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EF.16

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EFFECTS OF MIXTURES ON LEAF LITTER DECOMPOSITION: METHODOLOGICAL AND HABITAT INFLUENCES

The effect of mixing litter on decomposition and colonization has been the focus of many studies carried independently in terrestrial and aquatic ecosystems. Those studies are carried out in different regions, use different experimental protocols and methodologies for the assessment of additive or non-additive effects and the conclusions on the effect of mixtures vary accordingly. In this study I tested the hypothesis, via a short-term decomposition experiment, that, when using the same experimental protocol, mixtures have similar additive effects on decomposition and associated biota in a stream and at its riparian zone. The effect of mixing litter was assessed by comparing values in mixtures with the average of single-species, alder and poplar (method 1); comparing the value of a species in mixture with the value of that species alone (method 2); and by a graphical analysis of the average difference between observed and expected values and the 95% confidence intervals (method 3). Method 1 was the most conservative, detecting non-additive effects on macroinvertebrate abundance only; method 2 detected non-additive effects on both dry mass remaining and ergosterol, with differential responses of the leaf species and the habitat; and method 3 detected non-additive effects on all variables except macroinvertebrate biomass and also identified different responses of the leaves exposed in the terrestrial and the aquatic habitats. These results show that (i) the methodology used to detect the effects of mixtures deeply influences the results obtained, and may partially explain the diversity of responses available in literature; and (ii) the effect of mixtures may differ in the stream and at the riparian area. However, the findings of the present work should be assessed in a larger-scale experiment in order to generalize the effects of mixing litter on terrestrial and aquatic habitats.

AE.8

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ASSESSMENT OF RIVER WATER QUALITY USING AN INTEGRATED PHYSICOCHEMICAL, BIOLOGICAL AND ECOTOXICOLOGICAL APPROACH

In order to maintain and improve water quality in European rivers, the Water Framework Directive (WFD) requires an integrated approach for assessing water quality in river basins. Despite aiming at a holistic understanding of ecosystem functioning, the WFD fails to explicitly establish cause-effect relationships between stressors and changes in aquatic communities. To overcome this limitation, the present study combines an ecotoxicological approach with the typical WFD physicochemical and biological approaches. The main goal was to assess river water quality through an integrated manner, while identifying potential risk situations for aquatic communities in the Cértima river basin (Portugal). To achieve this goal, surface water samples and macroinvertebrate specimens were collected at contrasting hydrological conditions (autumn and spring seasons) at three river sites exposed to distinct pollution levels defined according to the WFD (low, moderate and highly polluted). Physicochemical water quality status was defined according to the Portuguese classification for multipurpose surface waters, whereas biological water quality was assessed in accordance with the South Invertebrate Portuguese Index (IPtIS). Ecotoxicological assays included four standard species, a bacterial species (Vibrio fischeri), a microalgae (Pseudokirchneriella subcapitata), a macrophyte (Lemna minor) and a crustacean (Daphnia magna), which were exposed to different river water concentrations. A clear and pronounced pollution gradient was identified between sites. Locations under moderate to high anthropogenic pressure presented clear signs of organic pollution, e.g. low dissolved oxygen, high nutrient levels and prevalence of highly tolerant macroinvertebrate species, in contrast to the unpolluted reference site. Despite the evident signs of pollution, no clear evidence of toxicity was observed on test species, suggesting that ecotoxicological assays using standard laboratory species and methodologies might not be suitable for assessing the effects of organic pollution. Nonetheless, these results reinforce the importance of an integrated evaluation scheme combining standard WFD quality elements and an ecotoxicological approach for a realistic evaluation of river water quality. Thus, its wider use could contribute to a more comprehensive assessment of the effects of anthropogenic pollution on the status and functioning of aquatic ecosystems under the WFD, which is essential for risk assessment evaluations and for a sustainable management of freshwater resources.

SS4.4

Abril, Meritxell[1]*; Menéndez, Margarita*[1]*; Barceló, Milagros*[1]*; Casas, Joan P.*[2]*; Gómez, Lluís*[1]*; Muñoz, Isabel*[1]

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CONSEQUENCES OF WATER FLOW REGULATION ON ECOSYSTEM FUNCTIONING IN A MEDITERRANEAN WATERSHED

Mediterranean rivers are specially affected by flow regulation. This drastically modifies the system morphology, creating a new structure based on an alternating series of lentic and lotic reaches that interrupt flow connectivity. The aim of this study is to assess the variability caused by flow discontinuity on the ecosystem functioning at a watershed scale, using the breakdown process as a functional indicator. We expect variability in the process along the fluvial continuum, with higher breakdown rates in lotic reaches and as the stream order increases. To achieve this objective, we have studied the mass lost from wooden sticks during 3 months in different lotic and lentic sites located along a Mediterranean watershed, both in winter and summer. The results show differences on the rates of wood mass loss between sites, either summer or winter. On one hand, in winter, lotic reaches display an increment in the breakdown rates with the river order. Lentic reaches, however, have more homogeneous rates along the watershed, so the differences between adjacent lotic and lentic bodies are only found downstream. On the other, in summer spatial variability is also found in lentic reaches and there are not differences between adjacent lotic and lentic systems. Breakdown rates appear to be related to temperature, concentrations of nitrogen oxides (NO2-, NO3-) and water residence time. Hydrological changes caused by flow regulation can interrupt temperature and nutrient gradients along the river, affecting the natural ecosystem functioning at watershed level.

RLWE.15

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SEASONAL AND SPATIAL PATTERNS OF BENTHIC INVERTEBRATE COMMUNITIES BETWEEN REGULATED MEDITERRANEAN STREAMS AND THEIR NON-REGULATED TRIBUTARIES IN THE IBERIAN PENINSULA

Flow regulation is perceived to negatively influence fluvial ecosystems through alterations of natural habitat conditions, particularly in highly variable Mediterranean streams. However, the detection of adverse effects may depend on chosen metrics, requiring a multiple-lines-of-evidence approach for ecologically relevant impact assessment. Thus, the aim of this study was to compare the community structure, the trophic function, the microhabitat influence and the body condition of benthic invertebrates between a regulated Mediterranean stream, the River Bullaque, and their non-regulated tributaries in the Iberian Peninsula (Guadiana River Basin, central Spain). Benthic invertebrate communities and their physical microhabitat were seasonally sampled in 2010. Community structure was assessed using different descriptors by means of two-way rm-ANOVA. Total abundance, EPT abundance, Rheoindex and LIFE were higher in the regulated River Bullaque during summer, whereas H' was lower. Rheoindex and LIFE were higher in the tributaries during winter. Trophic function was analysed using biomass proportions of FFG by means of chi-squared tests. Filterers were very abundant in spring and summer in the tributaries and the regulated River Bullaque, respectively. Deposit feeders dominated during summer in the tributaries. Despite these differences, ANOSIM was not able to reveal significant differences in community structure and trophic function between fluvial systems. MVDISP, a measure of βdiversity, was always higher in the River Bullaque for both taxa and FFG abundances. Microhabitat influence was assessed by means of stepwise multiple regression models, with community descriptors as response variables and microhabitat features as predictor factors. Body condition, measured as FA level, indicated that damming created favourable developmental conditions for several benthic invertebrate species in the Bullaque River. Overall results showed that community structure, trophic function and microhabitat influence on benthic invertebrates vary between fluvial