom to the surface water seems to be the main reason for TP increase in water during cyanobacterial blooms. The proportion of soluble reactive phosphorus (SRP) is the highest in the winter and early spring and the lowest in May-June. The seasonal dynamics of total nitrogen (TN) was similar to that of DIN in L. Peipsi s.s. showing the highest levels in early spring with a following decline in concentrations and maintaining low levels throughout summer and autumn. A higher level than in L. Peipsi s.s characterized the dynamics of DIN in L. Lämmijärv in early spring. The dynamics of TN in L. Lämmijärv displayed a more pronounced seasonal distribution with an increase in concentration from July and reaching the summer peak (in August) and the autumn peak (in November). Si displayed no overall marked seasonal patterns. The study revealed that intra-annual variability in nutrients is high and tends to be greater in L. Lämmijärv, in the shallowest part of L. Peipsi. The seasonal variability of nutrients in lake parts is affected by local factors such as lake morphology, internal loading of nutrients from sediments as well as local external sources of nutrients.

Contribution to geographic distribution of *Kahlilembus attenuatus* (Smith, 1897) *(ciliophora: hymenostomata)*

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Studies related to ciliate diversity in Turkey is scarse. In this study a hymenostome ciliate, *Kahlilembus attenuatus*, was recorded from a small pond at Central Anatolia. The population was investigated by using glass slides as an artificial subtrate. Compared with sampling ciliates from natural substrates such as stones and macrophytes, collection using glass slides seems to be nondestructive and enables to make in vivo observation of the whole slide. When considered the former studies, *Kahlilembus attenuatus* was mostly investigated in Europe by conventional methods and founded at grassland, meadow and forest soils, additionally anaerobic sediments. There were very few records from inland waters. In Turkish population, its morphology was investigated using live observation and impregnation methods. Illustration of the specimens were based on free sketchs and/or micrograph prints. Measurements and counts were performed on randomly selected individuals by IM 50 image manager system and Q-win programme. The species is recorded for the first time from Turkey. Therefore the features are given in details below: Size in vivo 50-80 X 7-15 µm, flexible body slenderly fusiform with a conspicuous tiny posterior part. Spherical macronucleus 7-11µm, almost centrally located and has one micronucleus. Contractile vacuole subequatorially placed; approximately 9-10 somatic ciliary rows. Oral part composed of 3 adoral membranes and the cilia of the membranes seem to be as a brush in live observation. Mostly found at littoral zone.

Limnological characterization of 16 lentic water bodies belonging to the territory of the 'Fundación San Ignacio Del Huinay', Xth region de Los Lagos, Chile

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Huinay is a territory covering about 34,000 hectares in the Commune of Hualaihué (Xth region of Chile) and belonging to the San Ignacio del Huinay Foundation (HF). Its location (42° 22´ S; 72° 24´ W) corresponds to the bio-geographical Province of Magallanes and specifically to an area which is highly representative of the continental Northern Patagonia.
Based on an aerial prospecting conducted during 2008, we identified more than 30 water bodies of different size and morphology, occurring at different heights and in different landscapes. Among these, 16 water bodies were selected to be studied at the end of the summer, in February 2009.
In each water body, longitudinal and transversal bathymetric profiles were generated from echo-sound data. Vertical profiles of some physical and chemical variables (temperature, oxygen concentration, pH, conductivity and chlorophyll-a concentration) were measured, from surface to bottom, at the deepest section of the lakes using a multiparameter probe model YSI 6920 V2. Furthermore, water samples were collected at different depths for further chemical analysis *ex situ*. Qualitative (bottom-surface) and integrated (40-0 m) zooplankton and phytoplankton samples were then collected with appropriate plankton nets. Water transparency was measured as Secchi Depth.
The results of this study are considered of bio-geographic importance for the Chilean territory given that both Huinay and the bordering territories completely lack of any limnological information. Eventually, data from the lakes of Huinay, will allow us to contrast various hypotheses about the distribution of plankton assemblages and species richness formerly reported to change according to latitude increases along the Chilean territory and the Patagonian area specifically.

The value of irrigation ponds, as compared with natural habitats, for the conservation of endangered species: the case of the Iberian toothcarp (*Aphanius iberus*, cuvier & valenciennes, 1846)

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The Iberian toothcarp (*Aphanius iberus*) is an endangered endemic fish discontinuously distributed along the Mediterranean coast of Spain. This species thrive mainly in littoral lagoons and traditional irrigation facilities. A study carried out 20 years ago on the distribution of this species in the lower Adra River (Almería) concluded that was present in pools of the river, the littoral lagoons (albuferas) at the mouth, and in irrigation channels and ponds of the surrounding greenhouse crops. Since then, the natural habitats has experienced intense degradation, particularly the albuferas due to eutrophication promoted by agricultural nutrient lixiviates. On the other hand, many irrigation ponds are treated with biocides, mainly copper sulphate. This study is aimed to evaluate the current state of this distribution, by comparing habitat quality, population density and physiological condition of individuals between natural and artificial habitats. The results show that the species was virtually absent in the river, except for 3 individuals found in a temporary pool of a lower reach strongly impaired by water impoundment. The highest mean density was obtained in irrigation ponds with submerged aquatic vegetation (SAV), followed by ponds without SAV and irrigation channels. Mean fish density in the albuferas was by far the lowest. The high eutrophication of this habitat seems to be a deleterious factor for the conservation of this species, despite it is recognized as tolerant to this type of impact. Enzymatic analyses revealed significant differences of the oxidative status of individuals between natural and artificial habitats. The organisms from the albuferas showed the lowest activity values for all anti-oxidative enzymes analysed followed by ponds with SAV, and the highest values were obtained in ponds without SAV. Perhaps the predominance of anoxia or hypoxia in the albuferas might promote a satisfactory oxidative status but, on the contrary, lower growth, survival and reproduction rates as a consequence of a lower individual activity compared to irrigation ponds.

How phytoplankon biomass and functional groups react to environmental constraints? A comparison in two different mediterranean ponds

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Grouping organisms into functional groups represents a way to better understand how the environmental constrains act on these organisms through the analysis of peculiar features, usually morphological, shared by the set of species. Since groups (Coda) include species which react to environmental constraints with an analogous response, this approach was adopted to compare the structure and the biomass of phytoplankton assemblages in two different Mediterranean ponds, one temporary and the other permanent.
A phytoplankton survey, carried out monthly in the brackish and shallow lake Biviere di Gela in 2005-2007, revealed a deep transformation in the structure of its phytoplankton assemblage as compared with similar data collected in 1987- 1988. A progressive shift from a clear water macrophyte-dominated state to a turbid cyanobacteria-dominated one was observed together with a transition from a given set of Coda to another one. In addition to the effect driven by the climate, an alteration of the original composition was induced by an anthropogenic-mediated decrease in the electrical conductivity of the water that most likely opened the way to a toxic algae, *Prymnesium parvum*, whose allelopathic and toxic glycosides further contributed to the transformation of the lake biota. While Biviere di Gela shows a discrete influence shaped both by human and climatic impact, the second study site, Gorgo di Rebuttone, seems to be more stable in its principal habitat characteristics.

Periphyton changes over 20 years of chemical recovery of Lago d'Orta, Italy

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Lago d'Orta, a large Italian subalpine lake has a long history of industrial pollution by acid, ammonia, and metals. A whole-lake liming treatment in 1989-1990 led to a gradual increase in pH (from 4.4 to 7) and a concomitant decline in ammonia (from 2.5 to 0.05 mg/L) and metal concentrations (copper: from 35 to 2 µg/L). To study the effects of this chemical recovery on periphyton, we sampled epilithic algae at two sites from 1987, in the pre-liming period, through 2007 when the lake approached chemical equilibrium. Chemical variables collected in the littoral near the periphyton samples followed the same temporal trends observed in the open water. Chlorophytes, the dominant algae in the pre-liming period, progressively waned after the calcium carbonate addition. Filamentous cyanobacteria (Phormidium and Oscillatoria) increased to become dominant in cell density in the years following the liming, which were characterized by chemical instability. However, because of their small size, they never represented > 40% of total biovolume. Diatom importance gradually increased to reach up to 80 % of the total biovolume in the most recent years. There was a clear shift in the diatom taxonomic composition over the study period. Acidophilous *Pinnularia subcapitata* and metal-tolerant *Achnanthes minutissima* were dominant before liming. With the progressive increase in pH and decline in metal concentrations, there was successively the dominance of *Synedra tenera* and *Cymbella microcephala* in the transition period and of circumneutral *Navicula cryptocephala* and *N. radiosa* in the recent period. Species richness increased during the chemical recovery. The shift from chlorophytes to diatoms observed in the periphyton closely mirrored the changes documented in the phytoplankton. After more than 80 years of anthropogenic contamination, Lago d'Orta is reverting to the diatom-dominated assemblages recorded in past documents and observed in nearby unpolluted lakes.

Anthropogenic pressures exerted on watersheds control the dominance of cyanobacteria in West African small reservoirs

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In arid countries, reservoirs creation is a frequent strategy to alleviate water shortage. Burkina Faso is the West African country with the highest density of small reservoirs (≈ 1500). After the dramatic droughts experienced during the seventies and eighties, the retention of surface water in numerous and scattered reservoirs has been a priority for this country. These water masses constitute today a network of productive and intensively exploited hot spots. Sound interrogations regarding the evolution of health status of water masses, with the potential impacts on the goods and services they contribute to provide, are now seriously increasing. To document this issue, two large scale field campaigns has been organized in order to describe the limnological characteristics and to assess the cyanobacterial biomass in several ensembles of reservoirs of this country. Simultaneously, a tailor made GIS has been developed to characterize watersheds and quantify anthropogenic pressures at different relevant scales. It appeared that (1) cyanobacterial dominance was as a key attribute for a large number of reservoirs; one of the studied basins, the Nakambé (former White Volta) was particularly involved. It existed (2) a strong association between cyanobacterial dominance and the combination of two "anthropogenic factors" related to the basin's characteristics: population densities at the watershed scale on the one hand, and land use within a 3 km radius buffer zone defined around reservoirs, on the other hand. (3) Both factors appeared also strongly associated to the concentrations of inorganic nutrients and to the particulate loading in water columns. These relationships are interpreted as the impacts of watershed usages on the nutrient and particles fluxes: both create a favourable environment for the development and for the persistence of cyanobacterial communities. These observations may advocate for integrated approaches linking water masses properties and basin's characteristics, (1) for a better assessment of their actual status, (2) to provide scientific baselines open to forecasting or eventually to remediation. By now, in Burkina Faso, more than 10% of the populations (> 1.5 M. of inhabitants) depend on surface waters for their daily consumption.

Littoral benthic macroinvertebrates of alpine lakes (Tatra Mts, Slovakia) in altitudinal gradient: a basis for climate change assessment

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Littoral benthic macroinvertebrates in three alpine lakes in the High Tatra Mountains (Slovakia) located at different elevations: 2157, 1940 (alpine zone) and 1725 m (sub-alpine zone) were studied. Sites were selected in order to emphasize differences in their thermal regimes. Model of gradient lakes was used to find whether the changes in faunistic composition of lakes are sufficient for indication of climatic events, and identify species/taxa that could be used for monitoring purposes and climate change assessment. Quantitative macroinvertebrate samples from 2000 and 2001 were supplemented by measurement of lake surface water temperature and POM amount. Both LSWT and POM changed markedly along altitude showing increasing pattern with decreasing elevation; duration of ice-cover decreased with decreasing elevation. 60 mostly oligostenothermic macroinvertebrate species/taxa from 10 higher taxonomic groups were collected. Results showed trends of several biotic metrics with altitude: clear increases in the number of species/taxa, genera, and higher taxonomic groups, as an increase in the Shannon-Wiener diversity with decreasing altitude. Evenness and density did not show any similar patterns with altitude. Gatherers of detrital particles dominated in trophic structure; no distinct changes in proportion of FFG along altitudinal gradient were recognized. While the permanent fauna of the lakes was rather uniform, temporal fauna reflected the position of the lakes on altitudinal/temperature gradient. DCA confirmed that differences in aquatic insect fauna composition best reflect the altitudinal gradient, thus it can be used as good indicator of temperature changes. Chironomids, followed by caddisflies, could be considered as flagship groups in the assessment of climatic changes in mountain lake areas. Results suggest that while permanent benthic macroinvertebrate fauna will remain more or less stable, aquatic insects will be strongly affected through an increase in the number of more thermophilic species recently present at lower altitudes. These colonizers will increase biodiversity of alpine lakes, however the extinction of cold stenothermal species will lead to impoverishment of native benthic macroinvertebrate fauna. An indirect impact on benthic macroinvertebrates through food sources could be assumed and changes in trophic structure of the littoral assemblages can be expected.
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Methodology to evaluate the effects of sediment contaminants on macroinvertebrates communities - an example from a torrential system on two storages of fier - Annecy (France)

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Understanding freshwater ecosystems is essential for their conservation and restoration. Within these systems, the sediment is of major concern due to its role in pollutant accumulation and the inherent risk of the remobilisation of those contaminants after either natural or anthropic perturbation. Such impacted sediments have an important functional role through, for instance, their effect on the associated macroinvertebrate assemblages. Lentic systems and in particular sediments have to date have not been well studied especially in context of metal contamination. Thus within storage systems there is currently a need for the development of a contextual framework of biomonitoring tools for contaminated sediments. The objective of this study is to assess the impact of contaminated sediments by comparing environment data, macroinvertebrate taxonomic composition, functional diversity, and other biological and ecological traits from sediments with varying degrees of contamination and scales (reach and patch-scales). Most of research work doesn't discriminate between the effects of physical and chemical perturbation linked to sediment. With our work, we look for to distinguish these effects on macroinvertebrates communities for instance, in identifying physical effects. Initial results suggest that at the reach scale, diversity indices fail to discriminate the impact of metals on these macroinvertebrate communities but that measures of functional diversity might be more useful. Our study also indicates that the impact of contamination cannot simply be detected from environmental data or by the analysis of faunistic structure. We thus question the relevance of using multimetric tools in freshwater studies and suggest that the application of multivariate approaches to functional diversity may be more effective in discriminating the effects of metal contaminants.

Determining stream biodivertsity conservation priorities on private land in the Waikato Region of New Zealand

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Identifying catchments or subcatchments that add most value to rivers that are already protected provides some unique challenges, given the network arrangement of rivers, their longitudinal connectivity, and the need to maintain access for migratory fish. The Waikato Region in New Zealand's central North Island contains a diverse range of stream and river types that currently have high levels of protection at high- and mid-elevations (≥75% of river length protected) but very low levels of protection in the low-gradient lowlands (3%). We developed a novel use of the conservation planning software, ZONATION, to identify a representative set of riverine planning units based on balanced protection across habitat groups from an environmental classification of rivers and streams, designed to maximise discrimination of their biological characteristics. Planning units, based on 3rd-order sub-catchments, were chosen to optimise biodiversity protection on private land, taking account of the existing protected areas network, connectivity constraints such as dams, and existing anthropogenic pressures (mainly agricultural land use). Planning units occurring predominantly in protected areas (>80% protected) were treated as already having adequate protection. Selection focussed on identifying a complementary set of less protected units that provided maximum biodiversity return for least cost, which was assumed proportional to planning unit extent; costs for partially protected units were decreased in proportion to their degree of protection. High value units identified using this approach were mostly located at lower elevations, had at least some degree of existing protection, were in moderate to good condition, and/or provided improved connectivity between the sea and fully protected planning units. These regional-scale environmental rankings were coupled with national stream and river rankings, predictions of probability of occurrence for selected threatened species, and predicted fish and macroinvertebrate diversity to identify a ranked list of sites that would optimise biodiversity protection in the Waikato Region. This approach has potential to be broadly applicable to other regions where predictive models and GIS resource and pressure layers are available for analysis.

Impacts of restoration of connectivity in Rhine side channels

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During the two past centuaries, the Rhine floodplain was submitted to important and succesive engineering civil works (rectification, channelization,...) that severely damaged floodplain functionality, e.g. through disconnecting side-arm channels. For several years, restoration works were carried on in order to create permanent connections between those former side channels and the main course. Impact of those restoration works was assessed through the recovery of aquatic vegetation functionality. Established aquatic vegetation, propagule bank content (i.e. propagules lying in the sediment and forming the latent biodiversity), including sexual and vegetative propagules, relationships between above-ground vegetation and propagule bank were studied in four restored side channels and two reference channels (target) that were never disconnected from the main course. Propagule bank was estimated in spring and automn by the seedling emergence method adapted for aquatic communities. An additional sampling was also carried out in spring in order to estimate the amount of species resprouting from rhizoms. Conservation status of the habitat types, propagule bank content, upstream / downstream vegetation patterns and links between each type of propagules in the soil and the established vegetation were analysed according to the date when the restoration occured. Thanks to those results, temporal patterns of (1) natural habitat types reconstruction, (2) propagule bank reconstruction, and (3) recovering of the vegetation dynamics following connectivity recovering could be emphasized. Invasibility of such newly connected sites was also studied through the survey of the invasive species *Elodea nuttallii*.

Effects of burial on leaf litter processing in a woodland stream

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Leaf litter constitutes the major source of matter and energy to woodland stream ecosystems. Aquatic hyphomycetes play a pivotal role in the decomposition of allochthonous organic matter, and thereby in the functioning of woodland streams. A substantial part of leaf litter entering running waters may however be buried into the stream bed as a consequence of flood events and sediment movement. While decomposition of leaf litter in surface waters is relatively well known, its fate when incorporated into river sediement remains poorly documented. For instance, the role of aquatic hyphomycetes in this compartment is virtually unkown. In the present study, we tested the hypotheses that, due to physical and chemical conditions prevailing in the hyporheic zone, (1) burial affects the diversity of aquatic hyphomycete assemblages associated with decaying leaves, (2) the existence of constraints in the small interstices of gravelly sediments restricts accessibility to buried organic matter for the largest shredders, (3) such modifications of decomposer assemblages induce an alteration of leaf litter processing. Alder leaf mass loss, the composition of leaf-associated fungal and macroinvertebrate assemblages, fungal and macroinvertebrate biomass, and microbial activity were followed in a 2nd-order stream located in southern France. Leaf litter was subject to three treatments: buried into sediment (depth: 15-20 cm), buried after 2-weeks exposure at the sediment surface, and exposure at the sediment surface for all the experiment. In parallel, we examined effects of burial on potential food value of leaves with regard to nitrogen and carbon contents. Our findings indicate that burial within the substrate reduce litter processing rate by limiting biotic access to leaves. As a result, the hyporheic zone may be an important region of organic matter retention in woodland streams and may sustain a portion of the invertebrate community during periods of low litter input and high biological activity. We hypothesize that temporary retention of litter through burial should ultimately contribute to a more efficient recycling of organic matter within the lotic system.

Environmental drivers of benthic communities: the importance of landscape metrics

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The distribution of aquatic communities is dependent on processes that act at multiple scales. In the absence of water quality impairment it is known that the local-scale physical habitat exerts a major influence over the biotic assemblages at a site. However, these local environmental features dependent upon large scale-controls, such as catchment level land use. This study deals with the following questions concerning with the scales of spatial variation of benthic invertebrates: a) what is the scale of variation of aquatic communities from individual samples to the whole catchment? b) How are local habitat descriptors shaped by higher scale patterns such as landscape characteristics and intensity of soil use? We used a nested sampling design to estimate the components of variance associated with three successive spatial scales: basin, site and microhabitat (transect). The study comprised a total of 270 samples distributed over 2 years. Habitat assessment was made using River Habitat Survey (RHS). The derived Habitat Quality Indices (HQAs) were crossed with a wide number of landscape metrics and types of soil use, obtained from Geographical Information System data (GIS). The benthic composition was also crossed with the same variables (habitat and landscape metrics), in both cases using distance-based linear models and distance-based redundancy analysis. Invertebrate taxonomic variation was mainly linked with intermediate scale (site) and landscape metrics were the main drivers determining local characteristics compared to proportions of soil use. We also found that the studied aquatic community exhibited a stronger relationship with landscape metrics, especially patch size and shape complexity of the dominant uses, than with habitat quality or percentages of the different types of vegetation cover. We suggest that instream habitat improvement is only a short-term solution and that stream rehabilitation must address the influence of components at higher spatial scales.

Leaf litter decomposition along a flow permanence gradient in a french river

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Intermittent rivers comprise a substantial proportion of the Earth's freshwater ecosystems. Quantitative relationships between flow intermittence and stream biodiversity have been recently documented in several rivers around the world. However, the effect of flow intermittence on ecological processes in streams and rivers remain poorly studied. In this study, we aimed at defining quantitative relationships between leaf litter decomposition (LLD) rates and flow intermittence, and understanding associated mechanisms, along a naturally-intermittent alluvial river in France.
Along the mainstem of the Albarine River (France), surface water progressively disappears into the subsurface to generate a 20 km-long flow-permanence gradient, ranging from 20 to 100%. At 10 sites scattered along this gradient and during 32 days, we measured i. *Alnus glutinosa* (LLD) rates using 150 leaf litter bags, ii. leaf litter microbial activity using the fluorescein-diacetate analysis method (FDA), iii. leaf litter benthic invertebrates assemblages.
Our results showed that LLD rates were strongly controlled by several hydrological variables describing flow intermittency (% flow permanence, average duration and frequency of dry periods, time since last dry event). For instance, linear relationships showed that an increase in 0 to 6 dry events per year would decrease LLD rate by 40%. We showed that this influence was clearly due to the abundance of shredders in litter bags, the abundance of which was also strongly determined by flow intermittence. By contrast, the influence of microbial activity on LLD rates along the intermittence gradient was insignificant.
Further studies will consider the fate of leaves litter on the riverbed during dry periods and attempt to understand aquatic-terrestrial interactions along this intermittent section.

Long-term changes in the climate and hydrological conditions in the Braila Islands LTSER site

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Climate is changing rapidly, beyond the range of previous natural variability. Climate changes induce hydrological regime disturbances and land cover and land use changes. The pressures induced by climate, land cover and land use changes are acting as positive feedbacks on one another's. Wetlands and freshwater ecosystems are highly sensitive to climate change, especially through hydrological regimen.
Braila Islands (BrI) site is part of the network of Long Term Socio-Ecological Research (LTSER) sites. The BrI area extends along Danube River and covers the river terrace and a large floodplain, preserving one of the few wetland areas remained under natural hydrological conditions in the Lower Danube System. This wetland contains numerous shallow lakes, ponds, marshes and channels that are strongly connected by longitudinal and lateral flows, under Danube natural flooding regime.
In this article long-term changes in the climate and hydrological conditions in the BrI LTSER site are presented. The trends and tendencies over more than fifty years long daily values data sets (1953-2008) on several climatic and hydrological parameters (air temperature, precipitations, water temperature and discharge) at Braila hydrological station are identified. Statistical analysis used was based mainly on trend analysis and frequency analysis. The statistical analysis of Danube discharge data showed an increase of the base-flow (with 0.07 units) and of the high flow pulse frequency simultaneous with a decrease of the seasonal maximum Danube discharge (with 1000 mc/s) and of the high pulse duration. Comparative data analysis showed statistical significant increase (with 1.4oC) in mean daily air temperature between two selected periods 1953-1963 and 1998-2008. The important shifts of the mean air temperature are due to a significant increase in the maximum air temperature (with 2.55oC). Preliminary results of the precipitation data sets analysis revealed a slight decrease of the total annual amount and a maximal rainfall quantity distribution in May, June and July.
The result of this analysis of long-term changes in the climate and hydrological conditions in the BrI LTSER site assures the necessary reference framework for studies regarding structural and functional alterations of this unique wetland area undergoing climate and land use changes.

Lotic biodiversity assessment and management - Viseu watershed case study

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This study assessed the benthic macroinvertebrate and fish communities diversity spatial variation in the north of Romania in the Vişeu Basin (1606 km2), in correlation with biotope characteristics, highlighting the importance of quantifying biodiversity in lotic systems to reveal the degree of homeostasis within these systems. Also the biodiversity - biotope relations modeling was done for the lotic systems biodiversity management in the reference area, testing the utility of mathematical models (factorial analysis) that reflect the interactions between biodiversity and biotope factors and their use in predicting the way such systems evolve. The assessed variables were the biotope factors, benthic macroinvertebrates and fish diversity, expressed through Margalef, Simpson and equitability indexes. Achieving the correlation analysis it was found that significant statistical correlations exist between the benthic macroinvertebrates and fish diversity and biotope parameters (slope, water flow, bank stability, bank vegetation, substratum, and channel modification). In the higher Ruscova basin the aquatic habitats present an almost natural ecological state, the human impact being insignificant. Here is the benthic macroinvertebrates highest diversity, also the highest specific diversity for the Ephemeroptera, Plecoptera and Trichoptera. The upper Bistra and Frumuşeaua sectors are natural. In the extreme upper Vişeu Basin, the aquatic habitats present an almost natural ecological state, the Borşa resort area and the confluence with the impacted Ţâşla River section induce a significant negative effect on the lotic biodiversity which recover only in the Vişeu Gorge where is the highest fish diversity, due to the river selfcleaning processes and clean tributaries. The Ţâşla Basin is the most heavily impacted by the human activities. Lotic sectors slightly affected by the rural and forest exploitation impact are the lower Ruscova and Frumuşeaua sectors. The Vaser River suffering a higher impact of this type. The lotic sectors affected by the urban and industrial impact are Vişeu begining with the section downstream the Borşa resort and its all middle section. The lotic sectors under major and permanent human impact are Ţâşla and its tributaries. The biodiversity assessment and the obtained models allow the establishment of the priorities, objectives and measurements for the studied rivers biodiversity conservation management.

Elemental stoichiometry of fungal and bacterial decomposers: effects on the functioning of detritus-based stream ecosystems

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The theory of ecological stoichiometry is aimed to study the balance of multiple chemical substances in ecological interactions and processes. This theory relies partly on the observation that the needs for multiple elements vary within and among species, and can cause an imbalance between consumer demand and element supply. This theory has mainly been developed using lacustrine models, and has only recently been transferred to other ecosystems, greatly improving the understanding of their functioning. Yet, very few is known on the stoichiometric functioning of detritus-based stream ecosystems. In particular, despite important knowledge on primary producers and macroinvertebrates stoichiometry, data on decomposers are still very scarce in the literature. Stoichiometry of aquatic hyphomycetes as main decomposers of organic detritus in small streams has never been investigated.

We present results from several experiments dealing with aquatic hyphomycetes and bacteria homeostasis and elemental composition, and their effects on detritus nutrient content. In particular, we investigated the effect of growth rate on elemental composition of aquatic hyphomycetes. Then, we measured the effects of microorganisms conditioning on detritus elemental quality.

These results should help to understand the stoichiometry of detritus-based stream ecosystems, and to parametrize stoichiometric models taking into account decomposers elemental composition.

Benthic and hyporheic invertebrate assemblages along a flow permanence gradient in a French river

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Naturally intermittent rivers comprise a substantial proportion of the Earth's freshwater ecosystems, but the state of knowledge about these rivers is rudimentary. Tools for analyzing flow intermittence and quantitative intermittence-biodiversity relationships are lacking. The Albarine River (France) is a natural laboratory for exploring intermittent flows and their ecological consequences. Along the mainstem of the river, there is a 20 km-long flow-permanence gradient ranging from 20 to 100%. 13 cross-sections along the river were visited monthly from 2008 to 2009 to measure discharge and vertical hydraulic gradients. Discharge data were used to calibrate a hydrologic model that predicts long-term flow conditions at each site and computes intermittence statistics. Benthic and hyporheic invertebrates were sampled at 2 occasions at each cross-section.
Intermittency was precisely described in space and time using the hydrologic model outputs. Multivariate analyses indicated that differences in invertebrate assemblages along the river were best explained by long-term flow-permanence and drying frequency. Across sites, invertebrate density and richness and assemblage stability were correlated with flow permanence. Invertebrates that were restricted to intermittent reaches were rare. Instead, invertebrate assemblages at intermittent sites were nested subsets of assemblages at perennial sites.
Further work will focus on comparing studies carried out in France and New Zealand, where flow permanence-stream invertebrate biodiversity relationships have been described.

Pondscape: towards a sustainable management of pond diversity

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The PONDSCAPE project aims to provide scientifically underpinned recommendations for a sustainable management approach to protect and increase biodiversity levels of ponds in Belgium and Luxembourg, while also taking into account economic activities and growth. PONDSCAPE is an interdisciplinary project studying different organism groups (bacteria, phyto- and zoobenthos, phyto- and zooplankton, macro-invertebrates, amphibians, fish and macrophytes) at different spatial scales. The project furthermore investigates ecosystem functioning, the effect of pesticides and socio-economic aspects.
PONDSCAPE has studied, amongst others, a bomb crater complex of more than 110 ponds in Tommelen (Hasselt, Belgium), created during the Second World War (1944). All ponds have the same age and similar size, are located very close to each other and share a similar environmental context. Nevertheless, they show pronounced differences in ecology. This pond complex is hence ideal to study ecological processes.
In this presentation, we will investigate in detail the macro-invertebrate communities of the Tommelen pond complex. We will study local and regional processes by partitioning the observed variation in the communities into variation explained by local environmental gradients and by spatial factors. Alpha, beta and gamma diversity will be studied as well. The results will be discussed in view of management practices.

Effect of streambed clogging on benthic / hyporheic invertebrate assemblages in 3 french rivers

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Human activities (e.g., agriculture, urbanization) have largely increased inputs of fine sediments in aquatic environments. Streambed clogging induced by fine particle deposition and infiltration into the sediments is today considered as a major environmental concern throughout the world. The hyporheic zone (HZ), defined as the interface between surface water and groundwater in stream and river beds, experiences intense hydrological exchanges, supports significant biogeochemical processes and harbours rich and diverse invertebrate communities. Nevertheless, the ecological effects of streambed clogging were rarely studied for benthic and HZ communities together, mainly because of differences in sampling techniques. The objectives of this study were i. to determine the influence of sediment clogging on benthic and hyporheic invertebrate assemblages; ii. to identify whether threshold levels existed in biodiversity-clogging relationships.
At 9 reaches across 3 rivers, we assessed streambed clogging coupling visual estimation of surface embeddedness (n=5/ reach), freeze-coring technique (n=3/reach), wooden stakes technique (n=12/reach), penetrometry (n=3/reach) and hydraulic conductivity measurements (n=3/reach). At each reach, we determined surface and subsurface water chemistry and collected benthic and hyporheic invertebrates at 3 different depths: -10, -30 and –50 cm.
Results showed that clogging considerably modified the characteristics and structure of both benthic and hyporheic invertebrate assemblages. Density and diversity decreased with increasing fine content and assemblages shifted from EPT dominated assemblages at unclogged sites to Dipteran/Oligocheta dominated assemblages at clogged sites. Our results did not show clear threshold in the responses of invertebrate assemblages to increasing fine content.

How are we going to get up there? - Research on native fish distribution and the effects of culverts in urban environments

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Ongoing urbanisation in lower stream reaches can adversely affect the ecology of river ecosystems by altering native fish community structure. For diadromous (marine larval phase) fish species, unimpeded access to and from the sea is necessary for life-cycle completion. Hence, to maintain and enhance fish populations in urban settings, providing fish upstream passage is particularly important, given the prospective growth of our cities. We studied the effects of urbanisation on freshwater fish species by comparing community composition of fish species between urban-impacted and un-impacted waterways. We also investigated the effects of culverts as barriers on species distributions and experimentally tested the remediation of migration impediments by different fish pass designs.
Analyses of fish community composition showed significant differences between urban-impacted and un-impacted stream reaches. Fish species sensitive to poor habitat quality were generally absent in urban waterways. Inland penetration of fish species was shorter in urban-impacted than in un-impacted streams, potentially indicating upstream migration barriers by culverts. Upstream–downstream comparisons of fish abundance at 13 culverts showed significantly more individuals downstream, further indicating that culverts can have an effect on fish species distribution. Laboratory experiments showed that the climbing ability of poorly swimming fish species, such as inanga (*Galaxias maculatus*), depended on fish size. It also depended on the length and slope of the ramp to climb, but not the availability of resting pools. Further, in situ experiments conducted at 13 culverts showed that fish could not pass (0% passage) undercut (perched) culverts unless aided by an experimental ramp (43% passage).
In combination, these results provide a rigorous framework for identifying and correcting barriers to diadromous fish passage. To provide successful upstream passage at culverts, fish pass designs should include the knowledge of species with the weakest swimming ability and consider trade-offs in ramp geometry.

Towards an understanding of hydrogeologic controls on lowland hyporheic assemblages in the UK

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The natural water quality of rivers and groundwaters is determined by the underlying geology, and the catchment soil type that the water is exposed too as it drains into the river. In this study we characterise the invertebrate assemblages that live in the hyporheic zone (HZ) of three geological areas strongly associated with groundwater aquifers. Invertebrate distribution in the HZ is strongly influenced by sediment grain size which in turn is influenced by local geology thus we have selected three geologies: limestone, sandstone and chalk, that give rise to a gradation of particle size in rivers. Sediment derived from limestone will have the largest pore size, sandstone will have an intermediate pore size and chalk will have the smallest pore size. We also examine the legacy of past glaciation on the composition of hyporheic assemblages by contrasting carboniferous limestone catchments to the north and south of the most southerly point of the Devensian Glaciation.
Two pristine catchments from each geological area were chosen with an extra catchment selected for the glacial study. From each catchment four riffles were chosen with strong up and downwelling zones. Each riffle was sampled at the head (downwelling) and tail (upwelling) at two depths (20 and 50cm) with three replicates at each depth. Hyporheic samples were taken using a Bou Rouch pump (approximately 5l per sample). Samples were passed through a 63 micron sieve and preserved. Animals were later enumerated and identified in the laboratory. Vertical hydraulic gradient at each site was measured using a mini-piezometer inserted to a depth of 30cm and an extensive suite of physic-chemical measurements were taken at each sampling point.
We found that hyporheic Invertebrate communities reflected hydraulic conductivities and sediment size, with highest abundances and taxa richness found at sites with the largest sediment size. Taxa richness and abundance differed between depths across all geologies; on all geologies there were differences in abundance and taxa richness between depths; glaciated and un-glaciated sites contained very similar taxa richness and abundance.

The conservation of a fish species: what does the future hold for the vendace (*Coregonus albula* (L.)) in the UK under a changed climate?

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The vendace (*Coregonus albula*) is a glacial relic fish species of high conservational value in the UK. Its few remaining habitats have come under a range of stresses and the future looks bleak for the species. Here, we present a modelling study that predicts the possible pressures that may be put on its habitat through the influence of climate change. A lake phytoplankton model (PROTECH) is coupled to a lake oxygen model (LOX) to examine how the twin pressures of increasing water temperature and decreasing oxygen concentrations could affect the vendace. The results of this study suggest that under current predicted climatic conditions, the lake will be too warm to sustain this species.

River water quality modelling within an integrated water management framework for the Western Bug region (Ukraine)

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Recently, the 'International Water Research Alliance Saxony' (IWAS) was founded by the Helmholtz Centre for Environmental Research (UFZ, Leipzig, Germany) and the Dresden University of Technology. It's aim is to contribute to an Integrated Water Resources Management in hydrologically sensitive regions by developing specific system solutions as a response to some of the most pressing water-related problems of our time. In this framework, the Western Bug region was recognised to be one of the sensitive model regions. Here, pressures on the surface water quality exist by intensive water extraction for human consumption, overburdened or over-aged waste water treatment plants, industrial waste water, contamination by coal mining sewage and leaky pesticide repositories. This cocktail is similar to pressures on surface waters in eastern Germany before the reunification after which enormous efforts were undertaken on restoration and re-mediation. Thus, main purpose of the project is to use an evaluation of the success of management measures in Germany for the development of sustainable management options for the Bug region. The general systems concept incorporates all sources and paths of pollution (urban and industrial waste water, agriculture, mining) within the model region. The contributions of the hydrobiological sub-projects are concerned with the identification of the most important water quality criterias, interactions between biological, chemical and morphological variables and definition of priorities. For system analysis and scenario purposes, a biogeochemical model will be applied and augmented by biological processes relevant for nutrient turnover. Additional focus will be put on the evolution of antibiotic resistances in bacteria. Both, approaches to diminution in substance immission and possibilities to improve resilience of waterways to pollution will be recognised. The general approach is guided by the EU Water Framework Directive and the modelling concept will be constructed using data from East German river basins. Current state analysis will help to develop scenarios, which, after comparison, will be used to derive priorities for site-specific, innovative and cost-efficient methods for improving water quality.

Battle in the dark: water colour affecting perch-roach interaction

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Reduced light in aquatic ecosystems may have fundamental effects on the interactions between fish and their prey. In humic waters, high concentrations of dissolved organic compounds may have substantial effects on the light climate under water. Changes in light intensity may affect the competitive interactions between fish since many fish species are adapted to a particular light climate. Perch (*Perca fluviatilis* L.) is a visual hunter which depends on good light conditions, whereas roach (*Rutilus rutilus* L.) is able to feed efficiently at low light intensities. In this study we analysed the growth and diet of perch and roach, as well as the prey selection and prey resource levels of the two species in small humic lakes with different water colour.
This study suggests that there is an interaction between water colour and perch niche shift, and water colour may affect the competitive interactions of roach and perch. We suggest that water colour has direct and indirect effects on the feeding and interspecific competition of perch and roach. Direct effects of water colour are displayed as disturbance in the vision of fish to detect and capture its prey. Our results as well as literature data agree with the prediction that, compared with roach, perch should be an inferior forager on zooplankton in highly coloured water. In addition to direct effects through vision, increase in water colour may decrease habitat complexity favoured by perch. In small humic waters, littoral habitats and vegetation are often scarce and simple-structured aquatic ecosystems with high water clour may favour roach over perch.

Testing links between predicted risk of toxicant mixture and fish assemblages using predictive models

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Monitoring programs throughout Europe have demonstrated a widespread presence of pesticides in rivers due to diffuse pollution from agricultural sources and this is one major cause of deterioration of surface water quality. To enable European surface waters to reach good ecological status by the year 2015, as required by the Water Framework Directive (WFD), it is necessary to develop a coherent and integrated framework for assessment, monitoring, and management of all surface waters and groundwater based on their ecological and chemical status. The aim of this study was to assess the risk caused by toxicant mixtures at the Adour-Garonne basin scale (South-Western France) using a probabilistic risk assessment procedure and to investigate the interaction between exposure to pesticides pollution and fish assemblage in the field. Assessment of the risk caused by 26 pesticides, belonging to six different toxic modes of action, at 131 sampling sites in the Adour Garonne basin was conducted by using the species sensitivity distribution concept as well as mixture toxicity rules according to the concentrations of pesticides found in the field. Risk predictors, called the multisubstance potentially affected fraction of species (msPAF), were computed according to the toxic mode of action of compounds, leading to six in total. Total predicted acute risks computed at each sampling site showed low values at the Adour Garonne basin scale with a maximum msPAF value of 4.4%. In order to describe the impacts of predicted acute mixture risks and observed fish assemblage characteristics in the field, classical predictive models (GLM, CART) as well as advanced modelling methods (ANN, RandomForest) were used. Fish assemblage are weakly correlated to toxic risk which can be explained both by the low msPAF values and by the fact that establishment of a causal relationship between a stressor and effects can be hampered by natural variability.

Synergistic effects of water temperature and dissolved nutrients on litter decomposition and associated fungi

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In the global warming scenario predicted for this century, atmospheric temperature is expected to increase by 1.5–5.8ºC until 2100, which will lead to a similar increase in water temperature of streams and rivers. Simultaneously, it is predicted an increase in pollutants and nutrients concentrations in water bodies as a result of increased evapotranspiration and human pressure. However, the combined effect of water temperature and nutrients concentration on litter decomposition and associated biological activity remains to be assessed. We addressed here the effects of temperature (5, 10 and 15ºC) and nutrients (0.01 mg PO4-P/L and 1.39 mg NO3-N/L vs. 0.10 mg PO4-P/L and 13.86 mg NO3-N/L) on the decomposition of alder (*Alnus glutinosa* (L.) Gaertner), and associated fungal biomass and activity in a complete factorial design. Leaf discs were incubated for 43 days in stream simulating microcosms inoculated with an assemblage of 6 aquatic hyphomycete species. Decomposition rates across treatments varied between 0.0041/d and 0.0100/d (linear model). High nutrient concentration stimulated decomposition rate at 15ºC, but not 10 or 5ºC; for both low and high nutrient concentrations, decomposition rate was faster at 15ºC than at 5ºC (ANCOVA, $p<0.001$). Litter remaining mass was negatively related with temperature only for the high nutrient concentration (linear regression, $p=0.003$ and $R2=0.74$). Litter decomposition sensitivity to temperature increased with increasing nutrient concentration (Q10=1.49 and 1.36 for high and low nutrient concentration, respectively). Fungal oxygen consumption was stimulated by high nutrient concentration only at 15ºC; for both nutrient concentrations oxygen consumption was higher at 15ºC than at lower temperatures (ANOVA, $p<0.001$). Fungal biomass and sporulation rate were stimulated by high nutrient concentration at 10 and 15ºC, but not 5ºC; for both nutrient concentrations fungal biomass and sporulation rate increased with increasing temperature (ANOVA, $p<0.001$). Percentage of mass loss attributed to fungal activity was higher at 15ºC (47–57%) than at 10ºC (33–44%) and 5ºC (26–33%). Overall, results indicate synergistic effects of temperature and nutrients concentrations on the detrital food web through a stimulation of microbial activity, with low nutrient conditions being protected from the effect of increased water temperature.

Recovery of zooplankton from acidity in small headwater mountain lakes

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Eight small, forested glacial lakes in Bohemian Forest (Šumava, Böhmerwald/ Bayerischer Wald) have been affected by atmospheric acidification, which culminated in the mid-1980s. The adverse changes in water chemistry brought about impoverishment of lake communities, including zooplankton. Since 1990, both sulphur and nitrogen deposition dropped significantly. This has been followed by amelioration of key parameters of water chemistry (sulphate, nitrate, pH, alkalinity, aluminum). The corresponding recovery in zooplankton, however, has been delayed. A long-term monitoring of the lakes made it possible to observe changes in zooplankton from its highest suppression to the present. In the most affected lakes, even those planktonic species of Crustacea considered to be acidotolerant (*Daphnia longispina*, *Ceriodaphnia quadrangula*, *Polyphemus pediculus*, *Cyclops abyssorum*), disappeared. The most resilient species withstanding low pH and high aluminum were *Acanthocyclops vernalis* (all lakes), and *Heterocope saliens* (Plešné Lake only). Other crustaceans found in the open water were accidental immigrants from the littoral (chydorid cladocerans such as *Acroperus harpae* and *Alonella excisa*). From the missing species only *Ceriodaphnia quadrangula* re-appeared in some lakes as a result of recovery. Recently there were also few accidental findings of *Bosmina longirostris*. Among rotifers the most resilient open-water species were *Microcodon clavus*, *Polyarthra remata*, *Collotheca pelagica*, *Keratella serrulata* and *Brachionus urceolaris* "sericus". In the course of recovery in Plešné Lake the numbers of acidotolerant rotifers increased by two orders of magnitude. Also, we found several common rotifers not yet reported from the most acidified lakes in the investigated area: *Keratella cochlearis*, *K. quadrata*, *K. hiemalis*. In addition, a whole-lake experiment was carried out by inoculation of *Daphnia longispina* and *Cyclops abyssorum* to Plešné Lake in 2004. The inoculum came from Prášilské Lake, where the two species survived the peak of acidification. In Plešné Lake C. abyssorum was last recorded in 1969, a Daphnia from the longispina group (*D. lacustris*) in 1910. The population of *C. abyssorum* increased exponentially in the course of two years, after which its numbers have stabilized. In the same time numbers of rotifers have dropped considerably. The introduced Daphnia, however, has not been recorded in the lake.

Macroinvertebrates of intermittent mediterranean streams: local biodiversity and climate changes

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Aquatic fauna and flora of intermittent Mediterranean streams are adapted to predicable hydrological stress (biological and ecological traits). Mediterranean streams in southern France show a low-flow period of 4 months (usually from June to October). This period is characterised by: 1) the drought of the flowing aquatic habitats and 2) the persistence of cool perennial pools where lotic taxa can survive. Such predicable hydrological stress in classified as a "press category perturbation". However, climate changes increased the drought period, leading to a less predicable constraint which can be classified as a "ramp category perturbation". The main question of this study is to show the response of invertebrate communities to this increase of the dry period, due to less rainfall.

This study shows the response of the invertebrate communities to a progressive period drought due to a year-scale lack of rainfall that occurred between 2002 and 2007. Invertebrate communities of the main-stem and perennial and intermittent flow tributaries were sampled over 5 years.

The results show that cumulative decrease of the water discharge over the 5 years period 1) led to an overall biodiversity erosion 2) emphasized unexpected diffuse sources of pollution. At the catchment scale, intermittent tributaries harboured around 70 % of the taxa recorded in the catchment and thus play a major role in the biodiversity maintain in Mediterranean catchments, highly impacted by anthropogenic activities.

Detailed examination of the catchment's hydrographical system and the preservation of intermittent water bodies should be an important part of the catchment management, and support the need for catchment-scale conservation of freshwater invertebrates.

Family richness and composition of macroinvertebrate assemblages in farm ponds of a mediterranean region (South of Spain)

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Farm ponds are increasing in landscapes all over the world, particularly in areas dedicated to intensive agriculture. Over 16,500 artificial ponds have been inventoried by remote sensing in Andalusia (Southern Spain). These ponds differed in construction – embankments in streams, excavated off-stream storages, or made with artificial substrates - water origin, use and management. As a whole, they potentially provide suitable habitats for aquatic biodiversity conservation. The aims of this study are to study taxa richness and composition of the macroinvertebrate fauna in these artificial ponds and to determine their relationship with environmental conditions, particularly to investigate to what extend the type of construction affect richness and composition. For this purpose, an extensive physical-chemical and biodiversity survey was carried-out during spring 2007 on 120 farm ponds distributed throughout Andalusia. Our results suggest that taxa richness is higher in ponds with natural substrates compared to ponds made of concrete or made waterproof with polyethylene. However, in ponds with artificial substrates, when submerged macrophytes were present, macroinvertebrate diversity increased significantly. Moreover, using multivariate analyses, we detected that the main determinant of macroinvertebrate composition was the presence of submerged aquatic vegetation (SAV). The families Baetidae, Physidae and Pleidae were indicator taxa of macroinvertebrate assemblages of ponds with SAV.

Aquatic community patterns across environmental gradients in a Mediterranean floodplain and their application to ecosystem restoration

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In Europe and North America, up to 90% of floodplains have become extensively regulated, occupied, and polluted. In addition, the future increase in water demand combined with predicted consequences of climate change (i.e., decrease in water availability, increase in salinization and eutrophication) will have profound consequences on the floodplain ecosystem. For this reason, it is of great relevance to explore the processes that drive ecosystem structure and functionality in order to develop management plans to effectively counteract the influence of climate change and other negative human impacts. To address this need, the present study aims to provide a solid background for river-floodplain management based in the response of macroinvertebrates to changes in hydrological connectivity, environmental factors and human pressure across the floodplain of a large Mediterranean river (Middle Ebro, NE Spain).
We found that controlling factors - as hydrology, turbidity, salinity and nutrient status - interact to influence each aquatic habitat and that the aquatic community respond accordingly. The lateral hydrological connectivity was the most important factor, and integrated a wide variety of environmental processes that affected directly and indirectly the presence of aquatic organisms. Hydrological connectivity explained at least one third of the macroinvertebrate species and trait composition; and more than half of the variability observed in total species abundance and richness. Turbidity, salinity and nutrient status were secondary drivers of the floodplain ecosystem and nonetheless were essential for understanding the response of aquatic communities' composition and diversity to hydrological patterns.
Empirical models based on the response of the aquatic assemblages composition and richness to environmental changes can be helpful in guiding management and conservation of the river-floodplain ecosystem. To counteract the combined effect of river regulation, water over-exploitation and climate change, the modification of the actual embankments, creation of new wetlands, the recovery of unproductive agricultural areas, and the improvement of the water quality on a catchment scale are proposed

Diversity of primary producers in farm ponds of a mediterranean region (Andalusia, southern Spain)

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The increasing water demand for agriculture has determined an exponential proliferation of farm ponds in Mediterranean regions. In Andalusia (Southern Spain), a recent inventory based on photointerpretation has detected over 16,500 small artificial water bodies, most of them used for farming activities. These ponds may be suitable habitats for aquatic biodiversity conservation, althought up to the present any study has been carried out on this subject. In this study we investigate the species richness and the assemblage composition of primary producers in farm ponds of Andalusia, and their relationship with the type of pond construction, management regime, water origin (superficial vs. groundwater) and water quality. For this purpose an extensive survey of 120 ponds was carried out throughtout the region, during spring 2007. The ponds studied were representative of a wide range of climatic conditions, types of construction, management regime, and water chemistry. Phytoplankton assemblage composition was primarily conditioned by the water origin and macronutrients concentration. Species richness of phytoplankton was significantly higher in ponds with natural substrate, particularly in those with submerged aquatic vegetation. A similar pattern was observed for filamentous algae and submerged macrophytes, which showed higher species richness in embankments and excavated ponds than in ponds constructed with polyethylene or concrete. However, if these two types of artificial ponds are not managed aggressively, they can exhibit highly diverse assemblages of primary producers.

Evidences for a link between decomposer diversity and functional process of organic matter decomposition

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Aquatic hyphomycetes play an essential role in the decomposition of allochthonous organic matter, which is a fundamental process in the functioning of forested headwater streams. Several studies show that anthropogenically acidified running waters can have deleterious effects on the diversity of decomposer microorganisms particularly on aquatic hyphomycetes. Likewise, leaf-litter breakdown is severely reduced in acidified ecosystems, raising the issue of whether the functioning of headwater streams could be impaired by a loss of aquatic hyphomycetes species. The decomposition activity of aquatic hyphomycetes can be investigated by measuring the Fine Particulate Organic Matter (FPOM) generated by the leaves maceration. During our study we aimed to define how deeply the leaf-litter breakdown functional process could be affected by decomposer diversity. In this context we investigated the decomposition of alder (*Aulnus glutinosa*), maple (*Acer platanoides*) and beech (*Fagus sylvatica*) leaf-litter in six forested headwater streams selected among a pH gradient. We have performed both a classical in situ litterbag decomposition study (500 µm mesh net; 9 sampling dates) and FPOM production experiments in microcosms. For each sampling date, we determined the leaf mass remaining in the litterbag, the conidial production of leaf-associated aquatic hyphomycetes, and performed FPOM production experiments in microcosms with the conditioned material. The processing rate of beech leaves was significantly slower than those of alder and maple leaves, and leaf breakdown rate was drastically reduced under acidic condition for all species. Whatever the tree species, the FPOM production 1) exponentially increased during hyphomycete litter colonisation and 2) is drastically reduced under acidic conditions. Our study provided evidence for a link between decomposer diversity and functional process of organic matter decomposition both in situ and in laboratory test.

Response of biological indices to pressures in the running waters of the Alsace floodplain (eastern France). Towards a proposal of a new tool for assessing ecological status of waterbodies

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The EU water framework directive "requires the establishment of classification schemes to reflect the ecological status or potential of surface water bodies". The aim of this study is to compare four French normalized biological indices usually used to assess ecological status of running waters. We selected 40 sites 1) according to the classification of waterbodies under WFD and 2) related to different pressures. Physico- chemical measurements were made for specific pressures: hydromorphological, chemical (eutrophicants, organic pollution, micropollutants). In each site we calculated four French standardized indices, based on macrophytes (IBMR), invertebrates (IBGN), oligochaetes (IOBS) and diatoms (IBD). Multivariate analyses were used to establish relationships between pressures and biological indices and to compare response of the different indices and communities to pressures. Results showed that IBGN would be more useful for the evaluation of organic pollution and eutrophication, IBD is more efficient for determining organic and mineral micropollutants of waters, as well as organic pollution and eutrophication (1). IBMR seem to be more sensitive to physical pressures(2). IOBS index is sensible to pollutions stored in fine sediments and to ammonium salt contents of waters(3). We also tried to establish relationships between biological traits of the different groups and pressures. In fact, each standardized index gives information on part of the whole ecological context. It is thereof hazardous to support ecological biomonitoring by a sole index. The present step is to propose a multiple index which could combine several indices, and to identify biological traits assemblages as indicators of ecological or potential status.

Negative effect of the enhanced turbulence on the zooplankton in Lake Balaton, the largest shallow lake in central Europe

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During the unusually long lasting drought between 2000 and 2003 in Europe, the water level of the large and shallow Lake Balaton (area: 596 km2 mean depth: 3.25 m) decreased by 28%. Although the food availability of the zooplankton remained unchanged, the density of populations of several planktonic Rotatoria, Cladocera, Calanoida Copepoda and veligera larvae of *Dreissena polymorpha* decreased by 35–70% in parallel to the water level decrease and regenerated only after the drought period. The generally strong hydrodynamics of the lake were further intensified during the four consecutive years of decreased water level as verified by our two years' instrumental monitoring of the RMS-turbulence and by the turbulent kinetic energy dissipation rate at different water levels and wind conditions. In our laboratory experiments, simulating turbulence conditions similar to those observed in the lake during the water level decrease, zooplankton taxa showing the highest mortality were the same as those found "in situ". It is concluded that the increased turbulence coupled with the water level decrease is especially disadvantageous for several zooplankton organisms

Shifts in food web structure between two reaches of a saline Mediterranean stream suffering different degrees of stress

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The food web structure was studied in two reaches of a Mediterranean saline stream subjected to different degree of natural and anthropogenic disturbance using stable isotope signatures of carbon and nitrogen. For each reach, we estimated the contribution of basal resources to consumers' diets and trophic positions and the trophic structure using Layman´s community metrics, and analysed the shifts in isotopic signatures by using circular statistics. Reach 1 (upstream) was characterised by a pronounced anthropogenic (freshwater and nutrient inputs) and natural (hypersaline water inputs) stress. Reach 2 was downstream but closer to more natural conditions. Consequently, primary producer diversity and biomass were lower in reach 1 which resulted in basal resource scarceness and, therefore, lower consumer density. Furthermore, freshwater and nutrient inputs from surrounding crops enhanced the proliferation of common reed in reach 1, and its $\delta^{15}N$-enriched leaf values reflecting the assimilation of $\delta^{15}N$-enriched nitrate derived from manure fertilisers. Thus, the mineralisation of stems and leaves deposited on the streambed yielded $\delta^{15}N$-enriched ammonium and nitrate in sediments. These N forms were incorporated in the primary producers and, in turn, significantly increasing the $\delta^{15}N$ of consumers in reach 1. Resource scarcity in this reach may shift the major food assimilate by consumers since diatoms were mainly fed in reach 1 while *Ruppia maritima* was the most important basal source in reach 2. However, consumer trophic positions did not generally shift, suggesting that common species played similar functional roles in both reaches. Finally, resource scarceness in reach 1 produced substantial changes in its trophic structure. In fact, we observed shorter ranges of $\delta^{15}N$ and $\delta^{13}C$ which resulted in a narrower community trophic niche but lower trophic redundancy of species.

The role of in-stream vegetation as 'disturbance modulators' in a small Mediterranean-climate stream

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Fluctuating discharge (floods and droughts) is considered a major ecological disturbance and a source of temporal and spatial variation in many fluvial ecosystems. Community recovery after such disturbances ('resilience') depends on the features of the disturbance (e.g. magnitude, duration, predictability) and on the evolutionary adaptations of the community ('resistance'). The use of refugia (e.g. low shear stress areas) during spates is an example of the latter.
We suggest that in small agricultural streams, where boulders and wood debris are scarce or absent, patches of in-stream vegetation may be exploited as refugia by benthic macroinvertebrates during spates. Sheltering invertebrates form the base for community recovery.
We assume 4 possible community responses to the modulation of disturbance: "indifference"; "amelioration"; "amplification" and "exacerbation".
For testing this hypothesis we analyzed the response of a small Mediterranean-climate stream (MCS) macroinvertebrate community to seasonally predictable disturbance (stream discharge) in two situations: 1) un-vegetated stream landscape (P1) and 2) stream landscape composed of both un-vegetated and vegetated patches (P1+P2).
We found that in the un-vegetated landscape macroinvertebrate family richness and total density presented an "optimum" response with discharge ($R^2>0.65$, $p<0.05$). However, in the presence of vegetation this response was indistinctive ($R^2<0.25$, $p>0.05$; "amelioration"). On the other hand, density of five families which were present in the stream the year round, responded differently to fluctuating discharge; whereas in the presence of vegetation the density of *Baetidae* and *Chironomidae* showed amelioration response (no significant decline with discharge) that of *Caenidae* declined in both situations, with no effect of the vegetation. Conversely, scud-shrimps (family *Gammaridae*) were "indifference" to flood disturbance whereas black-flies larvae (family *Simuliidae*) responded positively, increasing in numbers with fluctuating discharge ("amplification").
The modulation of environmental physical stress by a biological entity can very well be viewed as the action of an 'ecosystem engineer'. In this manner in-stream vegetation patches modulate the impact of a disturbance, with positive community effects (trait specific). The finding of this study emphasizes the need for a new vision of stream management, namely flood prevention measures applied by local drainage authorities.

Methane-subsidised secondary production in a fast flowing lowland river

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We measured the δ13C values of dominant primary consumers and their potential food sources in a fast flowing lowland river. Whereas the δ13C for consumers, such as Gammarus and Simulium, reflected that of the dominant forms of primary production, the cased larvae of three genera of caddisflies (Agapetus, Silo, Drusus) were isotopically light (min. δ13C -44‰ vs. PDB) throughout the year. Interestingly, the river water was consistently supersaturated (~50 times atmospheric) with methane, reflecting both supersaturation in the groundwater and local production in fine sediments. Pore water in the fine gravels had consistently lower concentrations of methane than in the water column and we measured significant methane oxidation in the biofilms associated with these gravels, on the caddisfly cases themselves, and on the bottom of larger rocks. These caddisflies are thought to acquire most of their carbon from grazing of periphyton on the tops of such rocks. However, their light δ13C values indicate that ~20% of their biomass may comprise methane-derived carbon and probably comes from the grazing of methane oxidising bacteria on their cases or on those of conspecifics.

How does a shift from filamentous chlorophytes to cyanobacterial (*Lyngbya wollei*) mats alter the trophic network in a large fluvial lake?

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The effect of the quantity and quality of food supplied by various primary producers (micro-epiphytes, vascular plants, filamentous chlorophytes and cyanobacteria) on the biomass, composition and trophic network of benthic invertebrates was examined in a large (about 300 km^2), slow-flowing fluvial lake of the St. Lawrence River (Quebec, Canada). For this, we took advantage of a gradient of physical-chemical-biological conditions in riparian wetlands, where upstream areas characterized by abundant filamentous chlorophytes gave way to downstream sectors dominated by cyanobacterial mats of *Lyngbya wollei*. Marked decreases in dissolved inorganic nitrogen (from 320 to 5 µg N L^{-1}), total phosphorus (from 29 to 9 µg P L^{-1}), and macrophyte biomass (from > 200 to < 100 g m^{-2}) occurred over the same 14-km distance. We examined the macroinvertebrate biomass, species composition and isotopic signature at increasing distance downstream of nutrient-rich tributary inflow, in order to assess the effects on the trophic network of these changes in macrophyte biomass and metaphyton composition. Between upstream and downstream stations, total macrophyte biomass (g dry mass m^{-2}) and macroinvertebrate biomass (mg g^{-1} of macrophytes dry mass) dropped four- and five-fold, respectively. Although Gastropods always represented a large fraction (47-92%) of total biomass, other taxa differed markedly along the upstream-downstream gradient. Oligochaetes and Chironomids, which are well-known indicators of eutrophic conditions, were abundant only at the upstream stations. Amphipods dominated at the downstream stations, where they colonized and fed on cyanobacterial mats. Invertebrate isotopic signature revealed that benthic cyanobacteria were consumed by invertebrates and thus contributed to the trophic network, in spite of their toxicity and lesser palatability. Our results indicate that invertebrate biomass is determined by macrophyte biomass (an indicator of overall food quantity), whereas macroinvertebrates species composition and size structure are rather influenced by the composition of primary producers (food quality). Furthermore, food quantity rather than quality could ultimately determine the carrying capacity of shallow riparian areas, since isotopic analyses showed that primary consumers indifferently utilize either algae or cyanobacteria where they occur and fish rely heavily on local opportunistic littoral invertebrates.

Influence of land use on hyporheos in Veľká Fatra Mnts. Catchment streams

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The historical influence of landscape on the quantitative variables and special groups of hyporheos in two streams with a similar origin but with different catchment landscape and forest management was studied. We examined how the structural and functional attributes of streams are related to catchments variables including land use. The study was done in two streams: (i) a preserved forested natural stream, where critical ecosystem processes had not been altered by human activities and (ii) a stream with strong anthropogenic stress (logging, agriculture, pasture) in the last 500 years and a variety of other factors that influenced the original stream conditions. Some parameters were strongly related to the land use gradient: conductivity, fine benthic organic matter (FBOD), orthophosphate (P_PO4) and periphyton content increased along the gradient; from a natural stream to urban-dominated catchment's a stream. The abundance of interstitial assemblages corresponded with the observed physicochemical parameters. The average abundance of hyporheos was higher in the urban-dominated stream catchments; and the Harpacticoida taxon richness was greater here (11 taxa vs 5) as well. That probably related with fact, that the content of fine particulate organic matter was more than two times higher than in forested stream. Crustaceans represented the main component of interstitial community with 14 taxa, including Cladocera, Cyclopoida, Harpacticoida, Ostracoda and Bathynellacea. Among of crustacean fauna the representatives of epigean harpacticoids from the Canthocamptidae family dominated. Stygobite species collected in streams were *Elaphoidella elaphoides, Bathynella natans* and archiannelid *Troglochaetus beraneckei*. The investigation was supported by the projects VEGA 1/4353/07 and SAV-FM-EHP-2008-03-04.

Long-term changes in habitat availability for arctic charr in a temperate lake

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Arctic charr (*Salvelinus alpinus*) are an endangered species in UK waters. A particular threat for the Arctic charr is habitat loss, caused by the twin drivers of eutrophication, with consequent oxygen depletion at depth, and climate change overly warming surface waters. We have examined these issues in Windermere, the largest natural lake in England, by combining long-term records of water temperature and oxygen concentration with more recently acquired hydroacoustic data. The long-term records show both a significant rise in water temperature and a decrease in oxygen concentration in the lake over the last 35 years, with more than 40 % of the south basin of the lake in the early autumn having had an oxygen concentration of less than 5 mg L^{-1}. Comparison with the hydroacoustic data reveals that the Arctic charr exhibit a strong behavioural response to not only avoid waters with an oxygen concentration of less than 2–3 mg L^{-1}, but also, as a population, to migrate vertically to higher oxygen concentrations whenever the oxygen concentration at depth in the lake is lowered. Despite this, there is a strong tendency for the Arctic charr to remain deeper than 10 m throughout the year, even in the winter when the lake is isothermal and the surface waters cool. Thus, the recent warming of the surface waters of the lake has not yet directly impacted upon the Arctic charr habitat. As such, it is the factors affecting oxygen depletion rather than those affecting water temperature that have been more important to the habitat loss of this endangered species.

Preferences of two expansive ponto-caspian gobiids, racer goby *neogobius gymnotrachelus* and monkey goby *apollonia fluviatilis*, for bottom substrates and macrophyte coverage

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Monkey and racer goby are successfully expanding their range in European rivers. They co-occur with each other, however, some differences in habitat use between them have been observed. Monkey goby prevails in more lotic habitats, whilst racer goby seems to be more abundant in more lenthic parts of rivers. We assumed that important factors, which may affect substantially habitat segregation between the gobiids, are also the nature of bottom substrates and macrophyte coverage. To check these hypotheses, we tested their preferences in 160-L tanks. Four different substrata (fine sand, gravel, small stones and mud) were offered simultaneously to single small (<7 cm total length) and large (>7 cm) fish. Alternatively, they could select among four different coverages of a macrophyte, flowering rush *Butomus umbellatus*: 0 (control), 111, 308 and 788 ind m^{-2}. We recorded fish movements among various treatments every 2 minutes for 3 hours using a camera. All monkey goby clearly preferred sandy bottom, while racer goby of both sizes evidently chose muddy sediments. Both species often buried themselves and hid in the preferred substrates. Moreover, monkey goby changed their positions more frequently and penetrated other substrates more often than racer goby, which revealed rather stationary behaviour and, apart from the preferred muddy areas, spent a little more time on find sand (small individuals) or gravel (large ones) than on the other materials. Small monkey goby slightly preferred open water areas (without or with the lowest density of macrophytes) over those covered by denser vegetation, whereas small racer goby mostly occupied areas with the highest plant density. Large individuals of both species spent more time among dense macrophytes. Our study shows that monkey and racer goby reveal clear habitat partitioning in relation to bottom substrates as well as macrophyte density. Probably, they are well adapted to coexist in the same location, which may favour their simultaneous expansion in novel environments.

The impact of eutrophication and climate change on Peipsi and Ijsselmeer: correspondence and ifferences in nutrient dynamics

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Natural factors (weather and ice conditions, water level etc) combined with human impact place long-term stress on lakes triggering changes in the ecosystem. The objective of the present study was to determine how do large lakes' Peipsi and IJsselmeer water quality react to coexisting human and natural stressors and, especially, to assess the role of natural variability in nutrient dynamics. Both lakes, Peipsi on the border of Estonia and Russia and IJsselmeer (including L. Markermeer) in The Netherlands are shallow, which differentiates them from other large European lakes. The lakes are situated between 50º N and 60º N and have biological communities that are to a great extent similar. However, the lakes also differ in many ways. Comparing Peipsi with man-made IJsselmeer highlights the influence of water level fluctuations and ice cover, which are absent on a regular basis in IJsselmeer. We elaborated and used a large joint statistical general linear model (JM), based on extended limnological data series available for both lakes. JM enables a detailed complex comparison and estimation of various dependencies between the ecosystem characteristics, e.g. eutrophication, and temperature fluctuations. JM is analysed with the SAS (Release 9.1) MIXED procedure, which realises powerful mixed-type analysis of variance (ANOVA) with various covariance structures. Our analysis demonstrate that indicators of eutrophication (e.g. total P and chlorophyll a concentration) are showing increasing tendency in L. Peipsi, while the strongly reduced man-induced external load has led to the re-oligotrophication of L. IJsselmeer. Recently, the water quality parameters in L. IJsselmeer are becoming better than in the southern, the most polluted part of L. Peipsi. Furthermore, the high-frequency fluctuations of total P in both lakes are correlated. Transboundary conditions complicate the implementation of policies that might prevent environmental damage in the Peipsi region. Comparative studies of Peipsi and IJsselmeer are highly important for determining which factors are driving spatial and temporal patterns in large lakes as well as measuring the ecosystem's capacity to recover from disturbances.

Preferences of the Ponto-Caspian amphipod *Dikerogammarus haemobaphes* for the habitat formed by living zebra mussels

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A Ponto-Caspian amphipod *Dikerogammarus haemobaphes* has recently invaded European waters, where it encountered well-established populations of a habitat-forming bivalve *Dreissena polymorpha*. These two species co-occur in their native Ponto-Caspian range. We assumed that the gammarids in newly invaded areas could benefit from the habitats provided by mussels. We checked whether they are able to detect and select a habitat containing living mussels and attempted to disclose cues used in that selection. We hypothesized that the gammarids might respond to such traits of a living mussel as (1) byssal threads, (2) activity (valve movements, filtration) and/or (3) shell surface properties. We tested these hypotheses in laboratory, using various objects glued to plastic tiles (10 x 10 cm). They were presented to gammarids in the following pairwise combinations: (1) living mussels vs. their empty shells (glued together to imitate living individuals), to check the gammarid preference for living mussels; (2) living mussels vs. shells with added byssus and shells without byssus vs. shells with added byssus, to test the effect of byssal threads; (3) living mussels vs. shells, both coated with nail varnish (neutralizing the differences in surface structure) to test the effect of mussel activity; (4) varnished vs. clean living mussels and varnished vs. clean shells to test the effect of shell surface properties; (5) varnished shells vs. varnished mussel-shaped stones to check the effect of shell shape; (6) varnished vs. clean stones to control for the effect of varnish. We put single gammarids into experimental tanks and determined their positions after 24 h. They preferred clean living mussels over empty shells and over varnished mussels, as well as clean shells over varnished ones. As they did not distinguish between clean and varnished stones, we can exclude the negative effect of varnish. Thus, the attractant was associated with the shell surface and its effect decreased after a mussel's death. The gammarids also responded to the shell shape, but not to the byssal threads or mussel activity. The ability to detect and actively select zebra mussel habitats may be beneficial for an invasive gammarid and help establish stable populations in non-native areas.

Long-term and seasonal changes of planktonic food webs in Rybinsk reservoir (Upper Volga, russia): the importance of microbial loop

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Long-term studies (1965-2007) were carried out in a mesoeutrophic Rybinsk reservoir (surface area – 4550 km2, mean depth – 5.6 m) located in the Upper Volga Region (Russia). In the region an intense increase of air temperature as well as a significant rise of water temperature has been observed since 1976. Long-term data on phytoplankton pigments concentration and primary production rates evidence of the reservoir eutrophication. In 1977-2007 the total plankton biomass (including phytoplankton, bacteria, heterotrophic flagellates, ciliates and zooplankton) increased more than two folds and reached 500-600 mg C m^3. Phytoplankton and carnivorous zooplankton biomass was growing faster than bacterial and protozoan biomass. Therefore the portion of microbial loop in the total plankton biomass decreased. Among protozoans, a decrease of biomass of spring psychrophylic species of ciliates and an increase of heliozoan biomass in summer time were recorded. On an annual basis, the contribution of phytoplankton, microbial plankton (including bacteria and protozoans), and metazoan plankton to the total planktonic biomass was approximately 70%, 20% and 10%, respectively. Earlier the summer peak of abundance and production of heterotrophic bacteria in Rybinsk reservoir was either lower or comparable with the spring maximum but since the 1990s it has become stably higher. Similar changes have occurred in a pattern of seasonal fluctuations of chlorophyll concentration in water and primary production of phytoplankton. The seasonal biomass allocation pattern is characterized by a dominance of protozoan in spring and herbivorous crustaceans (mainly daphnids) in early summer. The peaks of biomass of microbial community were observed in spring and late summer. Seasonal changes of the higher trophic level – zooplankton, apparently determined the changes in seasonal variation of microbial loop – both protozoans and bacteria. This work was supported by the Russian Foundation for Basic Research (project # 08-04-00441a).

Bacterioneuston enzymatic activity in humic lakes

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Activity of bacterio-plankton and neuston were studied in two dystrophic lakes of different contain of organic matter. Both lakes were acidic (pH about 5.0) and colour was much higher in polyhumic (631 μg Pt L^{-1}) than in oligohumic (30) what could be related with concentration of dissolved organic carbon (38 to mg 11 C L^{-1}). However in polyhumic lake concentration of DOC was higher than in oligohumic enrichments of surface microlayer was the same (Ef=1.1). SUVA (Abs_{260}/DOC) was near five times higher in polyhumic lake (what testify about more aromatic kind of matter of allochthonus origin) but higher values were determined in subsurface water. Concentration of phosphorans and different forms of nitrogen in both lakes and layers was on the same level. Bacterial abundance was slightly higher in polyhumic lake and stabile enrichments of surface layers were determined in both lakes. Bacterial production was higher near five times in polyhumic lake but in both lakes was higher in subsurface water. Polyhumic lake have been characterized by slightly higher activity of bacterioneuston and plankton due to some enzymatic activities like aminopeptidase, alkaline phosphatase, glucosidase and lipase. However enrichments factors were higher in oligohumic lake.
It could be stated that thought polyhumic lake is characterized as more eutrophic with higher concentration of organic matter, nutrients and more active bacteria according to oligohumic lake thereto enrichments of surface microlayer of chlorophyll a, aminopeptidase, alkaline phosphatase and lipase was higher in the second one.

Effects of land use on macrozoobentos in submontame streams (West Carpathians, Slovakia)

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Effects of land use on benthic fauna were investigated streams Ľubochnianka and Revúca (upper Váh River catchment). Two reaches (upper and lower) were studied in each stream. The degree of intensity of land use differs between catchments (Ľubochnianka –primarily forested catchment; Revúca – markedly deforested catchment). The study reaches are of the fifth order, located in the submontane area (metarhithral, altitude 480 - 650 m a.s.l.). Mixed and coniferous forests predominate in the Ľubochnianka catchment. The streams flow in parallel valleys, separated by the main ridge of the Veľká Fatra Mts.
Mesolithal was dominant substrate in all reaches. In comparison to Ľubochnianka, in Revúca the share of fine substrates (microlithal, psammal) was superior and maximum water temperature and conductivity were higher, phosphate concentrations were significantly higher and those of nitrates were moderately higher, mainly in lower part of the flux. Algae mats and FBOM were also higher in the Revúca. Positive correlation was recorded between water temperature and phosphorus value. In contrast, by increasing temperature and phosphorus, the concentration of oxygen significantly decreased. Negative correlation was recorded between nitrogen and phosphorus values.
Decrease in macrozoobentos abundance was observed along the river continuum. About 1.5-times higher abundance was recorded in upper reaches of both streams. Biomass was 1.7-times higher in Revúca. This confirms the unnaturally high trophical potential that is result of higher values of phosphates and conductivity (eutrophication). Increased values of nitrates and FBOM due to erosion and increased abundance of consumers (collectors – gathers) were found in Revúca. Mainly stoneflies reacted very sensitively and negatively to increased phosphates values, conductivity and water temperature. The reaction to increased oxygen was positive. Different occurrence strategy as a result of landscape degradation was recorded in stoneflies and blackflies. For example *Taeniopteryx auberti*, the predators *Isoperla oxylepis*, *Dinocras cephalotes* and *Perla marginata* (Plecoptera), *Prosimulium rufipes*, *Simulium monticola* (Simuliidae, Diptera), react quickly to landscape changes. In contrast, *Leuctra fusca* (Plecoptera), *Simulim ornatum*, *S. argenteostriatum*, *S. equinum* and *Simulium reptans* (Simuliidae, Diptera) are tolerant.
The study was supported by projects 1/4353/07 and 1/4355/07 of the VEGA Grant Agency and grant SAV-FM-EHP-2008-03-04.

The occurrence of leeches (*hirudinida*) on localities with different anthropogenic influence

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The occurrence of leeches was surveyed in the area of the Bohemia Uplands (České středohoří) protected landscape area and surrounding areas (both Czech Republic). Minimally influenced localities and also those with considerable anthropogenic influence (especially because of brown coal mining) were chosen for the research. In May 2007 almost all of the bodies of stagnant water in this area were sampled, totally 48 localities, the occurrence of leeches was detected on 45 of them. Totally, 2567 individuals falling into 11 species and 4 families were recorded.
Leeches were collected manually by tweezers for one hour. At each locality, physical-chemical variables, substratum composition, size of fish stock and amount of available diet were recorded.
The species data and the environmental data were analyzed by indirect gradient analysis (DCA), direct gradient analysis (RDA, CCA) and factors with the highest influence on the occurrence of leeches were found.
All localities were divided into three groups according to the rate of anthropogenic influence, considering the total character and morphology of the water body as the most important parameters. Box-plots showed that chosen groups differed also in chemical parameters, but differences were not significant in all parameters. Differences in parameters of general character of locality (altitude, percentage of shadowed area of water surface, substratum composition expressed by phi value) were much more evident. The group of localities with low anthropogenic influence (18 localities) and high influence (13 localities) were surveyed separately. The main factor for occurrence of leeches on both types was found. Differences in abundances of common species and total numbers of adult individuals were also observed.
Results showed that altitude had remarkable influence in the studied area. A percentage of shadowed area of water surface was another important factor. It apparently affected water temperature and trophy. Nitrates were the most important chemical variable. Other significant parameters, which affected the occurrence of leeches, were size of fish stock and substratum composition.
Amount of available diet was the most important parameter on localities with low anthropogenic influence, PO43- was important for localities with high influence. There were fewer leeches on non-affected localities.

Ecological characteristics of non-marine ostracods (crustacea) from Erzincan (Turkey)

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A total of 30 taxa were collected from 89 different aquatic habitats of Erzincan during the summer (July-August) of 2006. The maximum number of taxa found from a single station was six. Canonical correspondence analyses explained about 71.4% of the species and environment correlations. The influence of water temperature on species ($p = 0.02$) was significantly higher than the other factors used. Based on quantitative data, the most frequently occurring species based on their ecological characteristics were clustered into three main groups by Unweighted Pair Group Mean Analyses. Both tolerance and optimum estimates and Environmental Tolerance Index showed that species with cosmopolitan characteristics had usually high levels of optimum and tolerances to different variables. Results suggest that once ecological characteristics of individual species are known, it is possible to use such knowledge in reconstruction of past ecological conditions. Since most individual ostracod species' habitat preferences are not known, future studies should be concentrated on particular habitats.

Variability of the leaf litter processing in headwater streams of the Iberian Peninsula

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Leaf litter processing is lately being proposed for biomonitoring streams as it involves an ample array of biotic and abiotic factors. Nevertheless, a great effort should be made to record its natural variability in order to interpret and understand with confidence the response of this process to the different environmental affections. In this context, we studied the variability of the leaf litter processing in four regions, from North to South, of the Iberian Peninsula: Cantabrian mountains, Catalan coastal mountains, Sierra de Guadarrama and Sierra Nevada. These four areas cover a latitudinal gradient of 700 km and differ in continentality. Alder (*Alnus glutinosa* (L.) Gaertn.) leaves, collected all in the Cantabrian region, were incubated in 5mm mesh bags at 4-7 sites in each area in winter 2007-08. In each of the four samplings performed, stream water was taken for physicochemical analyses and carbon, nitrogen and phosphorus were determined in the remaining material. Abundance of hyphomycetes and macroinvertebrates associated to the process was estimated in one of the sampling occasions. Inter- and intraregional variability was detected in the processing rates. Taking all the streams into account, we observed a significant positive correlation between the processing rate and the mean slope of the upstream channel, suggesting an effect of hydrology in the process. There were noticeable differences in the number of associated organisms even among sites having similar processing rates. Our study highlights that the contribution of the agents implied in the leaf litter processing vary among different regions making difficult to establish a simple model.

Pressure-health status-impact model and macro-zoobenthos bio-ecological traits use for the evaluation of road de-icers impact on two springs of the granitic Vosges Mountains, France

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Many countries have conducted research works on the pollutant potential of road de-icers (NaCl mainly). Most of them targeted the water resource as the impact priority, but few of them tried to evaluate the salt impact on the freshwater biocoenosis integrity. No relevant studies have been published on this topic in France, though French winter road maintenance services have annually used 700 – 1,500 kt road de-icers over the past 40 years. However, for the last three years, the Laboratoire Régional des Ponts et Chaussées (Nancy, France) has been working on a Pressure-Health Status-Impact (PHSI) model to evaluate the road de-icers impact on freshwater ecosystems.

This PHSI model is based on a Geographic Information System (GIS), where the pressure indicator corresponds to the salt quantity affecting a watershed (t/km²/winter); health status combines different environmental information such as: watershed surface, watershed drainage density, Stahler order, land occupation, topography, geology and climatic characteristics and impact indicator is dedicated to chloride concentrations ratio between a reference and impacted situation.

This model could be used as a decision-making tool, but needs improvements, in particular in its ability to evaluate the road de-icers impact on the biological compartment, before being tested by road managers. Our main objective was to analyze the response of the benthic invertebrate assemblages on two springs to salt contamination using their ecological traits.

The field study was conducted in the Vosges mountains (North-Eastern of France). The sampling sites were chosen to illustrate the last two winters' (2007-2008) contrasting levels of pollutant pressure (i.e. 0,5t for a 0,09 km² watershed and 54,6t for a 0,49 km² watershed). Our work first aims at demonstrating the usefulness of macro-zoobenthos life traits for indicating diffuse pollutions such as de-icers salt contamination. Then, a bio-indication tool was defined for this kind of stressor. Finally, the robustness of the PHSI model was evaluated by coupling the field biological observations to the theoretical impact given by the model.

Phytoplankton diversity and dynamics in the r. Loire

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A long term survey of the French river Loire phytoplankton has been carried out at several sites along more than 800 km. Composition and biomass are evaluated across contrasting hydrological and meteorological conditions, aiming to understand the main controlling factors. The overall pattern of phytoplankton composition can be compared to other European rivers, but we underline here a very high taxonomic diversity, mainly explained by the comparatively moderate flow and water level regulation in the R. Loire. Indeed, different types of backwaters still exist in most sections, which create habitats for phytoplankton and may influence the diversity of the micro flora in the main channel, especially in green algae and cyanobacteria. After several decades of high levels of chlorophyll a and biomass, a recent decrease is noticed. This reduction may be related to a significant reduction of phosphorus inputs throughout the watershed, which has led to visible decrease of reactive soluble P in the main river. However, the invasion of the Loire watershed by *Corbicula* spp. could also have contributed to the reduction of phytoplankton biomass. Simulations with a non-stationary potamoplankton model developed for regulated rivers are used to test how phytoplankton dynamics in the R. Loire respond to variations in physical factors, nutrients and biotic interactions.

The river Thames landscape strategy: working in partnership to meet common aims

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The River Thames is of major socio-economic & environmental importance and a significant source of freshwater that flows through the centre of London. The Thames Landscape Strategy provides a vision to 'conserve, promote and enhance these facilities'. The aim of this paper is to summarise some of the important long-term datasets that assist in the management of the River Thames and to show how integrated community action has made a significant difference in the last 20 years. With changing climatic conditions, fluvial flooding is becoming more frequent and the management of parts of the river is complicated by tides that can exceed 7m. Policy issues specifically relating to flood management have been taken forward by the Department for the Environment Food & Rural Affairs, a Government Department in their strategy 'Making Space for Water'. This includes the concept of restoring lost flood plains. A regulatory body, the Environment Agency has also developed a vision called Thames 2100 that also has to encompass EU legislation such as the Water Framework Directive, Habitats and Birds Directives. We propose to summarise what these strategies are attempting to achieve in the part of the river known as the Arcadian Thames. This area of the Thames is subject to fluvial and surface water flooding and has been extensively modified but benefits from collective community actions that generate a sense of well-being and purpose. Management options recognise the importance of being able to value different types of ecosystems and some of these will be described. The Thames Landscape Strategy includes education and out reach initiatives which seek to inspire current and future generations about the uses and management of the river. This includes identifying flora and fauna, foreshore discovery days, producing walking leaflets and interpretation panels as well as implementing a programme to control invasive species. A vision of good practice will be summarised that may be applicable to other EU rivers.

Combined refuges in humic lakes - a secret of survival?

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Brown-water, humic lakes are common in temperate, boreal region of the globe. Humic substances absorb light very effectively, especially short wavelengths. Therefore brown-water lakes are dark in general and light climate is dominated by the red part of the spectrum. The strong thermal stratification produces a barrier for oxygen transport from air to deeper water layers. Both low light and low oxygen concentration could enhance a refuge for planktonic prey, since fish are visually oriented predators and most of them are not tolerant of low oxygen. Our earlier experimental study with Chaoborus and fish showed that only combination of two different types of refuges – physiological and visual – could create powerful shelter against fish predation. In humic lakes these both refuges are available. We examined experimentally the strength of humus as visual refuge against fish predation and compared the utilization of combined refuges in two lakes differing in water colour; in polyhumic Lake Majajärvi (water colour 200 mg Pt l^{-1}) and mesohumic Lake Iso Valkjärvi (water colour 60 mg Pt l^{-1}).
The results from experiments showed that high water colour or low light intensity did not protect Chaoborus from fish predation. In the lakes, Chaoborus utilized combined refuges; in polyhumic lake larvae occupied in the water layer with less light and more oxygen and in mesohumic lake in water layer with more light but less oxygen. Interesting finding was that in both lakes the upper limit of the occurrence of Chaoborus in the water column was exactly in the same photic environment; Chaoborus were situated in the depth were the irradiance was <1 mW m^{-2} in wave length 693 nm. Universality of this phenomenon will be investigated more detaild in the future.

Downstream dispersal in lowland streams - a matter of habitats?

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We investigated the dispersal of macroinvertebrates from near-natural sites to degraded sites in small German lowland streams. Eight streams were selected which had a long river section of near-natural hydromorphology and which were colonized by a reference invertebrate community. At each stream sampling took place in the near-natural section and in the following distances (to this section): 200m, 500m, 1000m and 2000m. Macroinvertebrate samples were identified on the species level and analysed in terms of similarity of sections and the presence and absence of indicator species for in-stream habitats. Furthermore, a river habitat survey of the downstream degraded sections provided information on the habitat availability and served for correlation analysis. We will present answers to the question if the availability or the quantity of microhabitats determines the presence and the establishment of species. Furthermore, the potential distance of downstream dispersal in small lowland streams is analysed.

Invertebrate community composition and biodiversity in Mediterranean coastal lagoons

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Coastal lagoons are ecotonal habitats between marine, freshwater and terrestrial environments. They are very heterogeneous ecosystems characterised by its high variability and subjected to the influence of extreme physical forces and variables (e.g. sea storms, salinity, temperature). Moreover, coastal lagoons suffer from significant anthropogenic and natural pressures affecting ecosystem processes, and the biotic communities. In this study we analyse the invertebrate community composition of coastal lagoons from the Balearic archipelago (Mediterranean ecoregion), and the different scales and forms of their diversity. Thirty coastal lagoons (forty-seven sampling sites) of different salinity (oligohaline, mesohaline and euhaline) from four islands (Majorca, Minorca, Ibiza and Formentera) were sampled during the years 2005-06. We sampled the benthic littoral invertebrate fauna of the lagoons and a number of environmental and landscapes variables (inorganic dissolved nutrients, chlorophyll a, ions, salinity, pH, temperature, dissolved oxygen, area and depth). Multivariate analyses were used to relate invertebrate communities with environment and landscape variables. The fauna from the small islands Ibiza and Formentera (Petiusses islands) showed to be similar, but different to those of Majorca and Minorca. However, these latter two islands also differed in composition. The invertebrate community from lagoons in Petiusses islands was characterized by the diptera Ephydra and the ostracod *Cyprideis torosa*; Minorca for a heterogeneous group of taxa, including dipterans, ostracods, oligochaeta, gastropoda, and amphipods amongst others; Majorca mainly by the gastropod *Hydrobia ventrosa*. All salinity types of coastal lagoons (oligohaline, mesohaline and euhaline) displayed different invertebrate community composition. Oligohaline sites were inhabited by a diverse group of taxa such as dipterans, ostracods, oligochaeta and isopods, while more brackish and marine water taxa were typical of the mesohaline (e.g., *Hydrobia ventrosa*) and the euhaline (e.g., *Ephydra sp. Cletocamptus retrogressus*) environments. Patterns of diversity and its relationships with explanatory variables, such as those indicating eutrophication, were explored, providing differences between islands and lagoons of different salinity. We discussed the implication of our results for the conservation of Mediterranean coastal lagoons

The role of minnows in the trophic transmission of the manipulative parasite *Pomphorhynchus laevis*

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Parasites are now recognized as full participants in the functioning of ecosystems. This is particularly the case for trophically-transmitted parasites, because most of them are able to change trophic relationships between predators and prey. By manipulating the phenotype of their intermediate hosts, they increase the vulnerability of these preys to the predation by definitive hosts. Ecological implications of manipulative parasites may nevertheless be biased by our imperfect knowledge of parasites' life-cycle or specificity. *Pomphorhynchus laevis* is an acanthocephalan which uses several amphipod species as intermediate host and numerous fish species as final host. During a fishing campaign aiming to measure the specificity of *P. laevis* towards its definitive hosts, we found an important proportion of minnows (*Phoxinus phoxinus*) harbouring larval stage of the parasite (cystacanth) in their abdomen. This infective stage has never been reported elsewhere than inside freshwater amphipods, and minnows were known to serve only as definitive hosts for *P. laevis*. We investigated how parasites are distributed in natural populations of minnows (prevalence, parasite load and viability according to fish size class) to get information about their fate once inside this new host. In the laboratory, we performed experimental infections with either parasite eggs or cystacanths to identify how minnows get infected with this parasite. We then performed behavioural tests under microcosm conditions to explore whether parasitized minnows behave in a way that may increase their vulnerability to predation by larger fish, where *P. laevis* can achieve its life-cycle. Taken together, field and laboratory data suggest that minnow may be an overlooked intermediate, rather than paratenic, host for *P. laevis*, a paratenic host being a facultative host where no development takes place for the parasite. The importance of these new data for both our knowledge of parasitic life-cycles and the trophic implications potentially induced by this new host are discussed.

Effects of pond management on water quality for irrigation and on the assemblages of aquatic fungi

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More than half of the ponds referenced in a recent inventory of artificial ponds in Andalusia (Southern Spain) are concentrated in greenhouse areas of Almería and are used for supplying drip irrigation systems. These systems require good quality water, especially concerning the presence of abiotic and/or biotic particles that may cause clogging problems. Farmers carry out different managements strategies in their ponds to reduce the presence of aquatic organisms and to prevent the proliferation of aquatic fungal pathogen. With this purposes, many farmers apply biocides (mainly copper sulphate), others cover their ponds with black screen-nets to prevent light penetration. The goal of this study is to determine how these management techniques influence water quality and fungal assemblages, particularly concerning the presence of potential plant pathogens. We surveyed 100 irrigation ponds, which were characterized in terms of water chemistry, suspended solids, planktonic chlorophyll a, % cover of submerged macroalgae and macrophytes (SAV), and heavy metals in sediment. Pond management was characterized throughout farmers' interviews. Species richness and composition of the fungal assemblage were studied in 15 ponds selected to represent different types of management. Our results show that the management guided to delete biotic activity applying biocides impairs water quality in the mid-term, particularly in ponds with SAV. These ponds when no treated or scarcely treated with biocides exhibited the best water quality, similar to that of ponds covered with plastic screen-nets. Fungal assemblages were significantly more diverse, also higher densities, in ponds with SAV compared to other pond types. No significant differences among pond types were detected for the presence of potential fungal pathogens. These results suggest that biocide application is not an effective management technique, at least in the mid to long term.

Global warming as a driver of biodiversity in karst streams?

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Karst regions are particularly susceptible to a decrease in annual precipitation and an increase in evapotranspiration, factors entailed by global warming. As a consequence, flow intermittency is expected to become more pronounced. We hypothesized that enhanced intermittency leads to a decrease in biodiversity on the alpha level, however, to an increase on the beta level, owing to (1) spatial isolation of communities and (2) to intrusion of invaders and species adapted to temporary flow. Consequently, also an augmentation in biodiversity on the gamma level is assumed. Data on benthic biodiversity were obtained from 27 streams on the Paderborn plateau (Germany, North Rhine Westphalia), comprising 44 sampling sites with permanent flow and 57 sites showing pronounced intermittency in runoff. The record encompassed 391 taxa, the majority identified as species. Data analysis in reference to flow categories revealed a near-linear relationship between duration of stream drought and decrease in taxa number of approx. 40 % per 100 days. Correspondingly, taxa number (alpha diversity) on average was 37 % lower at sites with intermittent flow, although permutative taxonomic dissimilarity was significantly greater (0.86, Bray-Curtis) than in permanent sites (0.78, Bray-Curtis). In how far a wider spectrum of environmental conditions is responsible for the observed effect is to be discussed. Furthermore, the importance of invasion and local community shift had been observed in populations of gammarid and trichopteran species. Against our assumption, taxa number at intermittent sites was slightly lower (-2 %), though. Their contribution to gamma diversity was not significant as extrapolated from permanent sites. On the basis of our findings we conclude that diversification of habitats and locally confined shifts of the benthic faunal composition is the key feature of changes in biodiversity expected under global warming.

Increased sediment load disturbance effects on stream macroinvertebrates

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Increased sediment loads may severely affect conditions in freshwater habitats (turbidity, water temperature, oxygen content, quality of benthic habitats, food sources, water chemistry, introduction of contaminants and pathogens). Such disturbance can be a result of natural processes (bank erosion) or of human activity. Here we deal with the latter- fine sediments produced by quarrying and rinsing the extracted material in stream. We analyzed effects of increased sediment load disturbance on water chemistry and macroinvertebrate assemblages focusing on the changes in occurrence of: 1) permanent against temporary fauna in the benthic habitats and 2) early (1st-3rd) against late (4th-5th) larval instars of Ephemeroptera, Plecoptera and Trichoptera. This approach was employed to assess the effects on organisms of different preferences and sensitivity in order to attain insight on recovery potential of the stream. The study was conducted at 'Jelenje vode' stream on the northern slope of Medvednica Mountain, NW Croatia. Sampling was done on four dates using Surber sampler at four sites along the stream, one was a control site situated upstream of the quarry. Permanent fauna was decimated at sites downstream of the quarry. Total numbers and diversity decreased severely along the entire study reach. Similar effect was noted for the temporary fauna however 3 km downstream of the quarry temporary fauna recovered in numbers. Chironomidae fauna dominate at this site (>60%) so the structure and the diversity of the assemblage is significantly diminished compared to the control site. Both the early and the late EPT instars were severely affected by the disturbance (more than 84% loss downstream of the quarry). The abundance of EPT instars 3 km downstream recovered significantly and reached 31% and 54% of the control site numbers for early and late instars respectively. We found that the specific cause for such a destructive effect were significantly increased temperature and decreased dissolved O2 content and pH value. Given the vitality of the upstream area, vicinity of similar habitats as well as lack of toxic effects of the sediment load we believe that the recovery of affected sites would be swift and successful upon the closure of the quarry.

Impact of heavy metals on interstitial fauna: the example of Arieş River (Romania)

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The Arieş River (north-western Romania) is a good model for the study of interactions between surface aquatic fauna and interstitial groundwater fauna, in the ecotone zone represented by the river bank sediments. This river is one of the most polluted in Romania, the area was known as very important in ore exploitation, especially gold and heavy metals. Our preliminary and sporadic results indicated a change in interstitial communities' composition in the polluted river section and the extraordinary flourishing of stygobiontic forms. Beginning with November 2007 we made again a more systematic study, by sampling monthly interstitial fauna, water from surface and interstitial, and sediments. We used a Bou-Rouch pump and sampled at about 1.5 m in depth, filtrated the water and analyzed water and fauna in laboratory. Beside these, superoxide dismuthase activity was determinate in laboratory from organisms' tissues and fluids, as good indicator of stress induced by environmental factors (such as pollutants in our case). Water chemical analyses show increasing pollution in the section of the river. Surface and interstitial waters have similar chemical composition without reaching critical values, while sediments show high degree of pollutant accumulation. Fauna composition can be also correlated with water quality. Almost all specimens were identified at species level. Fauna differences between clean and polluted sections are obvious, and seasonal variations are also discussed. The conclusions are emphasizing the role of competition in groundwater colonization and the highly dynamics of aquatic fauna, both of surface or groundwater origin, in the interstitial ecotone.

Changes in freshwater invertebrate feeding specialization and competition in a context of anthropogenic perturbations

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Benthic invertebrates are key components of food webs in particular by contributing to the transfer and transformation of allochtonous organic matter in river ecosystems.
Many benthic invertebrates are known for their sensitivity to anthropogenic perturbations. One potential impact of perturbation is structural modifications in communities which can lead to functional changes. Trophic processes could be altered if community structure is deeply modified.
Potential biological and ecological traits are a useful tool for studying functional characteristics of invertebrate communities. Focusing on two biological traits that describe the "food" and "feeding habits" of invertebrates, we quantified the specialization level of taxa and the intensity of trophic competition within benthic assemblages in selected mesohabitats of reference versus impacted sites.
Several indices, including a new competition index, allow us to quantify the "trophic specialization" and "trophic overlap" of taxa and the within-community "trophic competition intensity". The response of indices to four different perturbation types (i.e. acidification, organic pollution, habitat degradation and toxic pollution) was investigated for communities living in three mesohabitat types ("cobbles", "plants" and "litter") in 6 rivers of North-eastern France.
Our results highlighted variable alteration in trophic structure depending on the perturbation and habitat types. The most drastic alteration was observed for invertebrate communities living in cobbles when subjected to organic pollution. Impacted communities were generally less specialized and exhibited lower trophic overlap than those living in reference conditions.
The competition intensity was slightly affected by perturbation. Only organic pollution seemed to reduce competition intensity, but this trend was only significant for communities living in litter.
This study suggests that perturbation, especially organic pollution, may alter trophic processes in rivers, through qualitative and quantitative modifications in trait profiles of taxa within benthic communities.

Mutualistics effects of the complex *Paramecium bursaria***-C***hlorella vulgaris* **on** *two ciliates: Colpidium striatum and Tetrahymena pyriformis*

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Within ecosystems, individuals are submitted to many abiotic and biotic environmental pressures such as inter or intraspecific resource competition. Many strategies have been developed to increase organisms' competitive ability: rapidity, size, prehension, picking speed… Organisms may also deter competitors with spiteful behaviour such as allelopathy that is the release, in the medium, of compounds affecting sensitive organisms.
In order to test the effectiveness of allelopathy in resource competition, we use as a model the symbiotic complex protist - phytoplankton *Paramecium bursaria - Chlorella vulgaris*. *C. vulgaris* is known to produce compounds that may prove toxic. We run two experiments with two ciliates, *Tetrahymena pyriformis* or *Colpidium striatum* as a competitor of *P. bursaria* for bacteria. In each experiment, we follow population dynamics in 7 treatments:
(1) *P. bursaria* alone with *C. vulgaris*,
(2) Free *Chlorella- P. bursaria*,
(3) *C. striatum* or *T. pyriformis* alone,
(4) *P. bursaria* with *C. striatum* or *T. pyriformis*,
(5) Free *Chlorella- P. bursaria* with *C. striatum* or *T. pyriformis*,
(6) *C. striatum* or *T. pyriformis* with extract of *P. bursaria* culture
(7) *P. bursaria* with extract of *C. striatum* or *T. pyriformis* culture.
In a second time, we test competitive ability of each species with the measure of the R* value of each species. This allows use to test the hypothesis that a competitive disadvantage, measured by a high R*, may be compensated by negative allelopathics interactions.
We show that *C. striatum* and *T. pyriformis* are best competitors than *P. bursaria* and free *Chlorella- P. bursaria* with mechanist R*-rule.
While free *Chlorella- P. bursaria* maintains a small population when alone, it is excluded in presence of *T. pyriformis* and *C. striatum*. *P. bursaria* population coexists with *C. striatum* and excludes *T. pyriformis*. These different results show the importance of symbiosis for the persistance of *P. bursaria* when alone and in competition with other protists.
The experiment with *C. striatum* shows that the mutualistic interaction between *P. bursaria – C. vulgaris* allows their persistence and in this case, allelopathy may compensate a competitive disadvantage.

Current status of the Bohemian Forest lakes: further progress in the recovery from acidity?

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A new limnological survey of eight small glacial lakes in the Bohemian Forest (Šumava, Böhmerwald) was performed in September 2007 in order to evaluate the recent progress in their chemical reversal and biological recovery. The lakes were severely affected by atmospheric acidification, which peaked in the first half of 1980s, and resulted in a drop in pH, increase in aluminium concentrations and a conspicuous reduction of biodiversity in some lakes (in particular impoverishment of crustacean zooplankton and extinction of fish). Since the late 1980s, reversal from acidity has taken place as a consequence of a significant drop in deposition of acidifying pollutants. Current data on chemistry of lake water and tributaries, species composition and biomass of the plankton, as well as littoral macrozoobenthos were compared with results of long-term monitoring including two analogical surveys of 1999 and 2003. The lakes continued to substantially differ in their acidification status and phosphorus loading, which was reflected in variations in the total amount and structure of plankton biomass among the lakes. Whereas heterotrophic bacteria were dominant in most chronically acidified lakes, crustacean zooplankton together with phytoplankton formed the major part of pelagic biomass in the recovering lakes. Compared to the past surveys, we observed an important decrease in the proportion of filamentous bacteria, which formerly represented the dominant component of biomass in the acidified lakes. The ongoing progress in zooplankton recovery was documented namely by findings of several new or previously extinct rotifer and crustacean species. However, no significant amelioration of key parameters of water chemistry was observed in comparison with the survey of 2003. The present study represents a further evidence of a delayed response of biota to chemical reversal of the lakes.

Relationships between morphometry, geographic location and water quality parameters of European lakes

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We addressed the question how lake and catchment morphometry influences water chemistry and water quality over a large scale of European lakes.We analysed the data of 1337 lakes includes in the European Environment Agency (EEA) database, carrying out separate analyses for three basic lake types: large lakes (area #100 km^2, 138 lakes), shallow lakes (mean depth #3 m, 153 lakes), and large and shallow lakes (area #100 km^2 and mean depth #8 m, 35 lakes). The study revealed that in Europe, the lakes towards North are larger but shallower and have smaller catchment areas as the southern lakes; lakes at higher altitudes are deeper and smaller and have smaller catchment areas than the lowland lakes. Larger lakes have generally larger catchment areas and bigger volumes, and they are deeper than smaller lakes, but the relative depth decreases with increasing surface area. The lakes at higher latitudes have lower alkalinity, pH and conductivity, and also lower concentrations of nitrogen and phosphorus while the concentration of organic matter is higher. In the lakes at higher altitudes, the concentration of organic matter and nutrient contents are lower and water is more transparent than in lowland lakes. In larger lakes with larger catchment area the alkalinity, pH, conductivity and the concentrations of nutrients and organic matter are generally higher than in smaller lakes with smaller catchments. If lake is deep and/or its residence time is long, the water is more transparent and the concentrations of chlorophyll *a*, organic matter and nutrients are lower than in shallower lakes with shorter residence times. The larger the catchment area is with respect to lake depth, area and volume, the lower is the water transparency and the higher are the concentrations of the nutrients, organic matter and chlorophyll, as well as pH, alkalinity and conductivity. The links between lake water quality and morphometry become stronger towards large and shallow lakes. Along the decreasing gradients of latitude, altitude and relative depth, the present phosphorus concentration and its deviation from the reference concentration increases.

Feeding efficiency of perch (*Perca fluviatilis*) and roach (*Rutilus rutilus*) in varying turbidity - an individual-based approach

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The feeding efficiency of of perch (*Perca fluviatilis*) and roach (*Rutilis rutilus*) on *Daphnia pulex* with increasing turbidity was tested in aquarium experiments. The feeding rate of *P. fluviatilis* showed high individual variation at low and moderate turbidities, when one *P. fluviatilis* had consumed more cladocerans then any other individual, whereas no such heterogeneity in feeding efficiency was observed with *R. rutilus*. There was a significant decrease in total consumption of *D. pulex* by *P. fluviatilis* with increasing turbidity, but no correlation was observed in the case of *R. rutilus*. Our results suggest that the difference in the trajectory of *P. fluviatilis* and *R. rutilus* may be detectable as behaviour-related species-specific trait differences in the early planktivorous stage of the two common species.

On the edge; invertebrate assemblages in geothermal affected sub-arctic streams

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Geothermal streams are an example of extreme environments. The fauna and flora of such environments are not only affected by the heat, but also by the chemical composition of the geothermal fluids. This may be a sever constraint for the freshwater organisms to colonize geothermal streams and therefore, both temperature and water chemistry may exclude certain species. Additional constraints affecting the biota of geothermal streams in temperate and Polar Regions is photoperiod seasonality at the same time as there is little or none seasonality in temperature. The lack of sufficient light during the winter months will inevitably affect primary production and therefore secondary production which may have to relay on the detritus pool to great extend.
Due to the volcanic activity, geothermal affected streams are widespread in Iceland, both related to the low and high temperature geothermal fields. A comparative study on geothermal streams in three high temperature geothermal areas was conducted in 2002-2003, with the main focus on the abundance and biodiversity of macro-invertebrates. The sampling was carried out three times: early and late summer with comparative sampling a year later. The streams fulfilled three categories, acidic streams, neutral streams and highly modified streams influenced by geothermal utilization for power production.
The main results show a clear geographical distinction in the community structure of the stream invertebrates. An apparent distinction was in the faunal assemblages of the geothermal streams in comparison to cold nearby streams, with warm adapted taxa found in the former streams. Furthermore, both abundance and diversity were significantly lower in the acidic streams and the modified streams. These finding will be discussed in the context of an increasing demand for geothermal utilization.

Evaluation of the finnish fish-based lake classification method

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Fish are one the four biological elements (phytoplankton, bottom fauna and macrophytes) that are used for ecological classification of lakes according to the Water Framework Directive. In this study, we evaluate the sensitivity and accuracy of the Finnish fish based classification tool in relation to eutrophication pressure, which is the major environmental pressure of Finnish lakes. We also compared the fish-based classification results to the results of the other biological elements. The Finnish fish based classification tool is based on the reference data of 10 different lake types. The four fish parameters are calculated from the standard gillnet catch (total biomass, total number of individuals, biomass % of cyprinids) or based on expert judgment (indicator species). The final classification (EQR4) is the average of the four parameters. The data included 250 lakes, ca. 50% were reference lakes. According to the preliminary results, the fish based classification tool separated the impacted and reference lakes quite well. Total biomass and total number were the best single parameters, EQR4 was more accurate than single parameters. The relation between EQR4 and eutrophication pressure was significantly negative. The fish classification results were quite well in line with the other biological elements, except the classification based on bottom fauna. The Finnish fish based classification tool is a robust method for classifying lakes with eutrophication pressure.

Genotype determined microcystin net production of *Planktothrix rubescens* in alpine lakes

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Microcystins are a group of toxic heptapeptides produced by cyanobacteria, they are synthesized non-ribosomally encoded by the microcystin (*mcy*) synthetase gene cluster. Much of the structural variation is due to the replacement of amino acids in positions 7 and 2 of the microcystin molecule. This structural variation could be shown to depend on genetic differentiation. For example, certain genotypes contain recombinations in the so-called adenylation (A)-domains resulting in structural changes of the microcystin molecule, i.e. the replacement of N-methyl-dehydroalanine (Mdha[7]) by dehydrobutyrine (Dhb[7]) in position 7, or the replacement of arginine (Arg[2]) by homotyrosine (Hty[2]) in position 2 of the molecule. The regulation of the abundance of those genotypes under natural conditions is unknown.
During the years 2005-2007 different microcystin genotypes were quantified in 12 lakes of the Alps in Austria, Germany and Switzerland by means of quantitative real-time PCR (the TaqMan Assay). Their absolute and relative abundance was related to the microcystin concentration as measured by HPLC. Over a wide range in population density (40 – 400,000 *Planktothrix* filaments l^{-1}) Dhb[7]-genotypes/chemotypes were most abundant while Hty[2]-genotypes/chemotypes occurred in lowest proportion only. In general there was a significant linear relationship between the abundance of specific *mcy* genotypes and the concentration of the respective microcystin structural variant. It is concluded that estimating the abundance of specific *mcy* genotypes by quantitative real-time PCR is useful to predict the concentration of microcystin variants in water.

The phytoplankton richness of streams feeding iğneada longos (Turkish Thrace); a case study

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İğneada Longos is one of the places in Turkey providing many animal species with different ecosystems of high quality. The high levelled base water here, as well as the asidic forest soil with an enormous organic matter content enrichs the forest ecosystem as in the case of tropical forests and thus lead to a conspicous biological diversity.
According to the criteria of Bern Convention, 184 avian species, either living or nestling in Iğneada Longos, are endangered species and need to be protected. The endangered species *Phalacrocorax pygmeus*, *Haliaetus albicilla* and *Falco naummani* are three indicator species for a stable ecosystem in İğneada. The Longos serves as an important breeding area for some water birds (herons, goose, ducks and rails) and for some predators (eagles, falcons and hawks). It is also on the migratory way of a number of migrators, especially storks. The recent studies revealed that the Longos ecosystem harboured 310 insect, 28 fish, 46 mammalian, 184 avian, 17 reptilian and 544 plant species.
Our present study, aimed to determine the phytoplankton richness of the streams feeding İğneada Longos, was carried on in eight different streams. For this puspose, field studies were planned between 2008 and 2009 years. Some physico-chemical and biological parameters such as air and water temperature, conductivity, salinity, pH, total hardness, free CO_2, dissolved oxygen, biological oxygen demand, chloride, calcium, magnesium, sulphate, phosphate, NO_3-N, NO_2-N, CO_3, HCO_3, suspended solid material, and chlorophyll *a* were sampled seasonally at each of eight stations.
Results were evaluated according to national standards for inland water quality. Some water resources were found to have low quality levels for nitrate and nitrite concentrations. As a result, the quality of the water resources (streams) feeding İğneada Longos was evaluated in terms of their phytoplankton contents and a total of 93 algal species from Bacillariophyta (58), Chlorophyta (26), Cyanophyta (5) and Euglenophyta (4) were identified. The results of the biomass analysis revealed that the biomass ratio was in parallel with speices richness, but Chlorophyta was the dominnat taxa only during summer period.

Hyporheic assemblages and diffuse nitrate pollution in chalk river ecosystems

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The hyporheic zone is an ecotone between groundwater and surface waters and recent work suggests that it may be crucial in the functioning of the whole river ecosystem. However, the impact of diffuse pollution, e.g. from nitrates, on the hyporheic zone is currently little understood. Here we present a study that examines the impact of diffuse nitrate pollution on hyporheic assemblages in groundwater fed rivers on chalk geology in the UK. Replicated samples were taken from 2 depths at 2 catchments on chalk with high nitrate levels and 2 catchments on chalk with lower nitrate levels at multiple riffles within each catchment. Samples were taken using a Bou-Rouch pump and the survey was conducted on two occasions at high and low groundwater levels. Detailed physico-chemical analyses were undertaken at the same time as biological sampling. We found distinct differences in assemblage structure and chemistry between the high and lower nitrate catchments. Interestingly, the higher nitrate catchments were not necessarily the most depauperate (Syncarida were found here) and it is clear that other factors, for example levels of fine sediment within the hyporheic zone, play an important role in structuring hyporheic assemblages in these chalk streams.

A contribution to the economic valuation of benefits provided by ecological restoration in the lower Danube Basin

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The WFD, aiming to address the complex issue of water quality and scarcity under the conspicuous evidence of climate change, is facing difficult issues like cost recovery and disproportionate costs. In this context, the EU funded AquaMoney project research group dealing with the International Danube Basin, aimed to contribute to the economic valuation required by the WFD by assessing non-market benefits in terms of improving water quality and reducing flood frequency associated with river restoration projects. The Romanian team carried out the research in a sub-regional Socio-Ecological Complex extending along a hundred kilometers of Lower Danube river stretch and having as its core area a large floodplain (1376km2) from which 84% was converted in the late 1960's into agricultural polders.

The study relied on information provided by an interdisciplinary research team, and employed stated preference methods, both contingent valuation (CV) and choice experiment (CE) techniques, in which individuals were asked directly in the former for their willingness to pay (WTP) for river restoration projects, and in the latter for water quality improvements and flood frequency reductions associated with river restoration. CE consisted of three attributes related to restoration alternatives: water quality, flood frequency and cost price. Respondents were shown maps with different restoration scenarios in order to visualize the landscape change induced by restoration projects, which were complemented by information about potential benefits in terms of restoring the floodwater storage and nutrient retention capacities of the study area.

The presentation deals with first estimates of the resident population's WTP, based on data derived from a sample of 518 respondents and also attempts to explain some significant differences among estimates recorded in two other study areas (Hungary and Austria).

The preliminary results show that lay people perceive water quality as a more valuable ecosystem benefit than they do flood reduction. The low willingness to pay for flood frequency reduction could be associated with the fact that people perceive floods as a natural and useful process according with their traditional knowledge. The estimates of non-market benefits complement some prior valuation of market benefits for the same region, and this allows for a Total Economic Value assessment as well as testing for benefit transfer.

Morphohydraulic structure of small streams channel in relation to macroinvertebrate communities

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Current approaches to stream assessment and their management emphasize increasing demand of integration of physical and biological aspects of the river ecosystems. This forms the new space for cooperation of several branches of science such as fluvial geomorphology, ecology, zoology, botany, etc. Fluvial geomorphology proposes for biological branches study and analysis of processes forming the river channel; and also methods for assessment of morphological structures of the channel. In our paper geomorphological structure of river channel of small streams in terms of River Morphology Hierarchical Classification – RHMC is analyzed. Potential physical habitats were treated on two levels: 1. morphological units in terms of RHMC; 2. flow types as complex hydraulic characteristic. Physical habitat attributes and macrozoobenthos communities were analysed within both habitat types. Four streams were selected – Drietomica and Teplička in north-west Slovakia; and Bystrica and Pokútsky brook in the middle part of Slovakia. Physical characteristics of potential habitats were described by calculating Reynolds and Froude number, and by directly measured parameters – average current velocity, depth and substrate. Analysis of macroinvertebrate communities showed that individual habitat types inhabited different communities in terms of density, taxonomic composition, feeding types, preferences for substrate and flow. Similarity of habitats based on macroinvertebrates was assessed using cluster analysis. Character of substratum (mineral or organic) played an important role in distribution and composition of macroinvertebrates. Moss, roots and woody debris inhabited different communities in comparison to mineral substrates. Particular habitat units were undoubtedly characterised by different environment conditions with distinct attributes for benthic invertebrates, and therefore they represent potentially interesting approach in stream management for the purpose of environmental protection. Preservation of natural habitat structure of stream channel can also positively influences maintenance of natural macroinvertebrate communities.
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Relationship among nutrients, land use and benthic invertebrates in Slovenian rivers

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We surveyed benthic invertebrate assemblages, physical and chemical parameters and land use parameters at more than 300 sampling sites representing a range of land use types. Benthic invertebrates were sampled using the multihabitat sampling approach. Nutrients (total nitrogen, total phosphorous, ortho-phosphate, nitrates and ammonium) and other physical and chemical parameters were measured at all sites, whereas percentages of different land use types were determined for each site at the catchment and subcatchment scales. At first, the relationship was studied by including all the sampling sites, whereas later, three subsets of data were made in order to study relationships at the ecoregion level. In all cases a positive relationship was observed between nutrients and percentage of agriculture at the catchment and subcatchment scale, but subcatchment data showed better correlation. To relate physical and chemical parameters, land use categories and benthic invertebrates, a canonical correspondence analysis was performed using whole dataset and datasets for each of the three ecoregions separately. An ecoregion-specific response of benthic invertebrates was observed, but this can partially be explained by the range of the observed nutrient and land use gradients.

Effects of river impoundment on leaf litter breakdown in Northern Spain

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The ecological effects of river regulation have become a major focus of environmental research. Ecologists have usually assessed potential impacts of dams by means of structural indicators, the functional ones being rarely used. Litter breakdown, a critical process on ecosystem functioning, could add valuable information for such evaluation as it integrates several different ecosystem components. The aim of this study was to analyze the effect of small dams on leaf litter processing in streams. The experiment was conducted in ten paired stream reaches, above (Up) and below (Down) five similar water supply small reservoirs (Surface < 4 ha; Capacity < 1 hm3), Basque Country (Northern Spain). Alder leaf litter (*Alnus glutinosa* (L.) Gaertn.) incubated in 5mm mesh bags from November 2008 to February 2009. Continuous measures of temperature and discrete samples of water for nutrient analysis were taken during the study period. Associated fauna was also studied around the middle of the process. A regular pattern of slower loss rates in downstream sites was observed. Impoundment seems to affect Macroinvertebrate communities, in particular shredders abundance which help to explain the observed differences in the processing.

Effect of fixed-fraction subsampling on macroinvertebrate bioassessment of rivers

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We investigated the effect of fixed-fraction subsampling on the variability of metrics based on data from 30 sites in the ecoregion Alps. The results of six fractions 1/12, 1/6, 1/4, 1/3, 5/12 and 1/2 of the sample were compared to the results of the whole samples. For five datasets - ecoregion Alps and four selected river types; small sub-alpine rivers/Danube river basin, small sub-alpine rivers/Adriatic river basin, small high-altitude rivers and small silicate rivers over 120 metrics (number depend on the river type) were tested, whereas for 28 frequently used metrics the individual response was studied. In general, variability of metrics decreased with increasing subsample size, but variability varied greatly with the selected metric group and river type. Considering the whole alpine dataset higher metrics variability was observed than for the tested individual river types. Independent of the river type highest variation was observed for metrics of the group composition/abundance and richness metrics, whereas low for diversity indices and metrics of the group sensitivity/tolerance and intermediate for funtional metrics. Metrics with high variation at the ecoregion level also showed greater differences among river types. In accordance with our results the subsample size applied for biological monitoring should be based on river type and metric(s) used for assessment. However, for most metric groups independent on the river type the main decrease in variability occurs up to 1/4 of the sample, what could therefore become a widely applied fraction. In river types where naturally low abundances of benthic invertebrates are observed, a higher fraction (1/2) is suggested to obtain a more reliable bioassessment as costs would still remain low. We suggest that the effect of subsample size on variability of metrics should be tested prior to selecting potential assessment metrics.

What do small oligochaetes like? - Distribution and habitat preferences of oligochaetes within the hydrologically dynamic lowland river

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The rivers and streams could be seen as a hierarchical system of patches that differ in size and environmental conditions. This patchiness and spatial heterogeneity in distribution of stream organisms is driven by a wide range of environmental factors, food availability and biological interactions, but depends also on the age of locality and its succession phase.
We have focused on the lowland Bečva River in the Moravian part of Czech Republic. The geological and hydrological characteristics of the catchment cause frequent periodical floods commonly alternated with periods of low discharges. At studied sites the exceptionally large flood brought destabilization of the river longitudinal section, created more space for the river, destroyed old embankments and changed the structure of ecotones. These parts are still under dynamic development.
The main aim of our work was detailed study of two channel reaches with unstable stony bottom. These two stretches differ in the shape of floodplain, character of riparian zone, surrounding land-use parameters and also in different position in the longitudinal river continuum. Oligochaeta (sensu oligochaetous Clitellata) were chosen, because they are common and together with chironomid larvae the most abundant taxonomic group in lowland rivers. However, their habitat preferences are not well known due to difficulties associated with their identification.
We focused our attention on the distribution patterns of oligochaete communities inhabiting particular mesohabitats characterized by different substrate and hydraulic conditions. We have identified four main types of habitat – pool, run, riffle and marginal pool (isolated or connected with main channel only at downstream end). We also compared their distribution between two seasons – autumn with low and stable discharge, when the habitats are better differentiated, and spring, when the particular patches are obviously more uniform, modified after period of spring high flows.
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Food webs in a changing climate: impacts of warming on arctic streams

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Climate change is one of the major global threats facing freshwater ecosystems, especially at high latitudes, where warming is predicted to be particularly rapid. However, many aspects of how climate change and rising temperatures impact on fresh waters remain unknown, especially at higher levels of organisation (communities, food webs, ecosystems). Many studies to date have used space-for-time substitution across large ranges of latitude to assess likely impacts of warming, but these are often confounded with biogeographical effects. The other dominant approach has been to employ laboratory microcosm experiments (usually using protist assemblages), but these tend to lack realism. Our study aimed to minimise these shortcomings by using a “natural experiment” in a set of of 15 geothermally heated streams in Iceland. The streams are heated by geothermal activity via the bedrock and range from 4ºC to 43ºC (mean summer temperatures). Given these systems are isolated from potential low-latitude colonists, we would expect a decline in species richness with rising stream temperatures. Temperature should also affect allometric scaling relations between body-mass and abundance, with increased abundances of small organisms within trophic levels at warmer temperatures. Further, faster biomass turnover due to increased temperatures could stimulate secondary production higher in the food web, resulting in a potential lengthening of food chains. We present results that demonstrate clear responses at each trophic level, and within guilds and the food web as a whole. The biodiversity of those cold-adapted systems declined with increasing temperatures, there was a clear shift in the composition of intermediate trophic levels and also in the abundance, size and trophic status of the top predator in this system, the brown trout, *Salmo trutta*, indicative of an increase in the “trophic height” of the food web.

Advection of nutrients and algae from benthic sources and within surface waters affects the propensity for cyanobacteria blooms

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During recent decades, harmful algal blooms have increased in aquatic ecosystems world-wide, and not exclusively in eutrophic ecosystems. The relationship between blue-green blooms and lake fertilisation by nutrients, particularly phosphorus (P), has been recognized since the early 1970s. The question is why are episodic or recurrent blooms currently occurring in lakes with nutrient-limited epilimnetic waters. Some studies have recently suggested a role for climate change in the increase of harmful algae in aquatic ecosystems. Temperature increase may augment P diffusion from the sediments and hence internal nutrient loading. Increase in precipitation, and especially increases in extreme rainfall events and storms, will boost wind intensity and frequency, and hence the importance of physical forcing in lakes. Our team started to work on the importance of physical forcing in small oligo-mesotrophic lakes as an approach to study the blooms of harmful algae (cyanobacteria) in oligo-mesotrophic lakes. In particular, we measure the importance of wind-induced physical forcing at the bottom of lakes in the fluxes of nutrients and organisms from littoral and deep habitats to the water column (pelagic habitats); and between physically constrained adjacent areas (e.g. vertically stratified layers). We will present preliminary results from one lake (Lake Bromont, Québec, Canada), on our working hypotheses: i) P accumulated in the sediments allows the growth of the bottom resting stages of algae in lakes with low external P loads and, ii) the intensity of the physical forcing of nutrients and organisms through boundaries links the different habitats (from the sediments to the water column and through the water column).

Body size dynamics and trophic structure of lotic macroinvertebrate communities

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In order to establish complex interactions within food webs that determine ecosystems structure and functioning, species identity and body size structure play an essential role. Lotic macroinvertebrate communities are characterized by high diversity and abundance and are sensitive to human perturbation. Specialised feeders, such as shredders and scrappers are presumed to be more sensitive to perturbation while generalists, such as collectors and filterers are more tolerant to pollution that might alter the availability of certain food.
Our research focused on the trophic structure and body size dynamics of chironomid communities in eleven lotic systems of Ialomita catchment (a subcatchment of the Lower Danube River) for understanding their involvement in energy and material fluxes through ecosystems. Spatio-temporal sampling programme was designed according with heterogeneity of aquatic ecosystems within the catchment. Based on their feeding strategy, chironomid larvae were included in four major groups: collectors, shredders, filterers, predators. Food quality, larvae size, sediments composition are the main factors which affect larvae feeding behaviour. Analysis of chironomid communities structure shows that, within small order streams, shredders are important with densities between 11.84% and 44.12% due to significant input of organic matter from riparian zone. Within a high order stream in the plain area, filterers are dominant with 75.86% relative density. Predators have a slight weight in all aquatic systems. Participation of chironomid populations at alochtonous coarse particulate organic matter processing through shredding activity, fine particulate organic matter consumption and elimination of fecal pellets, which constitute food source for other species, is discussed. It is emphasised that energy and material flows are the most important ecological processes which support ecosystem services provision by lotic ecosystems.

Body size overrides biodiversity effects on ecosystem processes

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Biodiversity research has revealed clear links between species richness and ecosystem processes and produced numerous hypotheses about the nature of the relationship. However, the fundamental mechanisms that underpin biodiversity effects are rarely addressed explicitly, reflecting the limitations of commonly-used experimental designs and current statistical approaches. We addressed these shortcomings by applying a novel suite of statistical models to experimental data from freshwater microcosms to assess the importance of the two most frequently used diversity measures: richness and evenness. Instead of using species as biodiversity units, we focused on similar sized individuals ("types") within species, which enabled us to focus on the effects of traits (i.e. body size). Moreover, our statistical design allowed us to exclude any sampling effects a priori and to test for 1) non-additive richness/evenness effects, 2) the effects of specific type combinations and 3) allowed for types to behave differently when their abundances changed or 4) when they were dominating the assemblage. We found that in our microcosms, resource depletion by leaf-eating invertebrates was independent of both richness or evenness and that effects were simply additive, i.e. performance in polyculture was the same as in monoculture. This finding also applied to a second ecosystem process – the rate of fine particulate matter (FPOM) production. Despite the absence of "traditional" (i.e. richness/evenness) biodiversity effects, both processes were strongly dependent on body-size, which reflected the consumers' predicted metabolic requirements. Consequently, the effects of "consumer types" were ascribed largely to average body size rather than species identity, providing important new insights into the mechanisms that drive biodiversity-ecosystem functioning relations.

Hydrologic controls on stand structure, tree architecture and growth in Southern-European forested wetlands

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Forested wetlands are rare ecosystems in Southern Europe and their ecological functioning and structure is poorly known. The effects of flooding stress on plant growth and functional responses have been widely studied at the individual scale, but the effects of extended soil inundation on the structure of whole forested wetlands have been less emphasized. This study focus on stand structure, growth habits and aboveground productivity of dominant trees (*Alnus glutinosa* and *Salix atrocinerea*) and their relation with hydrological and edaphic factors in Ibero-atlantic forested wetlands. In 49 plots with varying hydroperiod along the western Iberian coast, we quantified stand composition and structure, including density of live and dead stems, stem diameter and tree heights. We also took cores for dendrochronological analysis. We compared plot and tree-based attributes between species along a wetness gradient, and used PCA with linear mixed models to compare species functional responses to the full suite of environmental variables. Hydrology and soil associated properties were strongly correlated with tree density and architecture in wetland woods. Alnus tree density declined, and Salix increased, with increased waterlogging; Alnus also showed a strong multi-stemmed response in the wettest sites. The soil properties (texture and nutrients) interacting with hydrology indicated site preferences among species. Alnus growth and tree density was negatively correlated with waterlogging and fine-textured soils, possibly due to anaerobiosis in the rooting zone, whereas Salix growth was more influenced by coarse soils and/or nutrients limitation. These results suggest that these species, and particularly Alnus, persist with dominant canopy position in the most permanently flooded patches through increased sprouting relative to well-drained sites. However, when taken on a whole-plot basis, aboveground productivity is lowest in the wettest sites, suggesting either a negative productivity response to drought stress or a shift to belowground production. The maintenance of the whole community dynamics, natural shifts in species composition, structure and growth and associated strategies is directly dependent on keeping a sufficiently-developed mosaic of hydrologic conditions. The results are relevant for these ecosystems conservation in the face of uncertain climate variability and anthropogenic pressures (e.g., water diversions, reductions in area) to which they are subjected.

Ecological consequences of turbidity intrusions: linking water quality to water quantity management of drinking water reservoirs

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So far, seasonal management strategies for water withdrawal from drinking water reservoirs in Germany are based on the hydrological regime and use Monte-Carlo-simulations in order to provide recommendations with predefined probability thresholds. Ad-hoc adjustments are performed in case of unexpected events such as low water levels, high phytoplankton biomass or intrusions of turbid material due to flood events. Usually, long-term experience on the annual development of phytoplankton and inflow is used. In the framework of the project INTEGTA ('Integrated management of multi-purpose reservoirs') knowledge on the biological and chemical freshwater ecosystem will be integrated into the widely used management system TALSIM.
On the one hand, field studies on the reservoir system Klingenberg-Lehnmuehle were carried out in order to investigate the seasonal development and the dispersion of flood events in the major drinking water supply of Dresden, Saxony. The system consists of two closely linked reservoirs which are connected to other water storages so that many possibilities for water supply exist. In 2007 and 2008, water quality in Klingenberg reservoir was affected by summerly water deficiency. Though the inflowing water was of high quality and low temperature, the quality of the raw water could not always be stabilized on the desired level.
On the other hand, simulations by the coupled hydrodynamical ecological model SALMO provide the basis to include water quality predictions into the decision system for the reservoir. Hydrological scenarios are used as boundary conditions for the water quality model so that consistent predictions for the development of the water quantity and quality are derived. The output of the simulations are statistically analyzed with respect to increase/decrease of (i) phytoplankton biomass, (ii) turbidity, (iii) oxygen deficiency and (iv) securing a sufficient water volume. These are transformed into management rules that can be included in TALSIM. The hydrological scenarios are designed in order to cover a wide range of meteorological situations including changes in the climatic conditions. Thus, the system will allow for the consideration of water quality issues under extreme events such as droughts and floods as well as under conditions of climate change.

Impact of climate and nutrient loading on cyanobacteria - inter annual and seasonal variation in an eutrophic lake

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Eutrophication of shallow lakes is often considered as the main reason for cyanobacteria blooms, but recent studies also focus on the impact of climate changes on cyanobacteria response in lakes. In addition to deterioration of water quality, cyanobacteria produce toxins and various bioactive compounds harmful to wildlife, livestock and humans.
The objective of our study was to examine inter annual and seasonal variation in cyanobacteria forming blooms, composition and toxicity in the shallow Lake Årungen, located in south-eastern Norway. The state of the lake changed in the 1950's from mesotrophic to eutrophic, and in the 1980's to a highly eutrophic lake with severe summer algal blooms. In the early 1970's, *Microcystis aeruginosa* was the only cyanobacteria species registered in the lake. After external reduction of nutrients loading and improved water transparency a change in the composition occurred, as *Planktothrix agardhii* became the dominant algae.
In the subsequent period, 1988 to 2002, cyanobacteria biomass, composition and chemical data from the lake have been monitored. Heterocystous species of *Anabaena sp*. and *Aphanizomenon sp*., were registered for the first time in 1988. Their occurrence and periodical dominance are not related to reduced nitrogen concentrations, but rather with their ecological strategies. Warm and wet Norwegian winters with early ice out and high nutrient input from the catchment, as well as changed lake thermal stratification, are suggested to be the major reasons for qualitative and quantitative changes of cyanobacteria.
A more detailed study was made for the years 2007 and 2008 on water chemistry, phytoplankton biomass and composition, and cyanobacteria toxins, and insights on the effect of seasonal variation on cyanobacteria composition and their toxicity were obtained. For the year 2007 there was severe toxic cyanobacteria bloom and co-dominance of *Microcystis aeruginosa* and *Anabaena sp*., while for the year 2008 algal bloom and toxicity were not registered, and *Aphanizomenon sp*. was the dominant species.
Our result emphasize the need to study the reason why different genotypes of cyanobacteria species occurs in certain years, and to what extent the combination of environmental and anthropogenic factors affect certain cyanobacteria and their strains in the nature.

Climate warming and eutrophication: how will they impact local pond diversity?

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Climate change is expected to have a significant impact on biodiversity worldwide, both at the regional and local levels. Responses to climate change at the regional level, such as geographical shifts of species distribution, are well-studied. Little is known, however, about consequences on local biodiversity. Ponds are abundant and widespread, and because of their small size they shelter simple communities. Therefore ponds should play an important role as sentinel and early warning systems in the assessment of future changes in local biodiversity. Climate change is expected to highly impact water temperature, but indirect changes as an enhancement of eutrophication should also be taken into account. The main aim of this study was to evaluate the potential effects of climate warming and eutrophication on freshwater biodiversity on the local scale (ecosystem), using ponds as a model. Using predictive models, we forecast for 2100 the potential response to climate warming of freshwater biodiversity (macroinvertebrates, Odonata, amphibians and vegetation) for 110 ponds in Switzerland. Three different predictions were made. In the first one, only temperature was considered to change during this century. In the two other predictions, changes in other important environmental variables, in particular the trophic level, were also taken into account. The three types of predictions evidence strong species enrichment, for all taxonomic groups. Enrichment results in a positive balance between numerous colonization events by lowland species and sparse extinction events of cold stenothermal species. Only one taxonomic group, vegetation, clearly responds negatively to changes in the trophic level. Indeed, eutrophication strongly reduces the magnitude of the species enrichment predicted by a temperature increase alone. Nevertheless, in high altitude, eutrophication would turn the oligotrophic ponds into mesotrophic ponds and would enhance the species enrichment. In conclusion, local pond diversity will react to both temperature warming and eutrophication. Responses to warming will follow the same trend for the five taxonomic groups, whereas responses to trophic changes will be different according to the taxonomic groups.

Clim-arbres: plant trees to save fish!

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Global warming is one of the main environmental problems for the present century. In particular for water organisms, a minor modification of thermal regime can have tremendous implications along the food web and can completely modify the composition of the aquatic fauna and thus the aquatic biodiversity. Each species displays temperature preference. In this context, fish are some of the most vulnerable species, among them Salmonids being one of the important potential endangered families because of their need of fresh and well oxygenated water.
In the Swiss rivers, global warming is a reality which can be perfectly observed and measured. It is particularly important as the country is situated in mid latitudes and far from the oceans. In Switzerland, the mean air temperature has increased by 0.6°C during the last thirty years, between 1975 and 2004. This warming concerns the whole country, and is twice the value of the mean warming in the Northern hemisphere. A significant increase of 1.5 to 2.0°C in the maximum annual water temperature has been documented in certain Swiss rivers over the past 20 years.
Clim-arbres is a multidisciplinary project which proposes a pragmatic approach taking measures not against the causes of Global warming (even if this is an essential objective), but against its consequences. As a general purpose, the project aims to plant trees along the streams in order to create an optimal shadowing, thus cooling the air and the water. The first step of this project is to describe the spatiotemporal variations of the water temperature and to understand the relationships between air and water temperatures. As an example, the Boiron de Morges, a tributary of Lake Geneva in Switzerland is used for a case study. Secondly, a survey of the main tributaries of the lake is run in order to determine the main environmental factors playing a significant role in the warming of the streams. Thirdly, using these factors, the most in danger streams of one part of Switzerland are determined using a GIS approach. Finally different concept to use trees along the streams to protect them against warming are proposed. This part implies experiments to determine the capacity of different species to regulate local climate through evapotranspiration and different planting management concepts.

Hydropeaking impact on the vertical connectivity, effects on stonefly stygophilous species

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Alpine streams are very selective habitats due to their extreme chemical, physical and hydrological characteristics and their hyporheic zone (more stable than the benthic layer) can contribute to the overall biodiversity of high mountain streams, acting as an important refuge zone. The hyporheos comprises exclusively hyporheic invertebrates (stygobites), taxa with adaptations to exploit resources in the hyporheic zone (stygophiles), and organisms which occasionally venture into the hyporheic zone (stygoxenes). In Alpine regions, intermittent hydropower generation has high economical relevance; but can create serious ecological impacts on aquatic ecosystems.
The impact of water releases on the vertical connectivity of the Noce Bianco stream (3rd order stream, Trentino, NE Italy) was monitored. The sampling stations were located upstream and downstream of a representative Alpine hydroelectric power plant located at 1208 m a.s.l. A higher number of stygobitic taxa (copepods, syncarids, *Troglochaetus beranecki*) were collected upstream of the plant, with decreasing abundances in the downstream stations. The most abundant non-crustacean stygophiles were stonefly larvae. Nymphs of *Chloroperla susemicheli* were sampled upstream the power plant. We analyzed the life cycle of 71 specimens. Our result shown that this species presents an univoltine life cycle (slow seasonal cycle) and was present in the hyporheos for ten months. In general stonefly nymphs were 4 times more abundant upstream than downstream the power plant In the long-term study, on the other hand, high-elevation stonefly communities in the hyporheic were represented by 6 genera, with all larval stages. Downstream the release point, sampled stonefly larvae were all at very early stages, suggesting a poorly-structured stonefly community. Our results indicate that repeated hydropeaking events may cause the clogging of the interstices, with consequent reduction of the hyporheic habitat available to stygobite taxa. Particularly disturbed are the stygophile stoneflies, which did complete their larval development in the hyporheic, and other benthic invertebrates which used this habitat as a refuge from spates and as a nursery.

Seasonal effects on microbial biomass and community structure in lake sediments

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Phospholipid fatty acid (PLFA) analysis was applied to determine microbial biomass and community structure in sediments of eight lakes with different concentrations of dissolved organic carbon (DOC) and nutrient status during the course of a year. The total concentration of PLFA, an estimate of the microbial biomass, varied a lot during the seasons, with peak measurements in summer and lowest concentrations in winter. The highest PLFA concentrations were estimated in the sediment of the lake with the highest total phosphorus (TP) concentrations and intermediate DOC content (18.5 ppm). Biomass profiles depended more on the availability of nutrients than on DOC concentrations. In general, lakes with a larger depth gradient yielded clear differences in microbial biomass, whereas shallow lakes resulted in relatively similar PLFA patterns along profiles from the littoral to the profundal zone. The compositions of PLFAs indicate more variation between the lakes than across seasons and depths within the 8 lakes. The results imply that sediments strongly impacted by allochthonous organic carbon do not support high microbial biomass.

Aquatic ecosystems as indicators of climate and land use changes

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Aquatic ecosystems are seriously affected by their catchments. Lakes and reservoirs might integrate those effects from a considerable area. The effect of catchment depends on (i) catchment to lake area ratio, and (ii) hydrological residence time. Aquatic ecosystems are directly affected, but, at the same time, also indirectly via changes in catchment. Two canyon-shaped, deep reservoirs (dam-lakes) in Czech Republic - Slapy (Vltava river) and Římov (Malše river), were regularly investigated for 50 and 30 years (water chemistry and biology. They former was filled in 1954, the latter in 1979, they have different residence time (38 and 96 days), and different catchment to reservoir area ratio (960 and 20). Data were elaborated in two ways: (i) long series describing trends, and (ii) construction of average seasonal changes in biological assemblages, identifying the meaningful notable points and their timing in different years. During the study of Slapy reservoir, several remarkable changes in catchment occurred: increase of fertilizers dosing up to 1989, then slight decrease; increase of sulphur and nitrogen oxides'emissions and decrease after 1981; increase of phosphorus in detergents since 1986; building sewage treatment plants (without enhanced P removal) in towns; treatment of paper mill wastes in the upper reach. This resulted in long-term trends in water chemistry, especially sulphates, nitrates, conductivity, alkalinity, chlorides and others are shown. On the other hand, in Římov reservoir, an effect of reservoir ageing was indicated during 2-5 years after impoundment, especially due to high variations in development of fish assemblage, which affected the zooplankton structure. However, in a more stable situation later, the internal processes and interrelations between different components of pelagic assemblages in covariance with temperature effect are more pronounced in this reservoir, with a longer residence time and small catchment, as documented especially on zooplankton development. In both reservoirs, the onset of spring phytoplankton peak (days from Jan. 1) correlated with North Atlantic Oscillation index of preceding winter, more significantly in Slapy. We may conclude from our data that the changes in catchment have more pronounced effect at shorter water residence time and higher catchment to reservoir area ratio, and vice versa.

Decoupling nutrient and climate impacts on an alpine lake comparing sediment and long-term limnological records

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Piburger See is a small soft-water lake situated at 913 m a.s.l. in a crystalline range of the Central Eastern Alps (Tyrol, Austria). At present the lake is oligo-mesotrophic, but it has suffered of cultural eutrophication during the mid 1900s. Lake restoration was started in 1970 and was followed by a monitoring program by the University of Innsbruck, which provided a 30 year long data set of lake chemistry. Phytoplankton was investigated regularly only until early 1980s and again since 2002. Although the lake oxygen regime rapidly improved after lake restoration, effects on nutrients and phytoplankton were delayed by about two decades. During the 1970s and 1980s an increase in phytoplankton biomass and a marked development of the filamentous cyanobacterium *Oscillatoria limosa* were observed, while since the early 1990s summer phytoplankton has been dominated by diatoms and coccal green assemblages. In early 2000 phytoplankton biomass increased again up to pre-restoration values due to a massive growth of the diatoms *Asterionella formosa* and *Fragilaria crotonensis*, both species being considered as indicators of nutrient enrichment. However, recent slight lake TP increase cannot explain neither increase nor species shift of planktonic diatoms. A radiometrically dated sediment core was analysed for chemical and biological proxies (e.g. for diatoms) in order to reconstruct the trophic and ecological evolution during the past 150 years.
Diatom reference assemblage was highly diverse and dominated by benthic species, eutrophication and restoration stages showed a clear succession of different Cyclotella species, while species dominant since late 1990s indicate a recent eutrophication not necessarily related to the recent slight lake P increase. Combined analyses of sub-fossil sediment diatoms and decadal records on lake temperature and nutrients suggest that the recent phytoplankton changes may be related to increasing nitrate supply from the forested lake catchment and to changes in the lake thermal dynamics (e.g. higher epilimnetic values and prolonged stratification toward autumn).

Research for ecological restoration of wetlands in the Holbina-Dunavat region, Danube Delta Biosphere Reserve/ Romania

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Research for ecological restoration is one of the main topics in the scientific co-operation between scientists from the Danube Delta National Institute for Research and Development, officials from the Danube Delta Biosphere Reserve Authority, the Dutch Institute for Inland Water Management and Waste Water Treatment and the Institute for Floodplains Ecology, Department of Water and River Basin (WWF Germany). Within the framework of this co-operation, attention was paid between 1993 and 2008 to the ecological restoration of the Holbina-Dunavat area (5,630 ha). The overall aim for the ecological restoration of Holbina-Dunavat area is to protect and maintain populations of species and habitats with high ecological value, and to carry out ecological restoration works where the natural or the semi-natural character of area has been lost as a result of human activity. In1996 a strategy was outlined for the establishment of a self-regualting wetland in the Holbina-Dunavat region, with decreasing riverine influence in isolated parts. This strategy involved the integration of the separate fish-ponds to form one unit and results in a combination of two ecological target states. The first possible target was the “black-water” or “reference” ecosystem state. This is a state similar to its historical condition, or as it is found elsewhere in the Delta. The second possible target could be a “clear water” ecosystem, with lower residence times and high biodiversity in flora and fauna but more common species than those organisms found in the first target state. Under natural condition, these states co-occur, with “clear-water” areas near the rivers, generally in the larger lakes, and “black-water’ conditions in the periphery usually in smaller lakes. Within Holbina-Dunavat area there were gradients from areas with “clear-water’ characteristics to areas that are more isolated, having a “black-water’ character. This paper represent a summary of research conducted within the framework of ecological restoration in the Holbina-Dunavat region, with particular focus on the maintenance of high natural values in the former fish-pond Holbina II.

Impact of impoundments on benthic invertebrate assemblages; a biodiversity aspect in lowland ecoregions of Slovenia

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Human activities influence the biodiversity of freshwater organisms. In two lowland ecoregions in Slovenia – Pannonian lowland and Po lowland, the impact of impoundments on benthic invertebrate assemblages was studied. Impoundments on rivers belonging to six different river types were considered in order to compare the impact. Unaltered and impounded sites were sampled for benthic invertebrates, whereas all impounded sites were classified as class 5 according to Hydrological Modification Index. Benthic invertebrate assemblages were compared using non-metric multidimensional scaling. Besides the community level comparison, the richness and diversity metrics were also calculated and the values of impounded sites were compared to the reference values of corresponding river types. It was found that the results of comparisons depend on the selected richness/ diversity metric and the river type. For all six tested river types, the number of EPT (Ephemeroptera, Plecoptera and Trichoptera) taxa and the number of EP (Ephemeroptera nad Plecoptera) taxa were statistically lower ($p<0.05$) at the impounded sites compared to the unaltered sites. This was not confirmed for the number of taxa, where for two types of large rivers and one type of small river, significant differences were not observed. Moreover, for both large river types, the values of Simpson index, Shannon-Wiener diversity index and Evenness were significantly higher ($p<0.05$) at the impounded sections.

Response of littoral benthic invertebrates on lakeshore degradation in alpine lakes

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Lakeshore deterioration is one of the main threats to the ecological integrity of lakes world-wide. Therefore there is a need to assess the impact of these pressures and to develop a responsible and integrated management of these areas, based on sound assessment methods and including aspects on a catchment scale. So far, only few impacts have been quantified, especially on the benthic invertebrate assemblages. European Water Framework Directive requires the use of four biological elements for evaluating the ecological status of lakes and benthic invertebrates are one of them. In order to assess the impact of lakeshore degradation on benthic invertebrates in alpine lakes in Slovenia, a new multimetric index was developed. First, the relationship between benthic invertebrate assemblages and lakeshore variables was studied resulted in development of the new metric. In addition, relationships between several biological metrics and hydromorphological gradients were tested using regression analyses. Three metrics were selected for the final multimetric index building and they were combined using weighted average approach. Prior to index calculation, all the selected metrics were normalized on the lake type specific reference value and lower anchor. In addition, boundary values for five ecological status classes were defined based on the observed changes in the benthic invertebrate community structure along the hydromorphological gradient. The effect of sample size was also tested to adequately assess the impact of different levels of lakeshore degradation.

Scientific arguments for identification the lower Danube river system (LDRS) as highly modified water body (HMWB)

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The LDRS, comprising the river stretch of 930 km long, between Black Sea and Iron Gate II man-made reservoir, together with the extensive wetlands which integrate inner and coastal deltas, and Razim-Sinoe Lagoons, used to play until late 1950[S] a multifunctional role and to provide a wide range of services. The policies which guided the management of LDRS, for about three decades (1956-1989), have been targeted towards extensive (~ 54%) conversion of wetlands into agricultural land where intensive agriculture and fishery have been practiced. The scientific arguments derived from holistic analysis of a large amount of data and information gathered during a long term research (~ 50 years) carried out in the LDRS.
That allowed us: i) to describe the dynamics of structured configuration of LDRS; ii) to identify the structural threshold, beyond which a shift in functional regime occurred under external drivers and pressures (mostly nutrient inputs and climate changes) and iii) to assess the impact of functional shift upon six critical services, provided by 46% of preserved wetlands (most of them in coastal Danube Delta) – biodiversity and food web support, primary exergy accumulation (NPP), fish yield, water storage and flood detention, nutrient loads and trophic state regulation, and recreation/tourism.
These findings are used as strong arguments in favor of classifying LDRS in the category of HMWB[S] and, consequently in favor of a new scenario of management, based on conservation and restoration of structural configuration, functional capacity and resilience. We are also proposing these findings, as a scientific support for solving current dilemma which is facing the national and EU authorities in charge with WFD implementation in the Danube river basin.

Do macrophytes stabilise the clearwater state with biological mechanisms in subtropical shallow lakes where the refuge effect is absent? - A mesocosm study

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In temperate shallow lakes submerged macrophytes often keep phytoplankton densities low and protect themselves from being shaded by phytoplankton indirectly by offering a refuge for large bodied grazing-efficient zooplankton against predation by fish. This refuge effect is absent in (sub)tropical lakes implying that submerged macrophytes in these climatic regions need to rely more on direct mechanisms like nutrient competition and allelopathy in their competitive interaction with phytoplankton.
Little however is known on the role of these two biological mechanisms in (sub)tropical lakes. Therefore we wanted to evaluate if biological (= nutrient depleting and allelopathic) effects occur and be able to play a role in the stabilisation of the clear water state of subtropical shallow lakes. To get a better understanding of the general role of these mechanisms we chose to work with two model species of submerged macrophytes, *Potamogeton ferrugineus* and *Egeria densa*, both very abundant in eutrophic shallow lakes throughout subtropical South America. The free-floating macrophyte *Eichhornia crassipes*, was also included in the design since this growth form and *Eichhornia crassipes* in particular is very abundant in (sub)tropical regions over the world.
A first mesocosm experiment was performed to study the effects of real macrophytes compared to their artificial equivalents when nutrients were added once-only in the beginning of the experiment. Chlorophyll a concentrations were lower in the presence of real macrophytes for all three species. Nutrient addition experiments showed that *Egeria densa* and *Eichhornia crassipes* but not *Potamogeton ferrugineus* caused nutrient limitation in phytoplankton community. In order to isolate allelopathic interactions, the mesocosm experiment was repeated but with daily nutrient repletion. Under these saturating nutrient conditions chlorophyll a was still lower in the presence of real macrophytes for all three species, indicating that all three macrophyte species can keep phytoplankton biomass low through allelopathy.

Effects of location and flood characteristics on fish growth in the Volga floodplain

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The flood pulse concept states that periodical flooding is the main driver of productivity in river floodplain systems. Given the importance of floodplains as nursery and foraging habitat for many fish species we hypothesize that the yearly variation in flood characteristics will also result in growth variability. We studied this hypothesis in a large floodplain (100 x 30 km) of the lower Volga River (Russian Federation), where annual floodings occur. We focused on bream (*Abramis brama*) and roach (*Rutilus rutilus*), both common, and commercially important species that use the floodplain for spawning and feeding. Fish were caught at two locations in the floodplain, in the middle part, consisting mainly of (flooded) grasslands and large lakes, and close to the main channel of the Volga River, consisting of small channels and lakes. Scales were collected and age and back-calculated growth were determined of 200 bream and 150 roach, using the Fraser-Lee method.
For bream we found that the annual growth increment per age-class of individuals from the middle part of the floodplain was higher than that of those caught closer to the main channel, especially for age 3-5. Also, the yearly variation in growth increment per age-class was less for individuals caught in the middle of the plain than that of those caught closer to the main channel. For roach the annual growth increment per age-class showed yearly variation (for age 3-4), however there was no difference between locations. Increased growth occurred during 2005, a year with a high and prolonged flood discharge. The results indicate variation in growth in response to flooding variation, for both species especially for age-class 3 and 4. In addition, bream growth is increased and less influenced by flooding variation when growing in the middle part of the area. This suggests that the middle part is more profitable than the area near the main channel and the scale of home ranges might be limited.

Spate frequency and lowland stream resilience: an experimental approach

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Lowland streams are characterized by moderate flow dynamics and a soft bottomed streambed. Changes in discharge can, through changes in current velocity, disrupt the stability of substrates and affect benthic organisms. These effects may depend on the resilience of the stream. By field experimental simulations of spates in a natural and a semi-natural stream, the effects of differences in spate frequency and stream resilience were studied. The streams were split in two longitudinal sections (50 m length), whereby the water gradually was diverted through one quarter of the streambed. Each experimental spate reached a magnitude of four times the median flow and lasted 5 hours. The experiments had a BACI design. Spate frequencies were 1 in one day, and 5 over a period of seven days, both in each of the streams. Both control and impacted stream sections were sampled on macroinvertebrates 3 times before, and 5 times after spate simulation. The response of the macroinvertebrate community was analyzed using the principal response curves (PRC). The significance of the PRC was assessed with a Monte Carlo permutation test, which uses an F-type statistics based on the eigenvalue of the component. Furthermore, the response per taxonomical group for the simulated spate(s) were analysed. Single as well as multiple spates had an indirect impact on the macroinvertebrate community, most probably caused by small changes in the substrate composition. The spates caused a slight movement of fine organic material. In the natural stream no direct effects on the macroinvertebrates were observed. In the half-natural stream direct changes in number of individuals occurred as well as downstream shifts. In conclusion, natural streams have a higher resilience to spates in comparison to semi-natural ones.

The efficiency of activity traps in bioassessment of macroinvertebrate communities in drainage ditches

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Bioassessment based on macroinvertebrates in small lentic ecosystems, like ponds and ditches, encounters a number of difficulties. Dense stands of emergent and submerged vegetation hinder standardized sampling, and processing of collected material is time consuming and therefore costly. Several studies have shown that activity traps provide a standardized and low cost alternative. Although, in comparison to pond netting the macroinvertebrates collected differ in taxonomic composition; traps seem to be biased towards mobile, predatory macroinvertebrates. We tested the hypothesis that by manipulating the activity trap, a more representative macroinvertebrate sample is obtained. The manipulation, in terms of the treatments duration of trapping (48h, 96h, 168h), use of attractants (Alnus leaves, bait) and provision of shelter (addition of artificial substrate), was tested in a macrophyte-rich drainage ditch complex in The Netherlands. 170 traps were positioned randomly along the banks, 5 cm beneath the water surface, with their opening pointed towards the middle of the ditch. In total, 102 macroinvertebrate taxa were collected. Trichoptera, Amphipoda, and Hydracarina accounted for the majority of the 5812 macroinvertebrates caught. Compared to pond net samples taken from the same location, the assemblage collected closely resembled the community sampled with a pond net. Longer duration of trapping resulted in a higher number of taxa and individuals collected, especially in the 168h trail. Surprisingly, use of attractants or providing shelter did not influence number of taxa, taxonomic composition or abundance in the traps. Trophic rank and habit of the macroinvertebrates did not differ between the treatments and trails. On average 41% of the taxa consisted of detriti-herbivores and 54% of carnivores. Most taxa caught were capable of swimming (66%). Taxon accumulation curves were similar for the 48h and 96h trails, but for 168h the curve was steeper and did not reach an asymptote. This indicates a shift from passive sampling to active colonization. Based on these findings we conclude that horizontal activity traps are a suitable sampling tool for bioassessment of small lentic ecosystems, but to standardize the traps duration of trapping is a key variable, as it considerably affects the results.

Variations in cell-specific extracellular phosphatase activity of natural dinoflagellate populations: effects of phosphorus deficiency versus light deficiency

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High bulk extracellular phosphatase activity (PA) suggested severe phosphorus (P) deficiency in plankton of three acidified mountain lakes in the Bohemian Forest. Bioavailability of P substantially differed among the lakes due to differences in their P loading, as well as in concentrations of aluminum (Al) and its species, and was accompanied by species-specific responses of phytoplankton. We combined the Fluorescence Labeled Enzyme Activity (FLEA) assay with image cytometry to measure cell-specific PA (CSPA) in natural populations of three Dinophyte species, occurring in all the lakes throughout the whole season (May–September 2007). The present FLEA protocol allowed for standard CSPA measurements at the single species level. Seasonal average CSPA varied among the lakes within one order of magnitude: 188–1831 fmol cell^{-1} h^{-1} for *Gymnodinium uberrimum*, 21–150 fmol cell^{-1} h^{-1} for *Gymnodinium* sp., and 22–365 fmol cell^{-1} h^{-1} for *Peridinium umbonatum*. To better compare CSPA among the species of different size, the values were normalized per unit of cell biovolume (amol μm^{-3} h^{-1}) for further statistical analysis. A step-forward selection identified concentrations of total and ionic Al together with pH as significant factors (P < 0.05, Monte Carlo permutation test), explaining cumulatively 57% of the total variability in CSPA. The CSPA status of dinoflagellates, however, opposited the trend in general P deficiency of plankton among the lakes under study. This unexpected result apparently contradicts the widely accepted indicative value of PA and needs alternative explanations, such as (i) complex Al effects, (ii) top-down effects (grazing and P regeneration) of distinct zooplankton, or (iii) different light availability in the lakes. This first autecological insight into Dinophyte CSPA suggests a noteworthy context of sufficient light availability to successfully employ extracellular phosphatases in algal competition for P.

Comparison of leaf-litter decomposition of a native (*Ochlandra stridula*) and of an exotic plant species (*Hevea brasiliensis*) in a Sri Lankan stream

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The decomposition process and colonizing invertebrate assemblages were investigated for a native and for an exotic leaf species in Eswathu Oya, a tropical wet-zone stream in Sri Lanka. In our experimantal design, the native *Ochlandra stridula* (bamboo) and the exotic *Hevea brasiliensis* (rubber) were used. The latter was introduced to Sri Lanka in the colonial time and now it is spread widely in the wet-zone. Both are widely distributed and are also abundant in the riparian zone of Eswathu Oya. Consequently, their leaves may deliver important organic matter into the stream food web. For both leaf species, the decomposition rate were significantly higher and the decomposition process faster in coarse mesh bags compared to fine mesh bags. Decomposition was also significantly different when the two species were compared. It was about three time faster (2.8 for coarse, 2.6 for fine mesh bags) in the exotic rubber leaves than in the native bamboo, a matter that might correspond with the different tougnhess of leaves. Initial colonization by macroinvertebrates was faster and more intense in the rubber leaves (maximum after 10 days) compared to the bamboo. Whereas the macroinvertebrates left the rubber leaf bags early, they remained in the bamboo leaf bags nearly for the whole decomposition process. The palatability of bamboo tissue takes longer and consequently it atracts the macroinvertebrate assemblage for nearly the whole process. Apart from the differences in time spans and types of colonizing species, we can conclude that the abundant exotic rubber leaf is “fast food” for consumers, whereas the native bamboo leaves are providing food for a considerable long period of time. The ultimate effect on the fauna still has to be explored further.

Long term variation of phytoplankton standing stock and productivity in Lake Kinneret, Israel

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Lake Kinneret is the only large freshwater body in Israel and since the installation of the National Water Carrier (NWC) in 1964 is the source of approximately 30% of the national water demand. As such, the lake is meticulously cared for and monitored continuously since the sixties of the last century. Phytoplankton density and productivity are monitored systematically along with other physical, chemical and biological characteristics. In the first 25 years of Kinneret continuous monitoring, the bottom line of the observations pertaining to phytoplankton was that, despite temporal, rather obviously expected fluctuations, phytoplankton composition, density and photosynthetic activity oscillate along a steady average in due time. That regularity has however ceased since the nineties, marked by floristic changes. The succession of algal species modified and the temporal dynamics of primary productivity changed, in an increase in phytoplankton density in the summer-fall, accompanied by reduction in primary productivity. In parallel, water transparency decreased and surface water temperature increased. Those modifications are discussed in relation to modifications of the hydrological regime imposed on the lake by climatic variation and man-made activity.

The impact of sand grain size on the substratum selection and growth rate of an *oligochaete limnodrilus* sp.

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We studied the responses of Limnodrilus oligochaete worms to particular size fractions of bottom sediments in a laboratory. We collected animals and sediments from the same lowland dam reservoir and divided the sediments into the following size fractions: >480µm, 280-480µm, 160-280µm, 60-160µm, 20-60µm and <20µm. We hypothesized that the oligochaetes would actively select the sediments with optimal granulometric composition. To check this, we offered various sediment fractions to the animals in the pairwise habitat-choice experiments. We put 20cm^3 of the sediments from a given fraction into each half of a 155ml glass beaker. Then we filled it with oxygenated water and put ten worms into each half. After 48h, we counted the individuals occupying each zone. They preferred the 60-160µm sediment fraction. Only this fraction contained an admixture of sand. Therefore, we hypothesized that the animals could respond positively to this admixture. To check this, we filled one half of the 155ml beaker with 20cm^3 of muddy sediments (<20µm, used as food source) and the other one with 18cm^3 of mud and 2cm^3 of pure sand of a given size (>480µm, 280-480µm, 160-280µm or 60-160µm), collected from the near-shore part of the reservoir. The oligochaetes preferred only the mud with an admixture of the 60-160µm sand, confirming its attractiveness for the worms. Thus, we further hypothesized that the positive effect of fine sand could follow from the improved food absorption in its presence. We checked this in the growth experiment conducted in 100ml glass beakers with 20cm^3 of mud and 2cm^3 of sand from one of the above-mentioned fractions. We filled the beakers with oxygenated water and put two oligochaetes of known size into each of them. After ten days, we measured each individual once again. In accordance with our hypothesis, the highest growth rate occurred in the presence of the 60-160µm sand. Furthermore, the oligochaetes in this treatment contained the greatest number of sand grains in their intestines, which suggested that they actively ingested sand and used it in the feeding process, perhaps for the maceration of food particles and thus facilitation of their absorption.

POSTER PRESENTATIONS

Study of heavy metal pollution and accumulation in water, sediment and fish tissue in Kizilirmak River Basin in Turkey

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The amount of heavy metals in drinking waters is allowed in limited value otherwise the accumulation of heavy metals results in many problems to living organisms. Especially Arsenic, Cadmium, Nickel, Mercury ex. levels are very important for freshwater ecosystems and drinking waters as well. The accumulation of heavy metals such as Pb, Hg, Co, Cr, Cu, Zn, As, Al, Fe, Mn and Cd) were determined in water, sediment, muscle and gill of three fish species (Leuciscus cephalus, Capoeta tinca, Capoeta capoeta) were collected in Kızılırmak River Basin (Delice River). Which is using as drinking water (Ankara). In study results, sediment and fish samples especially in the gill tissue was seen as a significant amount of accumulation of heavy metals. Heavy metal levels considerably varied among the fish species. The results of the present study are used to elucidate the accumulation patterns of heavy metals between *Capoeta spp*. and *Leuciscus sp.* in the Delice stream.

Effects of N and P supply on Phytoplankton growth in Sapanca Lake

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Sapanca Lake is an important natural lake used as a drinking water by a nearby city in Marmara region, Turkey. Increasing anthropological pressures, excessive water abstraction together with deficiency of precipitation affected the trophic status and shifted from oligotrophy towards mesotrophy. Moreover, metalimnetic *Planktothrix rubescens* blooms have been observed over the last decade in the lake. The aim of this study is to investigate the effects of increased nutrients on phytoplankton growth, especially *Planktothrix rubescens*. Enriched bottle experiments were conducted in situ and in the laboratory conditions during summer stratification period. Nutrient enrichment was tested in three different layers of the lake: epilimnion (5 m), metalimnion (12 m) and hypolimnion (18 m). Phytoplankton biomass reacts in different ways in response to phosphate and nitrate enrichment in three layers and also in laboratory and in lake conditions.

Experience in dams management decision support, trough an automatic dammed water quality monitoring system, at Guadiana river basin (South-West Spain)

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2/3 of the inhabitants residing in the Guadiana river basin region are supplied drinking water to through the several reservoirs in this area. Most of these reservoirs are provided with facilities which permit to extract water from different depths.
In 2007, at 18 dams (15 of them for drinking water purpose) were installed and commissioned Automatic Dammed Water Quality Monitoring Systems, which automatically perform vertical water profiles, measuring physical parameters every 6 hours. These collected data, which are mainly: *Temperature*, *pH*, *Pressure*, *Conductivity*, *Dissolved oxygen*, *Turbidity*, *Redox*, are daily sent to a Control Center.
Using these direct measurements in terms of continuous water quality monitoring, it is possible to know at any moment the state of the reservoir, such as if stratification phenomena occur, or when this stratification situation is going to end and so different water qualities are going to get mixed (taking into account the consequences this may have), and in general, this permits to know in detail the water quality for each depth near the dam's dock. Disposing of these real-time information provides the reservoir responsible authority with a very valuable support for the short-term period decision making, regarding the reservoir management and exploitation.
This Dammed Water Quality Monitoring System technology, makes it also possible to detect indirectly the potential presence of toxic algae in the reservoir, or other threats to the human water consumption. The early detection of this presences in the reservoirs has a dramatic importance due to the potential consequences of such events.
This innovating monitoring technology for reservoirs (AquaDam®) was developed by ADASA SISTEMAS and up to now, there are more than 30 units running, with absolutely successful results.
AquaDam® allows to represent the results of the water quality in some 3-D-graphs where it is possible to evaluate the state in real time to provide a better analysis. This system is used in the Hydrographical Confederation of Guadiana river to predict the changes in the reservoirs and allows to act before of the risks.

Electronic multiple entry key for the identification of aquatic invertebrates: a new tool for nature managers in Switzerland

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Due to legal requirements, nature managers increasingly have to carry out assessments of surface water quality using for example macroinvertebrates as bioindicators. However, identification of these organisms is not easy and requires the use of identification keys. The majority of these keys are dichotomic and paper printed. Despite their broad use, these keys suffer from three major problems: i) unflexibility of use, ii) limited quality and number of illustrations iii) difficulty to detect possible errors. Recent developments of electronic multiple entry keys allow to solve these problems and open new prospects for identification's assistance. We developed such a new tool for three aquatic macroinvertebrate groups (Plecoptera, Ephemeroptera and Mollusca). In order to fulfil requirements of future end users, this multiple entry identification key was developed with nature conservation managers, consultants, governmental organizations and taxonomic experts. This key, called CLEMACH, has major advantages in term of i) time spent to the identification (strongly decreased) and ii) quality of identification results (strongly improved).

Are aquatic hyphomycetes physically screened by sediments in the hyporheic zone of headwaters?

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Headwaters are mainly situated in forested ecosystems where the ecological conditions are responsible for a very low primary production. Such streams therefore receive most of their matter and energy from adjacent terrestrial ecosystems, principally through leaf litter. Aquatic hyphomycetes are among the main litter decomposers and thereby play a key role in the incorporation of allochthonous carbon into the stream food web.
After storms or flood events, a substantial part of leaf litter entering running waters may be buried into the stream bed. However, information is still lacking about decomposition and fungal communities in the hyporheic zone. The present study focused on mechanisms structuring fungal communities in this habitat. We specifically examined a possible physical screening of spores in the interstitial environment, by testing the hypothesis that spores circulate slower or faster according to their size and shape.
For this purpose, we have conducted a microcosm experiment where spores of different species were introduced into slow filtration columns containing sediment and fed with a low-nutrient solution. Four different size classes of sediment (0.5 to 8 mm) were used so that kinetics of spore displacement were compared as a function of sediment class and species characteristics. Such effects were also tested in natural conditions by comparing assemblages of fungal spores circulating above and under the surface of sediment in three streams.

Effect of environmental and chemical properties on diatoms of Asartepe Dam Lake (Ankara)

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In this study, the coastal diatoms of the Asartepe Dam Lake were observed in the samples taken from different habitats (epipelic, epiphytic, epilitic) in the research 7 stations between April 2003 and June 2004. In the investigation, a total of 103 taxa were identified. Of those, *Cymbella affinis* Kützing, *Nitzschia palea* (Kützing) W. Smith, Synedra ulna (Nitzsch) Ehrenberg, *Diatoma vulgaris* Bory de Saint-Vincent, *Amphora ovalis* (Kützing) Kützing, *Cyclotella ocellata* Pantocsek and *Nitzschia palea* (Kützing) W. Smith were determined at all stations. Some physical and chemical water quality parameters were determined and these were related with ecological parameters.

The effect of water level fall on the behaviour and survival of the zebra mussel (*Dreissena polymorpha*)

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The benthic animals of Lake Balaton are very sensitive to the water-level fluctuation because of the shallow character of the lake littoral. During the extremely dry period between 2000 and 2003, the water level of the lake decreased by 82 cm, large percentage of the stony littoral became dry and the electrical conductivity considerably increased. During this extremely low water level period the zebra mussel density significantly reduced.
We designed and created a special wave generator with which we studied the behaviour and mortality of zebra mussels in laboratory using different intensity of wave action and at different water levels. The mortality of the mussels at different conductivity of the lake water was also investigated in laboratory.
The mussels can easily adapt to the higher turbulence, the shells of the mussels were opened and the filtration was continuous. Parallel with the water level fall and the different wave actions especially the smaller mussels detached and moved away (12.34±4.67 %) but large part of the animals died. The animals died 3-6 days after the stones were only sprayed with the wave. More than half of the animals survived after 72 hours at the conductivity of 1600 and 2900 µS cm^{-1}. All animals died in the water of 4600 µS cm^{-1} within 2 days and 7100 µS cm^{-1} within one day. Hundred percent of the control animals (860 µS cm^{-1}) survived during the experiment.
This study was financially supported by BALÖKO 3B022_04 project, Hungarian Scientific Research Fund (OTKA No. T1749365) and MEH project (No. 150002).

Salmo Carpio L.: **an endemic salmonid in the Garda Lake**

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The 'carpione' (*Salmo carpio* L.) is a species strictly endemic to the Garda lake, considered to be critically endangered by the IUCN Red List. A few recent projects analysed in more depth some features of *S. carpio* by study of its genetic variability and phylogenetic relationships with the *S. trutta* species complex, and through the definition of rearing protocols to produce restocking material and support the natural population. Regarding this last aspect, over the difficulty to find spawners for the production of eggs and juveniles, sanitary restrictions impose strict limitations to freely move and propagate the species in breeding plants. Currently, about 80 individuals of carpione aged 3+, the result of the 2006 breeding campaign raised at the Bardolino Garda hatchery (Verona province), are maintained in a structure specifically identified in the basin of Basso Sarca (town of Riva del Garda) and realised with the aim and the characteristics of a quarantine plant. These specimens had constituted the first experimental captive spawners lot of the species. During the winter of 2008 a first artificial breeding was carried out. Actually 2500 fries (total length 5-6 cm) are present. In order to identify inbreeding and introgression all the progeny and samples form natural populations will be genetically characterized.

Responses of phytoplankton functional groups to mixing regime in a deep subtropical reservoir

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The present study was carried out in Faxinal Reservoir, a warm monomictic, meso-eutrophic reservoir in subtropical southern Brazil, with a long-standing well-stratified condition, low epilimnetic nutrient concentrations, and a relatively clear epilimnion. In this study, we analysed the dynamics of the phytoplankton functional groups, recognizing their driving forces in Faxinal Reservoir. Samples were taken at monthly intervals from January 2004 to January 2005 in surface waters. According to the reservoir's mixing regime, three periods were identified during the study: stratification 1 (January to May 2004); mixing period (June to August 2004); and stratification 2 (September 2004 to January 2005). The nutrient dynamics were driven by the mixing regime. The H1, F, and C phytoplankton functional groups were the most important in biomass, mainly represented by the N-fixing cyanobacterium *Anabaena crassa*, the colonial green alga with thick mucilaginous sheaths *Nephrocytium sp*., and the diatom *Asterionella formosa*, respectively. Tendencies pointed out by redundancy analysis (RDA) indicated that the mixing regime was the main determining factor of the seasonal dynamics of the phytoplankton community. The dominant functional groups showed a close relationship with the relative water-column stability (RWCS), and, as a consequence of the mixing regime, also with nutrient availability. The study also revealed the important role of physical processes in the seasonal gradient, in selecting for phytoplankton functional groups and, consequently, in the assessment of ecological status. Q index (assemblage index) of water quality based on functional groups revealed ecological status varying from bad to tolerable in stratification 1 period and from tolerable to medium in the mixing and stratification 2 periods.

The zooplankton of the glacial lake Gijstova (southern Albania, Month Gramoz)

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The faunal composition of the Gijstova lake zooplankton has been studied for the first time. The lake is a small, permanent water body, of glacial origin, at 2365 m above the sea level in the month Gramoz complex, on the border between Albania and Greece. The lake has been visited 4 times over 3 years, during the ice/snow free period (July-September). A total of 5 zooplankton samples were collected (with nets of different mesh size), and two samples of the muddy sediments, too. Crustacea were represented by four species: a large anostracan, two copepods, one cladoceran. Three rotifer species completed the zooplankton composition. Sediments contained at least 8 different types of resting stages, whose correspondence with active stages has been ascertained only for three cases. The faunal assemblage of the lake Gijstova has been discussed on the basis of its extreme isolation, young age, and geographic position, in comparison with data deriving from similar sites in Italy and Austria. The study represents a reference point for further researches on glacial lakes of the Balkan region.

Observations on water quality of the streams feeding to Igneada Longos (Turkish Thrace)

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Wetlands can be found all over the world, from the tundra to the tropics and on every continent except Antarctica. These areas provide services of great value to human society. Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation and other factors including human disturbance. In this study, water quality of Igneada Longos area which is an important wetland including a lot of different ecosystems, was investigated. In order to asses the water quality of the wetland, some physicochemical features of the waters belonging the streams feeding to Igneada Longos was measured between 2008 and 2009 years. Air and water temperature, conductivity, salinity, pH, total hardness, free CO2, dissolved oxygen, biological oxygen demand, chloride, calcium, magnesium, sulphate, phosphate, NO3-N, NO2-N, CO3, HCO3, suspended solid material, and some heavy metal concentrations (Cu, Zn, Fe, Cd) were sampled seasonally at the total of eight stations. Results were evaluated according to national standards for inland water quality. Some water resources were found to have low quality levels for nitrate and nitrite concentrations. Furthermore, benthic fauna of the streams were examined. A lot of samples belonging Oligochaeta, Hirudinea, Amphipoda, Ephemeroptera, Plecoptera, Trichoptera, Hemiptera, and Diptera was sampled. Consequently, the quality of the water resources feeding to Igneada Longos was evaluated according to both physicochemical features and benthic macroinvertebrate communities.

The evaluation of water quality and benthic macroinvertebrates in some water resources of Meric-Ergene River Basin (Turkish Thrace)

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Meric-Ergene River Basin is located in the European part of Turkey (Thrace region) and surrounded by the borders of the Northern Marmara Basin and Bulgaria. This area is exploited as agricultural, industrial, and urban land and they influence the basin, negatively. The most important surface water resources of the basin are Meric (Maritza) River, Ergene River, and their ramifications (Corlu Stream, Ergene Stream, Ogulpasa Stream, Sazlidere Stream, and Tunca Stream). In the present study, results of all studies which were performed between 1991 and 2009 years in the streams of Meric-Ergene River Basin on water quality and zoobenthos were evaluated. It was also discussed changing both some physicochemical features (water temperature, conductivity, pH, dissolved oxygen, biological and chemical oxygen demands, salinity, pH, total hardness, free CO2, chloride, calcium, magnesium, Cu, Fe, sulphate, phosphate, NH3, NO3-N, NO2-N, CO3, HCO3, and suspended solid material) and benthic macroinvertebrate composition of the Basin. The physicochemical values were evaluated according to national standards for inland water quality. Furthermore, it has been listed the all zoobenthic taxa were sampled from Meric-Ergene River Basin between 1991 and 2009 years. In this study, it was also discussed the threats on water quality and benthic macroinvertebrate composition of the Basin.

Morphology and infraciliature of two Ciliates (*protozoa: ciliophora*) from a river basin in Turkey

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Two hypotrich ciliate, *Cyrtohymena inquieta* and *Cyrtohymena citrina* were detected from the flooded zone of river Fırat. Live observations and impregnation techniques were applied to describe morphology and infraciliature. *Cyrtohymena inquieta* has a size of 100 X 50 µm in vivo; margins converting posteriorly, anterior end broadly rounded. Two macronuclear nodules in middle body third, left of mid-line, 114 X 8 µm size; micronuclei about 3-4 µm diameter. Contractile vacuole near mid-body at left cell margin with inconspicuous collecting canals. Cytoplasm colorless; cortical granules lacking. Adoral zone of membranelles about 35-40% of the body length; oral opening wide, deep and transparent. Somatic cirri 11-13 µm, transverse and caudal cirri 19 µm long. On ventral side 3 enlarged frontal, 1 buccal, 4 ventral, 3-4 postoral, 5 transverse cirri exist. One right and one left marginal cirral row; left marginal row commences on the posterior border of the adoral zone membranella and ends below the transverse cirri; right marginal ciliary row starts below the third frontal cirri and then joins to left marginal cirral row. Dorsal side has five kineties. *Cyrtohymena citrina* has 100 X 30 µm body size in vivo; slender, left margin sligthly convex, right margin almost straight, anterior and posterior ends rounded. Macronuclear nodules 20 X 10 µm; micronuclei about 3 µm across. Contractile vakuole at left of cell margin with inconspicuous collecting canals. Cortical granules about 1µm across. Cytoplasm with shining crystals. Adoral zone of membranelles like a question mark and 25% of the body lenght; oral opening wide and deep. Somatic cirri 15 µm long. On ventral side 3 enlarged frontal, 1 buccal, 3-4 ventral, 3 postoral 5 transverse, 2 pretransverse and 3 caudal cirri exist. Left marginal cirral row J-shaped; right marginal almost straight. Dorsal side ciliature consists of 6 kineties.

Phylogeny and biogeography of the riffle beetle genus Oulimnius (*coleoptera: elmidae*) based on molecular data

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The genus Oulimnius Gozis was described in 1886 and to date, 16 species and subspecies have been described. The genus occurs in Europe, North Africa and North America, although the systematic position of the two American species within the genus is questionable. Within the study, the material from the museum collections, and also recently collected specimens were used to revise the genus morphologically. For the first time the phylogeny of the riffle beetle genus was assessed using molecular data. Four DNA fragments (3 mitochondrial, 1 nuclear) were analysed using general methods (maximum parsimony, maximum likelihood, Bayesian analysis). The analyses suggested several species groups within the genus. All Oulimnius species formed monophyletic group in respect to the outgroups used, however more American samples (Oulimnius and also other genera) should be included in the future to test genus monophyly satisfactorily. For proposing biogeography scenario and assessing ancestral distribution of the genus, the data from the literature and own data on the Oulimnius species distribution were used in combination with the reconstructed phylogeny. Oulimnius species inhabit larger streams and smaller rivers, usually in lowland or submontane zones. In Europe, many of the habitats suitable for these elmid beetles suffer from human activities, and populations become fragmented. Data on phylogeny, biogeography and distribution are thus important for effective conservation efforts. The study was partly supported by the Slovak Research and Development Agency Project No. APVV-0318-06 and the EEA grant SAV-FM-EHP-2008-03-04.

Diversity of the river system within the Preajba Valley and its ecological features

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The Preajba Valley river system, located in the southern platform of the Oltenia Plain, comprises a great variety of ecosystems: springs, streams, rivers, marshes, and small basins. They cover an area of about 30 sq km. From the geomorphologic point of view, the hydrographical basin is located at the limit between the Romanați Plain and the high terrace of the Jiu. The river system is supplied by three categories of springs: reocrene, heleocrene, limnocrene.
From the chemical point of view, as compared to the rivers and lakes, springs are characterized by extremely low concentrations of nitrates and phosphates. The higher amounts of these compounds in rivers and lakes are induced by the discharge of surface water that washes out the neighbouring agricultural fields.
The hydrological and physical-chemical features of these categories of ecosystems are also reflected by the features of the plants and animals populations. In the springs, streams, and rivers, there have been identified numerous species of diatomeae, ciliates (*Vorticella microstoma*), testaceous (*Arcella arenaria, Centropyxis discoides, C. aculeata, Diflugia globulosa*), rotifers (*Rotaria magna*), *Ostracoda, Gammaridae, Gastropoda, bivalves, Chironomidae, Ephemeroptera, Heteroptera*.
As compared to the mentioned reophilic ecosystems, the structure of the biocoenoses of plants and animals populations living in marshes and lakes is fundamentally different. The marshes are invaded by paludous and aquatic macrophites the dominant species of which are *Phragmites communis Trin., Thypha latifolia L., Scirpus lacustris L., Heleocharis palustris L., Mentha aquatica L.* etc. The lakes resulted after the damming of the main river, the Preajba Valley, the depth of which goes to maximum 6 meters, display a sandy – silty bottom. Phytoplankton and zooplankton is made up of 78 species of algae belonging to the groups *Cyanophyceae, Euglenophyceae, Bacillaryophyceae, Chlorophyceae* and 65 species of planktonic invertebrates (rotifers, *Testacea, Cladocera, Copepoda*). In the structure of the zoobenthos, the *Chironomidae, Gammarida, Gastropoda, Oligocheta, Ephemeroptera, Plecoptera, Trichopterae* are dominant. The fish populations represent an important group for the bioeconomy of the lakes.
This is the first research that approaches the complex study of the river system within the Preajba Valley. The particular character of these ecosystems is imposed by the dry plain climate with extreme temperatures and low amounts of precipitation.
The determination of the algae was made by N. Nicolescu, while the determination of rotifers, *Cladocera*, and *Copedpoda* by Laura Parpală.

Impact of the sands and gravel exploitation mining activities upon rivers. Case study: Hidrographic basin of Arges

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Most of the research projects carried out in the hydrographic basin of Arges was focussed upon the emission of nutrient substances generated by the agriculture practices that have significant impact in the areas, with the mining activities being ignored or briefly mentioned due to the limited information related to them.

According to the I.N.S. and A.N.R.M., in Romania between 2001 and 2008 (there were recorded 80 exploitation permits and licenses in 2001, and 144 exploitation permits and licenses in 2009). This was due in particular upward trend of the application of ballast used in the construction and arrangements by road and rail.

The exploitation of the sands and gravels are usually located in the middle and lower classes of water courses or units out of mountain, river lodge packages where considerable alluvial and sedimentary deposits which have a granulometry lower right needs to use the concrete ballast in the preparation of various types.

This mining activity is considered relevant pressure on rivers when volume exceeding 25,000 cubic meters/year, and the Danube, the volume exceeding 50,000 cubic/meters/year.

The exploitation of the sands and gravels in the minor flow of the rivers represents one of the most important hydro-morphologic pressures, and the effects of these activities lead to the levelling of the river path, the alteration of the invertebrate group, the damage of natural habitats, and the change of the level distribution of underground water layers. The mining exploitation in the river meadows results also in the loss of the wet areas which can be added to the previously mentioned negative effects.

Effects previously referred to the mining activities are amplified and breach conditions imposed in the permit, and notices issued by regulatory authorities.

The present paper proposes a short presentation of the mining activities for sands and gravels and of their effects in the hydrographic basin of Arges with the purpose to bring into the attention a topic of major impact but very concisely approached.

Coherence of ecological status assessment by periphytic diatoms and phytoplankton in Lake Balaton

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The littoral region of lakes is especially exposed to incoming pollutions originating form the catchments and biota may respond faster and differently from those in the pelagic zone. According to Water Framework Directive, European countries must assess the ecological status of surface waters based on different groups of biota. In this sense, microalgae (planktonic and benthic), as good indicators of these effects, were evaluated in Lake Balaton, Europe's largest shallow lake. Samplings of periphytic diatoms, phytoplankton and water were carried out in ten different littoral sites, in the northern and southern shore of the lake from March to December 2006. After laboratory analyses, phytoplankton species were sorted into functional groups and ecological status of Balaton littoral region was assessed through phytoplankton assemblage Q index. Using the diatom data of the quantitative analyses, diatom indices were calculated. According to the national results, the average of two indices - TDIL (Trophic Diatom Index for Lakes developed in Hungary) and IBD – was established and used for the estimations. Twenty five functional groups of phytoplankton were identified. Q index indicated good ecological status of the northern part of Lake Balaton during the most part of the evaluated period. Ecological assessment based on benthic results was similar to those found by phytoplankton information, indicating good ecological conditions in Lake Balaton. However, some remarkable differences between the two communities' indices results were found and may be clarified in further intercalibration measures. Anthropogenic contribution and its influence on ecological status assessed by both communities, especially on western basin of Lake Balaton are discussed.

Lentic macroinvertebrate drift through culverts: does dispersal mode influence the colonization rate of restored waterbodies

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Important factors predicting restoration success are dispersal potential of target species and the barriers they experience when colonizing a restored habitat. Existing information on potential and actual dispersal of lentic macroinvertebrates is anecdotal. In a nature conservation area we quantified the actual passive and active dispersal rate of macroinvertebrates through water, between fens mutually connected by culverts. Activity traps and drift nets were installed in connecting culverts between 8 fens. Compositions of assemblages of dispersing macroinvertebrates were compared to the composition of macroinvertebrate communities in source fens. Culverts act as partial barriers to aquatic dispersal of many macroinvertebrate families. Low active dispersal rates were measured, whilst high passive dispersal rates for some families indicated the importance of water movement between connected lentic habitats. Since connections and the extent of flow rates are man-made in most Dutch lentic waters, dispersal through wet habitat can be managed. Therefore, water connections and water movement appear to be a powerful management tool in the conservation and restoration of lentic habitats.

Heavy metal accumulation in water, sediments and body tissues of *oligochaeta* and *chironomidae* of Lake Uluabat, a ramsar site of Turkey

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Heavy metals level (cadmium, chromium, lead, copper, nickel and zinc) were assessed in lake water, bottom sediment and two dominant macrozoobenthic taxa (Oligochaeta and Chironomidae larvae) were analysed together with some physico-chemical parameters from Lake Uluabat by atomic absorption spectrometry. According to average value the heavy metal levels were as follows for water; Zn>Pb> Cu>Ni >Cr >Cd; for the sediment; Zn>Ni >Cu >Pb>Cr>Cd; for the oligochaetes; Zn >Cu>Pb>Cr>Ni>Cd; for chironomids; Fe >Cu > Zn> Ni>Cr >Cd>Pb. Analyses of water and bottom sediments indicated that the lakes were polluted with Zn, Pb, Cu, Ni, Cr and Cd.

Growth parameters research of the S*cardinius erythorphthalmus* L.1758 in ILke Uluabat

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The present study was aimed at determining the population growth of *Scardinius erythorphthalmus* L.1758 population in Lake Uluabat (also known as Lake Apolyont). A total of 417 specimens were caught monthly period between March 2006 and February 2007
The ages of population ranged between I-VII age groups. The percentages of females were %59, males %32 and %9 juvenile out of 417 fish samples. Fork length of females were 13- 31,8 cm. (min-max) and weight 27-478 gr.(min-max); as for males were 12,3- 28 cm. (min-max) and weight 22,2-308 gr. (min-max).
The length-weight relationship was estimated as for females, W= 0,0087.L3,1782 , for males W= 0,0091.L3,1593
Bertalanffy growth parameters were computed for female as $L\infty$=38,47 cm, $W\infty$=945,01 g, k=0,191318 year-1 and t_0= -1,15495 year; for male $L\infty$= 31,72 cm, $W\infty$= 506,84 g, k=0,309779 year-1 and t_0=-0, 58332 year.

Characterising functional trait diversity and trait-environment relationships in fish assemblages of boreal lakes

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Characterisation of biodiversity is typically based on taxonomic approaches, while less is known about other related aspects. Functional trait diversity is one such component of biodiversity that has been addressed rigorously in ecological research only recently. We tested the congruence between taxonomic- and trait-based approaches, and examined how spatial configuration, local abiotic environmental factors and biotic effects interact to influence taxonomic- and trait-based characterisation of boreal lake fish assemblages in southern Finland (124 lakes). Variance partitioning in both linear regression analyses and redundancy analysis was used to quantify the relative contribution of spatial and environmental variables to taxonomic and functional trait diversity and structure. Additionally, a null model analysis was used to test for the potential effects of interspecific segregation and biotic interactions on the co-occurrence of species. The species pool was relatively poor. However, trait-based classification of species indicated that most species belonged to unique functional entities, which suggested low redundancy in species composition. Correlation analysis indicated a very strong relationship between species richness (SR) and the number of unique trait combinations (UTC). Ecoregion-level heterogeneity in SR and UTC were well represented in a relatively small group of randomly selected lakes (*c.* 30 lakes). Multiple regressions indicated moderate roles for abiotic environmental variables (i.e. lake surface area, depth, total phosphorous, colour and pH) in determining SR, UTC and the distribution of single trait categories, whereas geographical location was not generally influential. Redundancy analysis revealed similar patterns to those of diversity analyses for taxonomic and associated trait-based structure, emphasising the effect of abiotic environmental variables and the negligible effect of geographical position. Co-occurrence analysis indicated significant checkerboard distribution at the whole assemblage level, but interspecific segregation proved to be of relatively minor importance in the constrained analyses, where species pair combinations within trait category groups were evaluated. Our results suggest that taxonomic- and trait-based patterns of boreal lake fish assemblages are strongly interrelated. Environmental filtering through the effects of local abiotic variables seems to have the most prominent role in determining trait-based assemblage patterns among lakes, which may also be secondarily shaped by biotic interactions.

Biological and ecological traits of macroinvertebrate communities under natural and disturbed conditions in central Italian stream systems

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In freshwater ecosystems, macrobenthic communities constitute an important part of animal production, and are tightly integrated into the structure and function of their habitats (organic matter processing, nutrient retention, food resource for vertebrates). The diversity and functional structure of macroinvertebrate communities vary in relation to local habitat conditions. Thus, the biological assemblages of a river ecosystem integrate the spatial and temporal variability of aquatic habitats, in relation to disturbance patterns. To evaluate the effects of the river fragmentation upon the up- to downstream continuum, we analysed the biocenoses of the Chiascio River (dam of Valfabbrica) and of the hydrographic system of Tevere River (dam of Montedoglio). Benthic invertebrates were sampled at 47 sites according to the standardised IBE protocol, and physical-chemical parameters were measured. We used a fuzzy-coding approach of biological traits (Usseglio-Polatera, 2000) combined with species distribution analysis, to bring out functional shifts in river communities in relation to community structure and habitat alteration. Changes in the biological traits of macrobenthic communities, in response to physical disturbance of the habitat, showed a prevalence of polyvoltine and ovoviviparous taxa with small body size (0.25-0.5 cm), which are typical of environments with low discharge and temperatures above 15°C. Peculiar biological characteristics are pointed out at the Chiascio River dam, in relation to its hydrologic management. From our study, it appeared that species traits did well at revealing functional changes within communities subjected to disturbance, as species with certain traits were eliminated and/or replaced by others. This result supports the idea that Biological and Ecological Traits, in combination with species composition, provide further insights into our understanding of structure-function relationships and are thus relevant for integrated biological assessment.

Identification of local and alien species of anopheles by PCR technique to asses the possibility of malaria re-emergence in Romania

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Malaria reintroduction risk in Romania and its "malariogenic potential," is determined by the receptivity, infectivity, and vulnerability of different species of *Anopheles* vectors.
Because *Anopheles* species can't be identified by adult morphologic characters, the most useful methods are the morphological characters of their egg-masses and PCR technique.
Our researches focussed on the identification of *Anopheles* species (alien or autochthonous) that leave in different areas of Romania, using PCR technique. This is of special interest do to differences in their receptivity to infection with *Plasmodium:* highly receptive, low susceptible and even completely resistant species.
A polymerase chain reaction (PCR)–based diagnostic assay was developed that rapidly and reliably differentiates the species of the *Anopheles* complex from Comana area, Giurgiu county. The assay makes use of nucleotide differences in the internal transcribed spacer 2 ribosomal DNA sequences to generate PCR products of specific length for each species.
Among a total number of 182 *Anopheles maculipennis sensu lato* females, collected in Comana area, three local species (*Anopheles atroparvus, A. messeae* and A. *maculipennis*) were unambiguously identified by PCR.
Our results are in concordance with the morphological characters of the egg-masses of local *Anopheles* species proving the efficience of the method.

Annual changes of invertebrate's communities in the tundra water bodies

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In lakes of Bol'shezemel'skaya tundra (the European North-East, Russia) the changes of benthic and plankton invertebrates communities took place according to dynamic of temperature conditions in the water and terrestrial ecosystems. For the last decades of the former century, the regional climate became more continental and the temperature difference between the warmest and the coldest months in a year increased. Other months also underwent some re-distribution of air temperatures compared to usual parameters. Because till now the lakes are considered free of any anthropogenic influence changes of structure of communities can be the natural succession depending on directional change of trophic status of the water bodies. The basic investigation occurred on the Kharbei lakes representing a system from three connected water-bodies with the largest one called the Bolshoi Kharbei. Actual studies of the zoobethos and zooplankton of the lakes have been in the two contrast by temperature conditions years. By qualitative and quantitative zooplankton parameters the studied lakes are common with big fresh water-bodies at high latitudes. By plankton they are oligotrophic with mesotrophic features and middle-feeding lakes. During vegetation season, plankton is numerically and by species composition dominated by rotifers (*Kellicottia longispina* Kellicott, *Conochilus unicornis* Rousselet, etc.), by biomass by crustaceans one. Composition and number of plankton invertebrates underwent annual year changes that could result from temperature differences, including long-term changes. For 30 years gone from first to current studies, composition of benthic crustaceans changed. One abundant harpacticoid copepod species was almost totally replaced by the other. This year new information about tundra water communities was obtained and the researches will continue. Research was supported by grant of RFBR № 98-04-50007 and from the Ural Division of RAS.

Significance of social research for biodiversity conservation and sustainable use of wetland services. Case study: inland Danube Delta

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Long term research carried out in the Lower Danube Wetlands System (LDWS) and Lower Danube River catchment (LDRC) created a strong ecological background for: i) assessment of ecosystem functions and services; ii) identification major human drivers and pressures and; iii) development policy and management scenarios targeted towards biodiversity conservation and sustainable use. It has been argued that for achieving such policy objectives there is also a need for significant restoration of the ecological configuration of LDWS and LDRC. In spite of good scientific foundation of the sustainable based scenario, very strong economic and social constraints maintained confusion and delayed a clear policy option.
In order to provide support for removing or at least significant reduction of such constraints, a complementary social research program has been launched in the recent years.
The extensive and intensive social research activities were based on widely used methods – semi structured interviews, focus groups, questionnaires and deliberative events, and focused on the identification of: i) social structure; ii) people's perceptions, attitudes and behaviors related to biodiversity, wetlands restoration and sustainable use of ecosystem services; iii) traditional ecological knowledge and practical experience and; iv) conflict of interests as well as mechanisms for conflict resolution.
The presentation is dealing with the partial results derived from social research activities carried out between 2005/2008 in the IDD, one of the Long Term Socio-Ecological Research Site, established in the LDWS. That allowed: i) classification and mapping stakeholders involved in policy development and decision making; ii) identification a severe dichotomy between secondary stakeholders or/and primary stakeholders on one side, and the social groups representing local communities, on the other side; iii) identification sources and particular conditions that create conflicts between poor and marginalized local communities and very rich and powerful "colonists".
The analyses shows that the most powerful and influential secondary and primary stakeholders are against extensive flood plain restoration and biodiversity conservation, while most primary stakeholders are, or might be in favor of such scenario, if they are well informed about potential benefits for their future wellbeing, and are deeply involved in all phases of policy cycle.

The spatial and temporal variability of limnological properties of deep reservoir, Karakaya, Turkey

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In order to use the energy (hydro-electric power) and irrigation potential of the Euphrates River, a series of dams have been designed (upstream to downstream): Keban, Karakaya, Atatürk, Birecik and Karkamiş. Karakaya Dam Lake is the third largest dam lake in Turkey. In the study area, six sampling points were selected taken in order to define the character of the water system. In October 2005-November 2006 samples were taken sampling sites by monthly. In every sampling period, the physical and chemical parameters of water were measured. The Karakaya Dam Lake is deep mesotrophic reservoir. The reservoir of Karakaya Dam has special characteristics with respect to its limnological properties. One of the characteristics is from alkaline to high alkaline water of reservoir. While nitrite and ammonium of nitrogens were at high level especially in st 1 and 4, ortho-phosphate phosphorus was low in ecosystem.
The effects of selected environmental factors on the composition and structure of benthic macroinvertebrate communities in Karakaya Dam Lake were investigated. From the eleven sampling sites, species were determined representing the major taxa, Gastropoda, Oligochaeta, and Insecta.
The relative contribution of ecological factors in explaining the variation observed in macroinvertebrate assemblages were quantified using canonical correspondence analysis (CCA). The main environmental factor influencing the composition of communities was habitat heterogeneity, water chemistry particularly hardness, N and P concentrations. In sampling stations results the benthic macroinvertebrate communities showed less taxonomical diversity than expected. UPGMA cluster analysis (unweigthed pair-group method using arithmetic averages) separated main groups based on different characteristics of those communities. *Dreissena polymorpha* and *Tubifex sp*. were the most abundant benthic macroinvertebrate species in Karakaya Dam Lake.

Historical survey of the knowledge of aquatic biodiversity in Romania - past, present, perspectives

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The author, considering water issues as crucial to the future of mankind, surveys the main historical turning points – of aquatic ecosystem biodiversity in Romania.
Romania holds a rich and varied hydrographical system that supports a great variety of living organisms which form Romania's heritage of specific and ecologic aquatic biodiversity, counting over 11,000 species, many of them in a risk state. Romania collects from abroad a great volume of their inner waters; thus, Romania is strongly dependent on inflows amounting to over 75%, this contribution from other European countries meaning not only water and sediments, but also bio-discharges and pollutants/ fertilizers/contaminants. The aquatic biodiversity, particularly the forms that constitute renewable resources of economic value, has been studied for more than a century, the scientific researches being performed, according to the author, during four major stages:
1. the beginnings, when great Romanian biologists, educated at famous universities in Europe, laid the foundation of the national sciences in the newly-born modern Romania;
2. the period of development and consolidation of scientific interest in the biological heritage of our waters, in the use of their bio-productive potential; it was the time when scientific, specialized schools and institutions were set up and theoretical fundamentals were worked out in Romanian limnology and biologic oceanography;
3. the years following World War II, years of unprecedented socio-political changes in Romania, of forced nationalization, collectivization and industrialization, when, however, researches into biodiversity were encouraged and a great amount of scientific data were accumulated for the purpose of making maximum use of nature, so that the immense demand of resources necessary to our "developing country" should be satisfied, while, on the other hand, strong disturbances in Romania's aquatic systems occurred;
4. the present period characterized by a socio-political and economic system in transition, by our country's joining EU, by the start of globalization and the emergence of critical problems concerning biodiversity.
After analyzing the four stages in the history of the scientific research in Romania, the author succinctly underlines a few of the most significant aspects, insisting on issues that the scientific community of limnologists and oceanographers should take into consideration for the future. Main aspects referring to the aquatic biodiversity in Romania and targets in continuing and developing researches into this field are discussed.

Influence of *Eucalyptus globulus* leachates on microbial decomposition in streams

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A large number of Portuguese small watercourses are now lined by *Eucalyptus globules* trees. Such streams, running through eucalypt monocultures, clearly differ from their counterparts in autochthonous deciduous forests; they present distinct hydrology, seasonality, quantity and quality of the litter inputs. In summer, eucalypt streams are usually dry or remain reduced to small, acidic, and almost anoxic pools. These retentive areas are rich in decomposing eucalypt leaves immersed in leaf leachates (or derivatives). The fungal (Aquatic Hyphomycetes) degradative capacity of eucalypt leaves in such low flow/lentic conditions is largely unknown, but crucial to the understanding of nutrient cycling of such intermittent streams. Herein we assess the effects of eucalypt leachates on eucalypt leaves decomposition and associated microbial activity. Leachates were obtained by simulating pool conditions (28g eucalypt leaves/L of stream water) in the laboratory. Eucalypt leaves, previously incubated in a stream, were exposed to a gradient of aerated and non aerated leachate concentrations (2.5 to 100% v/v). Leaf mass loss, fungal sporulation and biomass (ergosterol) were assessed after an incubation period of 12 days. Leaf mass loss was not significantly different across concentrations in non-aerated media while, under aerated conditions, a significantly higher mass loss was observed in the lower leachate concentrations (0 – 2.5%). Sporulation only occurred in aerated leachates and was significantly higher in control media. Fungal biomass was not significantly different among treatments in either aerated or non-aerated leachates. However, results indicate that an increase in leachate concentrations may induce a decrease in fungal biomass in the absence of oxygen and an increase in its presence. A large amount of leaves accumulate in the eucalypt stream beds in summer. Flow reduction and consequent decrease in water quality (e.g. lower oxygen) may, according to our results, affect the crucial leaf processing role of fungi in these streams and though, stream metabolism. The intensity of the leachates effects seem to depend primarily on water oxygenation. A positive stimulating effect of leaves leachates on fungal degradation may nevertheless occur in eucalypt streams in spring/summer when the flow still allows water oxygenation.

An investigation of the zooplanktonic organisms in Delice stream and some arms in Turkey

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This research was carried out between May 2007-May 2008, to determine the zooplankton (Rotifera, Cladocera, Copepoda) fauna of running waters Kızılırmak, Delice, Budakozu, Kılıcozu and Malakozu in Turkey. For this purpose 10 sampling stations were selected. Besides the faunistic research, physical parameters of streams, which includes electrical conductivity, salinity, pH, dissolved oxygen and temperature, were measured during the field studies with portable devices.
34 Rotifera, 9 Cladocera and 1 Copepoda species were identified as a result of the study. Maximal species were belong to the Rotifera; *Asplanchna priodonta, Brachionus quadridentatus, Brachionus calyciflorus, Euchlanis dilatata* and *Synchaeta pectinata* were the species which observed the most during the research. *Bosmina longirostris* and *Chydorus sphaericus* were the most common Cladocera species. The only representative of Copepoda was *Eucyclops serrulatus*.
Kızılırmak and Delice Rivers had the most number of zooplankton species. 8 Roifera, 4 Cladocera and 1 Copepoda species were identified in both Delice Stream and Kızılırmak River. 7 Rotifera and 2 Cladocera species were identified in Malakozu Creek; 5 Rotifera and 2 Cladocera in Kılıcozu Creek and 5 Rotifera and 1 Cladocera in Budakozu Creek.
None of the zooplankton species were identified in all of the running waters. There are only one Rotifera and one Cladocera species which were identified in four of the streams. Rotifera species *Lecane luna* was the one that identified in all of the running waters except Kılıcozu Creek. Cladocera species *Bosmina longirostris* was the one that identified in all of the running waters except Budakozu Creek. The other most common species were *Testudinella patina, Brachionus calyciflorus* and *Colurella colurus* of Rotifera and *Chydorus sphaericus* of Cladocera which were identified in three of the running waters. The only representative of Copepoda was identified only in Kızılırmak River and Delice Stream.
Hacettepe University Research Center was supported this study with the project numbered 07D06601001.

Cold winters versus mild winters: effects on the plankton of following growing season

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The influence of two winter periods with different ice cover duration on L. Peipsi (Estonia) on plankton and nutrient content was analysed. Trends in nutrient and plankton dynamics during variable winters of 1997-2008 were studied as well. Duration of ice cover was 140 days in winters 2005 and 2006, about 50 days in 2007, and about 40 days in 2008. The winter of 2008 is regarded as the warmest of the last 140 years. The years 2007-2008 with a short ice cover had higher silicon and nitrogen content of water in the following growing season. The N/P ratio was markedly higher after the short winters. The high Si and N concentration and N/P ratio persisted throughout the growing season of these years. Unicellular centric diatoms showed a sharp increase in April 2008, while the large filiform diatom *Aulacoseira islandica* dominated in the cold winters and after ice break. The high spring peak of diatoms was was followed by their low biomass in summer. The dominance of cyanobacteria in summer was most strongly affected by temperature which behaves independently of winter conditions. However, dominant genera were affected by different N/P ratios in the two study periods: the biomass of Microcystis (non-N2fix genus) was high in summers 2005 and 2006 at the low N/P ratio (<10), while the biomass of Aphanizomenon (N2-fixator) on the contrary, at high N/P ratio (>20). The duration of the ice cover had an evident impact on the biomass of all zooplankton groups in May and June. The sum of water temperatures in April, May and June affected positively the biomass of cladocerans and copepods, and negatively the biomass of rotifers. The abundance of rotifers and total zooplankton in the growing season was significantly lower in years with warmer winters. The cool part of the year evidently affects on quantity of nutrients, particularly N, and N/P ratio in the vegetation period. The influence on phytoplankton is indirect and acts through nutrients. Zooplankton is mostly influenced by water temperatures in spring, timing the summer peaks of different groups.

Preliminary estimation of diatom tolerance values for Danube Delta lakes

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Community structure changes with pollution or stress. In the Water Framework Directive, high ecological status through biological parameters is defined as slight or minor deviation from the reference community, while the good status is defined as a small deviation. As diatoms (and other key organisms like macro-invertebrates or macrophyte communities) are in the center of the process, ecologically sound criteria are urgently need to assess the deviation of a sampled community from the highest potential quality awaited. Regarding diatom species recorded in Danube Delta we noted that only few of them are preset in indicator value lists of Romanian legislation concerning water quality assessment and therefore a completion is needed. Weighted average, cumulative percentiles, parametric regression method coupled with optimum value analysis and curve classification methods have been used for deriving tolerance values for phosphorus. From the total number of species for which tolerance values to phosphorus concentrations have been calculated, 29 represents sensible species, 47 are tolerant and 4 intermediary tolerant. Recommended method for tolerance value calculation is weighted average and cumulative percentiles, producing highly similar results (correlation coefficient is 0.87).

The relationship between diversity and community functions in Musura Lagoon (Danube Delta)

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Musura Lagoon (45°10' 48.12"N latitude, 29°39'21.34"E longitude), represents the interface of transitional waters between the Danube Delta and NV Black Sea and it belongs to fore-delta, part of Danube Delta, Biosphere Reserve. During the last 30 years, the Musura Lagoon (3500 ha in surface) has an accelerated trend of isolation from marine water of Black Sea, due to an active process of remodelation of its borders between the real Delta, marine waters and the alochtonous flow of Danube River. The aim of this study was to emphasize the state of transition of lagoon ecosystem in order to develope scientific ideas for the conservation and sustainable management of transitional waters. The evolution of structural and functional diversity of planktonic and benthic communities was evaluated by comparison between historical and actual data. On the functional point of view, it was determined specific parameters of energy flow through planktonic and benthic food webs in the recent period. Nowadays, the diversity spectrum of phyto, zooplanktonic and zoobenthic communities shows the presence of species with a wide range of tolerance while the halophylic species disappeared. The microbial community from water and sediment was represented by high functional diversity that it maintained up to the present. Energy concentrates mostly in the organic matter of the water column directly linked to plankton productivity (Wald's $\chi2=7.347$, $p=0.007^{**}$) and phytoplankton biomass (Wald's $\chi2=21.066$, $p<0.001^{***}$). The transfer between different compartments occurred with low efficiency, a high amount of energy remaining unused and being stored at detritus level. Bacterial production has a major contribution to degradation of organic matter in the water column through the aerobic decomposition rate. These parameters were directly correlated (Wald's $\chi2=22.923$, $p< 0.001^{***}$). The study revealed an imbalance of the transfer of energy and matter among the compartments in Musura Lagoon; the fact is most relevant for a better understanding of the network processes in transitional waters. Our study has a practical meaning and should be a valuable tool for a further sustained management and conservation politics of the transitional waters in the Danube Delta.

Shifts in the fish community of Lake Peipsi: the cumulative effect of eutrophication, climate change and fishery

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Fishery is an important factor in the ecosystem of large shallow Lake Peipsi (3,555 km^2, mean depth 7.1 m). L. Peipsi is inhabited by 37 fish species and is considered one of the best large fishing lakes in Europe. Recent yields of some 7,000 tons per year (about 20 kg ha^{-1}) are about half of those 70 years ago in L. Peipsi. The objective of the study was to track changes that occurred in the fish community during last decades. We analysed fish populations' dynamics using commercial fishery statistics from 1931 to 2008 in relation to eutrophication, daily data of water temperature and ice conditions. The limnological time-series data from 1950 to 2008 indicate deterioration of water quality and adverse changes in the whole lake ecosystem. Eutrophication has led to an undesirable growth of algae, massive blooms of cyanobacteria accompanied by oxygen depletion during the night and fish kills, low water transparency and siltation of the lake bottom. Proportion of fish species in commercial catches has changed considerably during observation period. Changes caused by climate effects and eutrophication lead to an increase of pikeperch *Sander lucioperca* (L.) and a decline of smelt *Osmerus eperlanus* (L.). Stock and catches of vendace *Coregonus albula* (L.) collapsed in the late 1980: the main reason was the cumulative effect of extreme weather events (extraordinary hot summer and earliest ice-off dates). Any other small fish does not compensate the low numbers of smelt as main food for young pikeperch. The fishery is very intensive and has a large impact on the size composition of the fish community. Particularly the size composition of pikeperch population is affected as larger specimens are almost completely removed leaving an unbalanced population of only few young year-classes. It is important to reduce the intensity of fishery to a level that allows balanced fish populations to develop. We argue that climate change will have more pronounced effects on fish community than nutrient dynamics.

The occurrence of the sewage fungus *Leptomitus lacteus* in the Biała River in Bialystok, Poland

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Fungus *Leptomitus lacteus* (Roth) C. Agardh (Oomycetes, Leptomitales) is an indicator of strongly contaminated freshwater. It also grows in water containing sugar industry and brewing sewage and is considered to be a nitrogenophilic species. However, the species has also been identified as a saprotroph in unpolluted freshwater. We compared the occurrence of *L. lacteus* in freshwater samples from autumn 2007 to summer 2008. For this purpose, we analyzed water samples of running waters from Bialystok, in Podlasie Province, Poland. Water used in the experiments was collected from the Biala River, which flows through Bialystok and represents a left-bank tributary of the Suprasl River with length of 29.9 km. All water samples (0.5 l. each) were collected from surface water for the isolation of aquatic oomycetes, especially of *L. lacteus*. To isolate of aquatic fungi we used baiting method. Fungi were identified under a light microscope, taking into consideration the following morphological features: the shape and size of the tallum, and the shape of sporangium and spores. The hyphal segments of L. lacteus under light microscopical study shows that they are very variable in dimension, but on average they are approximately 200 µm long and 20 µm broad. Zoosporagia are 400 µm long and mostly 8 to 16 µm, rarely to 50 µm broad. Zoospore cysts are 10 to 11 µm in diameter. *L. lacteus* is sewage fungus is one of only a few aquatic Oomycetes, which marks saprobe condition of waters. It has been observed on the spawn of freshwater fish in lakes, rivers, springs and ponds. The frequency of occurrence of different species of fungi is used as a measurement for the saprobic index of water. In the biological evolution of water *L. lacteus* indicates the alpha-mesosaprobe zone, sporadically also occurring in cleaner freshwater. Hence the occurrence of *L. lacteus* in biotopes atypical for the species could be documented by presenting in the trophic status, for the Poland saprobic index and also for the classification of water quality of the examined waters. It is useful for our understanding of the fungal diversity of freshwater ecosystems.

Water quality trends in Vistonis Lake (ne Greece): a long-term approach

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Greek Lakes and wetlands are primarily valued as water supplies for agriculture, domestic purposes, industrial needs and commercial fishery. Therefore both anthropogenic and physical are often accompanied by enhanced cultural eutrophication. On the other hand almost all of them appear a high degree of heterogeneity in space and time concerning the abiotic water quality parameters and the biotic factors. Long term data as well as multivariate approach of data elaboration are widely used, last years, as valuable “tools” for evaluation the lake’s status and for identifying the governing factors.
The research object of the present study is to integrate water quality criteria concerning lake Vistonis (NE Greece) for the last 10 years providing a long term evaluation of the ecosystem and furthermore linking the seasonality of the exa mined parameters with natural and anthropogenic factors. Vistonis lake is a shallow ecosystem of European significance, in terms of biodiversity, since is listed among both Natura 2000 and Ramsar convention’s sites. Monitoring data were collected for the last 10 years in four sampling stations. Water quality parameters concerning temperature, pH, conductivity, nutrients were measured at monthly intervals. The intra-annual and the inter-annual pattern of the water quality of the exa mined parameters are discussed. Furthermore the eutrophication process associated with the anthropogenic pressures, the major threats and implications for conservation are also highlighted.

Zooplankton communities in floodplain lakes of the Vychegda River basin (the main tributary of the Severnaya Dvina River)

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The Vychegda – main tributary of the Severnaya Dvina River – is remarkable for a large number of lakes (> 1800), where over 60% of them have surface area < 1 ha. Traditionally the studies centered on the fauna of large lakes, but recently the researchers have put forward the idea highlighting the importance of small floodplain lake habitats. Ecosystems of the latter kind directly participate in the formation of structural and functional features of rheobiomes. It follows that organisms from floodplain lakes form river plankton assemblages. Consequently, hydrobiont assemblages of the channel and running floodplain lakes represent a united natural system. In this work we aimed to study modern fauna composition and peculiarities of zooplankton structure in floodplain lakes permanently connected with the river. Overall 159 zooplankton species were identified. 49 Rotatoria and 23 Crustacean species and forms new for the lakes of the Vychegda River Basin were registered. During vegetation period the predominance in abundance and biomass belonged to Cladoceras in the littoral zone and Rotatoria and Cladoceras in the pelagial. Within abundant species there are no permanently dominant in the littoral zone, while in the pelagial the number amounts to 2-3. Composition of littoral and pelagial zones is similar; the ICS is 0.8 on average - the facts are, presumably, due to small lake sizes and insignificant difference in depths.

Distribution of viruses and their effect on planktonic bacteria in a large temperate reservoir

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The quantitative distribution and role of viruses in the regulation of bacterioplankton abundance and production were studied in the pelagic part of the Rybinsk reservoir. It is a large polymictic mesotrophic reservoir of the Volga River. During ice-free period the number of virus-like particles varied from 1.10 × 107 to 5.74 × 107 ml^{-1}, that is close to the values observed in mesotrophic and mesoeutrophic freshwater environments. The peaks were recorded in July or August. The ratio between abundances of viruses and bacteria ranged from 3.0 to 9.4 (6 on average). Up to 80 mature phages were contained in an infected bacterial cell. From 4 to 25% of the bacterioplankton were infected by phages in different parts of the reservoir. Phage-induced mortality rates amounted to 3.7-41.8% (22.5% on average) of daily bacterial production that is on average only 1.2 times less than bacterivory of heterotrophic nanoflagellates. The combined losses due to viral lysis and flagellate grazing accounted for 36.8 to 69.7% of heterotrophic bacterial production during the ice-free period. The role of these control factors varied considerably during the season. The maximal virus-induced bacterial mortality rates were recorded in August and September when a mass development of cladocerans was observed. During this period they reduced the number of flagellates and ciliates significantly. Electron microscopy studies have also revealed the viral infection of cyanobacteria from the genera Synechococcus, Synechocyctis, Microcystis, Oscillatoria and Anabaena. The ratio of Synechococcus and Synechocyctis cells, containing mature intracellular phages, to the total number of these picocyanobacteria was 3.1-5.1%. From 11 to 25% of the dominant colonial Microcystis were infected by viruses during the summer phytoplankton bloom. The results obtained show the importance of viruses in the control of abundance and production of bacterial populations as well as the carbon flows in the planktonic food webs of the reservoir. This study was supported by grant No. 08-04-00441 from the Russian Foundation for Basic Research.

Leaf litter decomposition in a low order tropical stream in Sri Lanka

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Within the framework of the cooperative project IRESA (Initiative in River Ecology in Sri Lanka: from Science to Application) on Sri Lankan streams (cooperation Austria - University of Innsbruck and Insitute for Limnology Mondsee, and Sri Lanka - University of Kelaniya), this decomposition was carried out in the 1st order stretch of Eswathu Oya, a tropical stream in the wet climatic zone of Sri Lanka. To compare the decomposition from three leaf species of the riparian vegetation, ´the litter bag technique´ with two mesh sizes (8 mm and 100 µm) was used to experimentally control the macroinvertebrate colonization. The decomposition experiment was carried out from September 2007 to June 2008. During this period, the exposed litter decomposed totally. The decomposition time varied for the different leaf species. For all three species, decomposition rates (k) were higher in coarse mesh bags campared to the fine mesh bags of the same leaf species. The k-rates in coarse mesh bags were 0.0090 per day for *Ochlandra stridula* (bamboo), 0.0253 per day for *Hevea brasiliensis* (rubber), and 0.0550 per day for Alstonia macrophylla. The k-rates in fine mesh bags were 0.0059 per day for Ochlandra, 0.0151 per day for Hevea, and 0.0180 per day for Alstonia, which increased significantly with decreasing toughness of these leaf species in all cases. The results demonstrate that both, the macroinvertebrate fauna and a potentially higher mechanic abrasion, respectively, provide fo a more effective leaf litter breakdown.

A contribution to the knowledge of Tunisian 'large branchiopods' *(branchiopoda: anostraca, notostraca, spinicaudata)*

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After the seminal works carried out at the beginning of the XX century, Tunisian freshwater crustaceans have been scarcely investigated and, in contrast to the other Maghrebian countries, a comprehensive checklist of Tunisian Anostraca, Notostraca and Spinicaudata has not been compiled; furthermore, the few available data are scattered in old and often hard-to-find pieces of literature.
In order to fill this gap, an extensive nationwide sampling campaign aimed at the census of the so-called 'large branchiopods' has been carried out from December 2004 to February 2009. Altogether, more than 300 temporary water bodies have been investigated, leading to the finding of 8 anostracan, 4 notostracan, and 2 spinicaudatan species. The presence of *Phallocryptus spinosus* in Tunisia is here reported for the first time. Conversely, the endemic Tunisian anostracan species *Streptocephalus bimaris* and *Chirocephalus recticornis* were not observed, nor was it possible to confirm the presence of *Streptocephalus rubricaudatus*, whose possible presence in the country was suggested on the basis of the finding of endite remains in the bed of a dry temporary stream near Kairouan.
The occurrence data for each species have been plotted on climatic maps in order to check whether the observed distribution patterns are influenced by climatic features. While the distribution of notostracan species in the country is sharply related with the precipitation and temperature patterns, anostracans and spinicaudatans seem to be less influenced by these factors.

Cryptic species within the freshwater copepod genus *Hemidiaptomus* **(***calanoida, diaptomidae***)**

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The genus *Hemidiaptomus* is composed by about 17 species inhabiting the freshwater temporary water bodies of the whole Palaearctic region. It currently comprises three subgenera, which are mostly parapatric and present only limited co-occurrence areas. There is no consensus on the taxonomical arrangement of the entire group, and to date no molecular studies have been carried out to test it. Accordingly, a thorough revision of the entire genus using a combined morphological and molecular approach is strongly advisable.
We have investigated the pattern of morphological and molecular diversity of three species of the genus *Hemidiaptomus* belonging to the three different subgenera (i.e. *Hemidiaptomus* (*Gigantodiaptomus*) *amblyodon*, *H.* (*Hemidiaptomus*) *gurneyi* s.l., and *H.* (*Occidodiaptomus*) *ingens*) with the aim of checking the reliability of the morphological characters currently used for species identification, and the possible presence of cryptic species within the genus.
The three studied species present a sharply different molecular structuring. *H. amblyodon* shows a remarkable molecular and morphological constancy throughout its distribution range; conversely, observed distances between presumed conspecific clades of *H. ingens* and *H. gurneyi* suggest that under these binomens are in fact included complexes of cryptic, or currently just unrecognized, species, which should have began to diverge during the Miocene or even the Oligocene.
Finally, our results gives further evidences of the high potential for copepod speciation with no or little morphological changes, and stress the need of a revision of the most controversial Palaearctic diaptomid genera, like *Hemidiaptomus* and *Arctodiaptomus*, with a combined molecular and morphological approach.

Leaf litter breakdown in mediterranean streams: effect of dissolved inorganic nutrients

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Anthropogenic release of nutrients into streams, such runoff from agricultural fields and urban lawns, causes an increase in dissolved nutrient concentrations in water. This increase could enhance or slowdown leaf litter breakdown, depending on the balance between nutrient dependence and the effect of toxic substances on microbial decomposers and detritivorous community. Litter breakdown of alder leaves enclosed in coarse mesh bags (5 mm) was studied in six low order streams with different trophic status defined by the soluble reactive phosphorus concentration (from 11 to 167 ug L^{-1}). Breakdown rates differed significantly between streams, but these differences were not only related with the availability of phosphorus in water. Invertebrate density and shredders abundance in the litter bags were positively correlated with leaf-litter breakdown. An inverse relationship was found between invertebrate diversity inside litter bags and ammonium concentration, the shredder density decreased dramatically in streams with high ammonium concentration. The effect of dissolved inorganic nutrients in leaf litter breakdown in streams receiving various anthropogenic inputs, varied depending on the stimulation and deleterious effects on different functional groups.

Interstitial fauna as indicator for heavy metal pollution

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Aries River (north-western Romania) is a good model for the study of interactions between surface aquatic fauna and interstitial groundwater fauna, in the ecotone zone represented by the river bank sediments. This river is one of the most polluted in Romania, the area being known as very important in ore exploitation, especially gold and heavy metals. Our preliminary and sporadic results indicated a change in interstitial communities' composition in the polluted river section and the extraordinary flourishing of stygobiontic forms. Beginning with November 2007 we made again a more systematic study, by sampling monthly interstitial fauna, water from surface and interstitial, and sediments. We used a Bou-Rouch pump and sampled at about 1.5 m in depth, filtrated the water and analyzed water and fauna in laboratory. Beside these, superoxide dismuthase activity was determinate in laboratory from organisms' tissues and fluids, as good indicator of stress induced by environmental factors (such as pollutants in our case). Water chemical analyses show increasing pollution in the section of the river. Surface and interstitial waters have similar chemical composition without reaching critical values, while sediments show high degree of pollutant accumulation. Fauna composition can be also correlated with water quality. Almost all specimens were identified at species level. Fauna differences between clean and polluted sections are obvious, and seasonal variations are also discussed. The conclusions are emphasizing the role of competition in groundwater colonization and the highly dynamics of aquatic fauna, both of surface or groundwater origin, in the interstitial ecotone.

Zooplankton dynamics and conservation problems of a mediterranean temporary pond

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Mediterranean temporary ponds were extensively studied in Sicily in the last years, in order to assess the biodiversity of plankton assemblages in these peculiar ecosystems. Among them, the “Gorgo di Rebuttone” was selected to study the dynamic of zooplankton assemblages during two consecutive years of impoudment. The pond is located 12 km far from the city of Palermo, at 720 m a.s.l. on a limeston bedrocks cover by clay and it is fed by rainwater; it has an elliptical shape and its main axes is about 80 m long at maximum holding. Maximum depht is about 1,7 m and its hydroperiod generally spans from October to June, depending on the amount of rainwater in autumn-winter. From February 2007 to August 2008, the main limnological parameters were recorded biweekly contemporary to the collection of plankton samples. Six cladocerans, one cyclopoid copepods, three ostracods and three rotifer were the only species recorded in the pond and their dynamics are described. Neither large branchiopods nor calanoid copepods, which have been commonly found in other analogous environments in Sicily, were recorded in this site. This low diversity, may be explained by the strong human impact suffered by the pond. Actually, it represents one of the few “green spots” in the surroundings of the city of Palermo and very often people were observed to introduce fish (gold fish but also domestic turtles), The introduction of these “alien species”, which naturally would not be present and wich generally die when the pond dries up in early summer, likely affects the species richness and plankton structure of the pond.

A lava formed pond ecosystem in ne Iceland

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In some of Iceland’s extensive lava fields, wetlands and ponds have evolved forming a unique ecosystem. The spatial heterogeneity of such ecosystems is visible and can be verified in their macroinvertebrate assemblage. An extensive wetland area, with a vast amount of ponds of various formations, surrounds the eutrophic Lake Myvatn, in North East Iceland. Most of these ponds are water filled depressions or pseudo-craters, and are a consequence of a volcanic eruption over 2200 years ago. A research project on these ponds was carried out 2001–2003. The two main objectives of this study were to assess and quantify the spatial and temporal diversity of macroinvertebrate communities and to isolate factors which might explain a great diversity of species composition. Samples, by sweep-netting, were collected from over 40 ponds in a cluster of over 200 ponds, once or twice every summer. The sampling emphasised the plankton, epifauna on macrophytes and sediment surface. On every sampling occasion physical and chemical variables were obtained, as well as trapping fish. The results will be discussed in the context of the two main objectives of the research.

Thermal sensitivity of electron transport system activity and respiration rate in lake and pond species of Daphnia

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Electron transport system (ETS) activity and respiration rate (R) were compared in field collected *Daphnia hyalina* and *D. rosea* at six experimental temperatures (5, 10, 15, 20, 25 and 30 °C) in the laboratory. *D. hyalina* was collected from Lake Bohinj (Slovenia), a dimictic, oligotrophic alpine lake in February (during homothermy: 4°C) and July (stratification; maximum temperature: 20°C). *D. rosea* was collected from a perennial, non-stratified lowland pond in Hraše (Slovenia) in May (water temperature: 21°C) and July (28°C). Hemoglobin content (measured in the summer populations) was 18.9 µg Hb/mg d.w. in *D. hyalina* and 86.4±11.6 µg Hb/mg d.w. in *D. rosea*. Respiration and ETS increased with increasing experimental temperature in all four experimental groups. ETS/R ratio peaked at 20°C in both *D. rosea* experiments while it was highest at 15°C and 25°C for winter and summer *D. hyalina*, respectively. Field acclimatization temperature affected ETS and ETS/R in both species, while respiration was only affected in *D. rosea*, where the spring population exhibited higher respiration rates at high experimental temperatures (20-30°C) than the summer population. Respiration was higher in *D. rosea* than in *D. hyalina* while there was no significant difference in ETS activity between the two species. ETS/R ratio was significantly higher in *D. hyalina*. Arrhenius activation energy (Ea) of ETS did not differ between the four experimental groups, but Ea of respiration was higher in *D. rosea* than in *D. hyalina*. Results indicate that while the metabolism of the stratified lake species is less sensitive to temperature change and the pond species uses a greater fraction of its maximum respiratory capacity for basal metabolism and locomotion, these differences are not due to habitat adaptation at the level of the enzymatic process but rather a reflection of differences in other factors (such as hemoglobin concentration) that affect the complex physiological process of respiration.

Eutrophycation impact on ecosystemic services. The role of planktonic communities in the Danube Delta

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The paper aims to emphasize the long-term changes in structure and ecological processes of planktonic communities in shallow lakes of Danube Delta Biosphere Reserve as well as their consequences on the flows of goods and services these lakes offer to socio-economic systems. Under the eutrophication pressure, profound changes in biodiversity and energy flow were observed as compared to the reference period. The balance between submerged macrophytes and phytoplankton characterized the natural status of the Danube Delta lakes (1975 - 1980). This was changed by the eutrophication process with consequences on the entire food web structure. Phyto and zooplankton species richness decreased with 50%, with effects on quality and quantity of production, as well as nutrients recycling rate. In Rosu Lake (a representative shallow lake used as case study), the phytoplankton and zooplankton biomass increased 50 and 8 times, respectively, due to increased nutrient supply and changes of micro/macro filter feeders ratio. A low level of increasing (1.7 times) has been recorded for the bacterioplankton biomass. The maximum impact of eutrophication (hypertrophic period) is characterized by the input of energy via phytoplankton exclusively. During that period, the primary productivity increased 4 times and that of zooplankton 7 times by comparison with the reference state. In the new conditions, primary production efficiency (NPP/GPP) drops from 80% in 1977 to 47 % in 1986. Nutrients recycling rates by phytoplankton and zooplankton decreased 11 and 1.1 times, respectively as a result of structure and trophic relationship changes. Shift in the submerged macrophytes/phytoplankton ratio affected the composition of organic substrate with consequences on the bacterioplankton communities. Since 1991, due to economic changes in the Danube basin a trend of trophic state recovery of lakes was registered, first observed at the level of phytoplankton communities. Responses at the level of phytoplankton communities consisted in increased nutrients recycling rates (without reaching the maximum capacity from reference period). Till 2001, zooplankton keeps the decreasing trend started in 1975, whereas bacterioplankton registers significant values of nutrients recycling that indicate the prevalence of degradation processes despite accumulation processes in self biomass.

Multidisciplinary evaluation of the function and importance of the small water reservoirs: the biodiversity aspect

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Small water reservoirs are the very important landscape elements for effective water management. Although these man-made artificial biotopes change the proportion of lotic and lenitic habitats and thus influence the species community structure, secondarily offer a broader scale of microhabitats and, in general, can significantly influence the fauna sustainable development. The evaluation of the function and importance of small water reservoirs in the biodiveristy development on all levels is still unappreciated. In this case, preliminary results of the study on 6 small water reservoirs in West Slovakia are presented. The research has covered the major species groups (phytobentos, macrohpytes, benthic and pelagic invertebrates, molluscs, fishes and birds). As the first step, we are focusing on the description of the biodiversity patterns within the particular water reservoirs followed by the analyses of species links to the environmental variables using the multidimensional methods (neural networks, ordination methods and generalised linear methods) as the second step. The third step covers the compilation of obtained results and evaluation of the function and importance of the small water reservoirs. The major benefits of this study are as follows: (i) significant improvement of the knowledge on the biodiversity of aquatic ecosystems influenced by small water reservoirs, (ii) implementation of the innovative methods of the multidisciplinary ecological research, (iii) support for sustainable development of the biodiversity in artificial biotopes, development of the multidisciplinary network of researchers and experts from the applied sphere, (iv) effective application of outputs in the ecological management oriented to the sustainable development of the artificial aquatic ecosystems in combination with their primary use and implementation of the results gained at the international scale.
The study was supported by the project SAV-FM-EHP-2008-03-04.

Natural and anthropogenic variations in littoral substratum affect periphyton and macroinvertebrates

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We tested whether different substrata (sediments, rocks, wood and macrophytes) in the littoral zone differ in their periphyton cover and in the biomass, size structure and taxonomic composition of the invertebrate communities they host. We studied seven lakes in the Laurentian region of Quebec experiencing different levels of shore disturbance.
The percentage of the littoral zone covered by submerged wood decreased significantly along the recreational gradient measured as dwelling density. Inversely, submerged macrophyte cover and percentage of fine particles (< 250 µÎ¼m) in the sediments increased significantly in the developed lakes. In undeveloped lakes, periphyton, invertebrate biomass and individual size were higher on sediments, lower on rocks, and somewhat intermediate on wood. Ephemeroptera, Anisoptera, Coleoptera, and Gastropoda were closely associated with sediments whereas Chironomidae were associated with rocks and wood. In developed lakes, sediments were again more densely colonized than other substrata (rocks and macrophytes). Taxonomic composition varied significantly among substrata. Oligochaeta and Nematoda were associated with sediments, Chironomidae with rocks, and Gastropoda, Hydra, Ceratopogonidae, and Ephemeroptera with macrophytes. Substratum composition is crucial especially in pristine lakes because the drastic differences in periphyton (3-fold) and invertebrate biomass (23-fold) between sediment and rocks tend to decrease when lakes undergo development. Submerged wood is replaced by macrophytes along the gradient of residential development. These organic substrata contribute to the biomass and taxonomic diversity of littoral communities. Our study has several implications for the management of north temperate lakes in periruban region that has been impacted by cultural eutrophisation following recent residential development.

The comparative estimation of river perch breeders of natural and artificial generations

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The river perch (*Perca fluviatilis*) broodstock were created with the materials resources of "Aquabiotechnopark" of Astrakhan State Technical University. For the first time the spawning of the breeders, rearing in industrial conditions, was carried out. The wild breeders of perch have a high level of infectiousness by worms (*Eustrongylides excisus J.*) in water basins of Astrakhan region. This has a direct and oblique effect on the physiological statement of perch before spawning. The mortality of perch breeders, caused invasion and the aggregative with the secondary diseases as branchiomycosis and eustrongylidosis, was observed in previous tests. During the total parasitological cutting of breeders of artificial generation there were no worms and other invasions. Some biochemical indices were corresponded to the indices of natural fishes. For the artificial generation of perch the total amount of protein was 18,6 % of body weight, fats – 0,8%, ashes – 1,3%. The indices of hemoglobin were 85-90 gr per liter, it was a little higher, than we observed for natural group ready to spawn. During the carrying out the comparative analysis of piscicultural and biological figures of natural and artificial perch breeders, the next values were established: the age of mature males of artificial perch – 2 years (3-4 years for natural group); the age of mature females of artificial perch – 2 -3 years (4-5 years for natural females); the average absolute fecundity of artificial perch was 80,6 thousand eggs (25-61 thousand eggs for natural generation), the survival rate of females after spawn – 100% (50-60% - for natural females). Consequently, the valuation of the perch breeders was carried out. It was revealed, that the artificial group of perch had similar biochemical composition as the natural ones, but this breeders were not infected by worms and had better growth rate. In this case the process of nutrients' accumulation in gonads passed faster and such breeders mature earlier.

Biodiversity of the rivers depending on their landscape in the eastern Pechora basin

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The European North-East of Russia is a unique region to carry out biodiversity investigation, conservation and restoration programs. Aim of our researches was to study biological diversity of aquatic communities in the Pechora river basin. Many rivers of the Pechora basin today are truly pristine, and few have been altered by various human impact. Investigated rivers cross the Urals mountain, its western foothill part and Pechora plain. Expedition research involved 8 key sites, different by nature landscape features and damage degree owing to difference in protected status. Zooplankton of the rivers in the mountains and foothills has low diversity, number, and biomass, benthos is richer. The highest abundance and biomass of benthos are typical for foothills. In mountain zone benthos includes 560 species from 27 groups of hydrobionts, in plain zone was found 120 species from 19 groups. The same taxa of invertebrates are dominating in benthos of mountain areas and foothills: mayflies, caddisflies, stoneflies. Oligochaetes and chironomids were more abundant on the plain with accumulation of sand and silt on the riverbed. Among the concerned upper and middle Pechora courses, the greatest number of fish families (9) was found in the foothill and plain upper reaches of the river, whilst the mountain stretches were identified for the least. The increasing gradient from mountain area to plain area relates to the confluence of the Pechora in foothill and plain areas with additional water-bodies. However, these additional water-bodies were not found for any considerable fish taxa diversity. Contribution of single fish species also changes. Portion of limno- and lithophile species as perch and roach absolutely dominating additional confluents significantly increases in the catch, whereas oxyphile fish as minnow slowly decreases. The data essentially complete existing information about water ecosystems diversity in the Pechora river basin and are applicable as basis for management decision on nature exploitation and environment protection.

Does species diversity affects aquatic leaf litter decomposition?

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Biological diversity degradation is compromising important ecological services. Integrated quantification of its impact on ecosystem functioning is typically realised as one or more ecosystem level process rates (e.g. primary production or detritus decomposition) based on single or multitrophic experiments. Our research is focused on identification of potential impact of species loss from different functional groups on leaf litter breakdown. In this context we varied diversity of aquatic hyphomycetes and shredders and evaluate the effect on leaf litter dry mass remaining in artificial microcosms. Changes in leaf litter composition were also investigated. The results suggest that the decomposition process is significantly influenced by hyphomycetes and shredders species identity rather than diversity. Similarly, the composition of the leaf litter is responsible for impairments on the litter breakdown.

Macrozoobenthos communities from the two types of land-water transition zones in a european lowland dam reservoir

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We investigated the abundance, biodiversity and taxonomic composition of macrozoobenthos from the land-water interfaces with sandy and organic-rich substrata. We also checked the possibilities of occurrence of the edge effect, consisting in the increased abundance and diversity of a community developing in a transition zone between two habitats, as well as in the presence of taxa specific only for that zone. The study area was the middle part of the Włocławek Reservoir (the lower Vistula River, central Poland). In 2002-2003, we sampled air-exposed (above the water line, water line) and submerged (0.5 m and 1 m depth) sites from a sandy area located in the flooded part of the reservoir and a small cove overgrown by macrophytes, with the sediments rich in organic matter. In the organic-rich sediments, biodiversity and abundance was higher at the exposed sites than at the submerged ones. Furthermore, we found numerous specific taxa, which occurred only in the land-water interface of the organic-rich habitat (semi-terrestrial Diptera: Empididae, Stratiomyidae, Tabanidae, Tipulidae, Cecidomyiidae, Nematocera; terrestrial and amphibious Oligochaeta: Lumbricidae, *Lumbriculus sp*., *Stylodrilus sp*., *Cognetia sp*.; as well as *Endochironomus sp*. (impar group) and Coleoptera larvae). Thus, it is highly probable that the edge effect occurred there. On the other hand, the sandy shore was a simple transition zone. Some symptoms of the edge effect appeared (high biodiversity and the presence of a few amphibious taxa), but the abundance was extremely low compared with that found at the submerged sites. Individuals inhabiting the sandy transition zone formed an accidental assemblage, consisting of casual survivors of frequent environmental stresses, aquatic organisms, which passively drifted to a location not typical for them, and animals currently recolonising the area. The homogenous, unstable land-water interface at the sandy shore is a poor habitat for macroinvertebrates, which are washed out by wave actions, have no protection against air exposure and freezing and their substratum may be totally destroyed in winter by ice drifting downstream. On the other hand, organic-rich sediments are more stable and provide much better protection and food conditions for the fauna living near the water line.

Advantages and drawbacks of calcein marking in external tissues for trout (*Salmo trutta*) population management

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In the context of fish management strategies, stocking efficiency is often questioned, regarding natural spawning and recruitment success. Many ways of marking actually exist and are currently applied by managers. For large scale studies, mass marking is usually favoured, and requires fluorescent chemical dyes. These dyes combine with calcium and are then stocked into internal bony pieces (like otoliths). Nevertheless, fish need to be sacrificed for otolith extraction. In recent years, many studies tend to show a great interest for calcein use. The characteristic of the molecule is based on its property to fix not only inside internal bones, but also in external bony tissues like fin rays and scales. Thus fluorescence can be detected with scale samples, and the fish kept alive. The methodology developed by Mohler (2003) was performed on several species including Salmonids species, but not on Brown trout, *Salmo trutta*. The marking method recommends a first pre-treatment involving an osmotic induction in a solution of NaCl 2.5%. Then, fries are bathed in a solution of calcein. With the objective to improve and validate a methodology for Brown trout, we lead two kinds of experiments in parallel. For one of them, we worked with a fish farm, so as to quantify the survival rates after treatments and to test two concentrations of calcein (0.5% and 1%). For the other, we tested the method in situ, in a small Swiss lowland stream in Geneva canton. Both experiments showed no mortality induced by the marking, in comparison with a control group. The most relevant period for marking appears to be early summer (June), after scales are formed. Concerning fin rays, first tests show a fast decrease of fluorescence intensity in the few weeks following marking. For this reason scales appear to be more relevant for fluorescence intensity measurement. However in practice, and especially in fish farms, a non-negligible number of scales are regenerated and thus show no fluorescence. On the contrary, the test performed in situ showed better results, with more than 96% of stocked trout showing fluorescent scales (double marking with adipose fin cutting), 3 months after marking.

Changes in riparian vegetation: consequences on ecological status of streams in Arges catchement

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Changes in riparian vegetation are considered to be one of the most important drivers in streams dynamics that impairs their structure and functions. Understanding the impact and the mechanisms of ecosystems responses are of significant importance for implementation of WFD. These were investigated in Arges catchment based on field experiments conducted as part of the EU-RivFunction project. Physical and chemical parameters as well as the structure of biotic communities in four pairs of reference and impacted low order streams were assessed. The results point out significant changes in the community's structure and ecosystem processes. The impact could induce transition of systems from the heterotrophic to autotrophic state. Changes in shredders species composition and leaf litter breakdown are discussed.

Short-term changes in the zooplankton community of the Po River (northern Italy) during summer 2005

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We report the results of a study carried out in summer 2005 to investigate the short-term evolution of the zooplankton community of the Po River (652 km, the longest watercourse in Italy) at reduced flow rates. The sampling station was located near Viadana (44°18' N, 10°22' E), in the middle reach of the river. From July 3 to September 3, 28 surveys were carried out. Zooplankton samples were obtained by filtering 60 L of water through a 50 µm mesh-size net. Samples were immediately fixed in 4% buffered formalin. Rotifers and crustaceans were identified to the lowest possible taxonomic level. River discharge ranged between 210 and 735 m3 sec-1. There was a negative relationship between river discharge and zooplankton density. Species of the genus Brachionus were numerically dominant throughout the sampling period. The maximum density of rotifers was 1461 ind L-1 on August 11. Crustaceans never exceeded 72 ind L-1, with a clear prevalence of cyclopid nauplii and copepodites and the cladocerans *Moina micrura* and *Bosmina longirostris*. In the first part of the study, predation by Asplanchna gr. girodi-brigtwellihad a significant effect on both density and species composition of rotifers, determining the highest diversity and evenness values of this assemblage. In particular, spined *B. calyciflorus* was the most abundant species (up to 840 ind L-1), but the increasing trend of Asplanchna coincided with its abrupt density reduction. A slight increase in river discharge and turbidity at the beginning of August led to the disappearence of Asplanchna, a sudden, short-lasting dominance of spineless B. calyciflorus, and a dramatic decline in the community diversity, followed by an overall decrease in rotifer abundance due to a further increase in river flow. In conclusion, the results of this study highlight the importance of biotic interactions in structuring the metazoan plankton community under low discharge conditions, although even modest increase in river discharge may induce rapid and marked changes in the composition and dominance relationships in the zooplankton assemblages.

Responses of stream fish assemblages to spatial, landscape level and instream factors in a human modified landscape

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It has been increasingly recognized that beside instream physical and chemical factors, landscape level variables, acting in a hierarchical manner from small to large spatial extents (e.g. riparian vegetation and land use in the whole catchment) can largely influence the organization of stream fish assemblages. However, spatial factors may also exert strong influence on fish assemblages in human modified landscapes where landuse intensity and the propagation of non-native species can change substantially at relatively small spatial extents. The goal of our study was to reveal the relative influence of spatial structuring and instream and landscape level environmental factors on the structure of stream fish assemblages in a heavily modified water basin in Central-Europe, Hungary. Reach level fish abundance data were collected from 60 wadeable stream sites. For each site 37 instream, 6 riparian land cover, whereas 18 landuse variables were compiled as explanatory variables using direct field measurements and GIS based approaches. Spatial structuring was considered using the principal coordinates of neighbour matrices (PCNM) as covariables in a variation partitioning approach. Spatial and environmental variables explained nearly half of the total variance of the fish data, suggesting relatively low predictability of fish assemblage structure. The relative contribution of spatial factors was comparable to that of environmental factors, despite relatively small distances among the sampling sites. Landscape level variables and instream features played the dominant role in determining the structure of fish assemblages, whereas the importance of riparian land cover was much less. Our results call attention to the importance of landuse variables and spatial structuring in shaping the structure of fish assemblages in heavily modified waterbasins.

Biotic and abiotic influences on free-living n2-fixing bacterial communities in southern European forested wetlands

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Non-symbiotic nitrogen fixation can contribute significantly to the biogeochemical cycles providing a source of plant-available nitrogen. The present study compares the communities of aerobic and anaerobic free-living N2-fixing bacteria growing below various species (*Alnus glutinosa*, *Salix atrocinerea* and *Frangula alnus*) in forested wetlands with different hydrologic regime (lentic and lotic). The study was carried out in three locations (Alpiarça, Caxarias and Madriz) in Portugal. The main physico-chemical parameters of superficial and soil waters of the six sampling sites were registered from field probes and analysis of water samples. In each combination of site x biotope x plant species, soil samples from top layer (0- 10 cm), middle layer (10- 20 cm) and bottom layer (20- 30 cm) were collected manually. Four samples were taken of each layer, approximately 400 ml of soil, and stored at 4ºC until analysis. Before analysis, the four samples were combined in two, and after mixture around 10g of fresh soil were transferred to a 500 mL Erlenmeyer flask containing 90 mL of a sterile 0.5% NaCl solution (w/v), and shaken (100 rpm) in an orbital shaker for 30 at 25ºC. Serial dilutions of the washing suspension were prepared, and 0.1 mL aliquots from the appropriate dilutions were plated in triplicate onto Burk's N-free medium. Burk's medium was used for incubation and quantification of aerobic nitrogen-fixing soil and rhizosphere bacteria. In parallel, we also quantified anaerobic nitrogen-fixing bacteria in both middle and bottom soil layers. The inoculation onto plates was performed immediately after soil weight, skipping the sample agitation, and plates were incubated in an anaerobic jar. The results from both aerobic and anaerobic N2-fixing cultivable bacteria were represented as CFUs (Colony forming units) per soil dry weight and analysed with environmental variables by univariate statistical methods. Our results showed a differentiated response of the bacterial communities to variations in the forested wetland hydrological regime and only a secondary influence of the tree species under which they grew. CFU of aerobic bacteria were significantly higher in lotic than in lentic sites whereas anaerobic communities appeared to be strongly influenced by water redox potential and conductivity.

The headwaters of "mother Volga" - an important reference system for European lowland rivers

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The Volga – Europe's largest river (3531 km) – arises in the Valdaian Hills. Its uppermost course is located in Tver Region, which is characterized by a gently undulating landscape (sea level less than 300 m), with temperate deciduous and mixed forests. Only few data was available on the benthic fauna and ecology in general from the natural habitats of the Volga's headwaters. Recently we established a hydrobiological and hydrochemical monitoring programme in the headwater of the Upper Volga River. During the Upper Volga Expedition 2005 (carried out by the Russian Academy of Science, Tver State University, Tver Technical State University and University of Innsbruck) the river between the Source at Volgoverkhovje and the city of Tver was surveyed. Along this 450 km stretch approximately every 15 kilometers, replicate benthic samples were taken. This data built the base for the monitoring programme near Rzhev, Staritsa and Tver. The macrozoobenthos fauna is taxa rich, diverse and it includes a couple of interesting species. Up to now 265 benthic macroinvertebrates were identified: Pristine sites on the Upper Volga River are still inhabited by typical potamal species (e.g. *Ephoron virgo*, *Heptagenia sulphurea*, *Potamanthus luteus* and *Prosopistoma pennigerum*, *Isoperla obscura*, *Xanthoperla apicalis*) that have become rare in European rivers. Within the Bivalvia especially the findings of *Unio crassus* (FFH Annex II), Unio tumidus and *Anodonta cygnea* are remarkable, because in European Rivers the mollusc fauna decreased significantly within the last century. Within the European Union the Water Framework Directive requests the assessment of the ecological status of inland waters by describing the deviation from undisturbed sites (reference condition). These RC are defined for most types of inland waters, but it is a difficult task for lowland rivers, since there are many anthropogenic impacts (agriculture, urbanisation) in the European lowland: most streams and rivers were physically changed, i.e. regulated, and eutrophication took place. The outstanding faunistic records from the present study underline the importance of East European running waters as refugial habitats for rare and endangered species. Evidently, the headwaters of East European rivers, like the Volga, still have large sections in natural conditions with an unaltered type-specific flora and fauna. The study of these intact structures builds a basis for future management issues in aquatic conservation and the test of general ecological theories for large European rivers.

Estimation of respiratory carbon loss through plankton, zoobenthos, macrophytes and sediment in an oligotrophic lake

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Determination of the respiratory carbon requirements of different groups of organisms in a lake has proved useful in providing information on metabolic processes in the ecosystem. Therefore, the intensity of respiratory carbon loss through respiration, assessed by the respiratory electron transport system (ETS) activity, was studied in net zooplankton, microplankton, macrozoobentos, macrophytes and sediment in shallow (i.e. littoral) and deep (pelagial and profundal) zones of Lake Bohinj over a year. The greatest areal (m^{-2}) carbon loss was observed through sediments in the littoral zone. Significantly lower values were observed in this zone for zoobenthos, microplankton and macrophytes. In the pelagial zone, sediments contributed significantly to the total areal carbon loss. Lower values were observed in microplankton, followed by zooplankton and zoobenthos. Zooplankton and microplankton fraction contributed a significantly greater proportion to total areal metabolic activity in pelagial than in littoral. Total areal respiratory carbon loss in the littoral significantly exceeded that in the pelagial zone. Total respiratory carbon loss increased in the warmer part of the year, especially in littoral sediments. The most important reason is probably the higher temperature that resulted in intensive degradation of autochthonous organic matter through respiration. The littoral and pelagial zones made similar contributions of respiratory carbon loss to whole-lake metabolism. It is concluded that both littoral and pelagial made similar contributions of respiratory carbon loss to whole-lake metabolism revealing sediment as the main component of respiration in both zones.

Reverse response of fish and macroinvertebrate assemblages to WWTP effluent entry in a canalized stream system (ne Hungary)

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The aim of this study was to examine the effects of a wastewater treatment plant (WWTP) effluent on both the physiscochemical and biological properties of the recipient canal system. Analysis of a two-year physico-chemical dataset showed significant differences for most parameters between the 3 impaired and the 3 non-impacted sites. Specifically, mean values of nitrite, nitrate, ortho and total phosphorus, BOD concentrations and the conductivity values were significantly higher on the wastewater impacted sampling sites. Moreover, significant differences were found in the case of fish and macroinvertebrate assemblage structure and stability between the impaired and the non-impacted sites. While the species richness and density of fish assemblages were found to be larger in the impaired sections than in the non-impacted ones, the macroinvertebrate assemblages could be characterized with only a few tolerant species in the impacted and much richer assemblages in the non-impacted sites. The evaluation of the temporal variability of the physical and chemical variables indicated higher constancy values for the impaired sites, which suggested the stabilizing effect of the wastewater entry to the hydrological and chemical properties of the canal. The constancy of fish assemblages was in correspondence with the hydrochemical data. Whereas, the macroinvertebrate assemblages showed higher variability and their constancy values didn't correlate with the constancy values of the physico-chemical parameters. These results suggest that fish and macroinvertebrate assemblages may show somewhat different responses to wastewater effluents in small watercourses, which should be considered in environmental management.

Data on abiotic (nutrients) and biotic (phytoplankton) quality elements in fortuna ecologically reconstructed area (Danube Delta Biosphere Reserve - Romania)

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The impact of inorganic nutrient enrichment on reophilic ecosystems has been observed and intensively studied in many rivers. Due to the scarcity of information on ecological conditions in the channel-network of the Danube Delta reliable information on the trend of the abiotic and biotic quality elements in the Danube River and channel system are needed – in order to fulfill the Water Framework Directive objectives and to implement the rehabilitation projects in area affected by nutrient pollution.
The purpose of this paper is to present, analyze and discuss the quantitative results concerning nutrient and phytoplankton variation obtained after the first reconstruction measures that have been taken in Fortuna area (Danube Delta Biosphere Reserve). Fortuna area has ca 2,114 ha, it is under natural flooding regime being strongly affected by anthropic action that took place before the establishment of the Danube Delta Biosphere Reserve.
In order to improve the quality of data on phytoplankton biomass distribution from Fortuna area, in the summer of 2008 a submersible spectrofluorometer with automatic algae class determination and chlorophyll analysis (bbe Fluoro Probe) has been used.

Dynamics of the atmospheric precipitation along the Romanian section of the River Danube and its consequences on wetland systems

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The analysis of the mean annual precipitation at three stations located along the Romanian section of the River Danube as well as their comparison to the multi-annual average emphasize a great unperiodical variability during 1961 –2000 and a decreasing tendency of mean annual precipitation from west to east. A linear decreasing tendency in precipitation was also recorded at all stations for this interval. Potential effects on the dynamics of the wetland systems along the Danube River and implications for their management are discussed.

Daily fluctuations of potamoplankton in the lowland course of a large river (River Adige, northern Italy)

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The studies carried out at diurnal frequency are important to assess the extent of fluctuations over short periods of time, allowing to interpret correctly the variations occurring in samples collected with the usual temporal frequencies (from weeks to months). The aim of this research was to study the extent of the daily temporal variations of the main physical and chemical variables, and of the phytoplankton community in the potamal zone of River Adige. The river has a watershed of 12,100 km2, a length of 409 km, and higher mean monthly water discharges between May and July (160 m3 s-1). The sampling station was located near Rovigo, at Boara Pisani, approximately 30 km from the river mouth. The samplings were carried out every 8 hours during an entire week from Monday, 8th (at eight o'clock) to Sunday 13th September 2008 (at midnight). During the research, the concentrations of the main algal nutrients never went below critical levels for phytoplankton growth. The concentrations of total phosphorus, DIN (Dissolved Inorganic Nitrogen) and silica were always above 20 mg P l-1, 0.5 mg N l-1 and 0.2 mg Si l-1, respectively. Conversely, the arrival of a flood pulse in the second half of the week was determinant in controlling the composition and density of the phytoplankton community. Total algal biomasses were highly and negatively correlated with the hydraulic discharge and other variables related to hydrology (such as mineral turbidity). The majority of the taxa belonged to the Bacillariophycee (30 taxa), while the remaining taxa (33) were represented by Chlorophyceae (14 taxa), Cryptophyceae (7 taxa) Cianophyceae (5 taxa), Dinophyceae (4 taxa), Chrysophyceae (2 taxa) and Euglenophyceae (1 taxon). With conditions of low flow, the contribution of the euplanktonic unicellular centric taxa (*Stephanodiscus spp. Cyclotella spp.*) was maximum. In the second half of the week, during the flood pulse, centric diatoms practically disappeared, in favour of meroplanktonic, benthic and drifted taxa (mainly *Navicula spp. Diatoma spp. Nitzschia spp.*). The implications of the extent of the observed fluctuations in the composition and structure of the phytoplankton community on the reliability of samples collected on a biweekly or monthly basis will be carried out also considering the research protocols commonly adopted in the scientific monitoring.

Effect of glucose addition on silica deposition kinetics in natural diatom population

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In July and August 2008, we performed two experiments examining the effect of glucose addition (final concentration 100 μmol l-1) on silica deposition and growth rates of natural diatom population in a eutrophic Římov Reservoir (Czech Republic). Silica deposition kinetics was measured at four-hour intervals over 24 hours using the incubation with PDMPO, which fluorescence is proportional to silica deposited. Diatoms represented 58 and 37 % of total phytoplankton biomass and were dominated exclusively with *Fragilaria crotonensis*. There was a linear increase in PDMPO fluorescence over time, slopes of regression lines significantly differed between the experiments. There was no difference in silica deposition between glucose-amended and control variant till 16th hour of experiment duration but later on, glucose addition significantly increased PDMPO fluorescence indicating diatom growth stimulation. This was confirmed by direct measurement of growth rates (based on cell counts), which almost doubled in glucose-amended variant ($\mu = 0.61\ d^{-1}$), compared to control ($\mu = 0.35\ d^{-1}$). Our results indicate that Fragilaria may subsidize its phototrophic metabolism by glucose uptake; however, there is a 16 hour lack required likely for induction of active transport mechanisms.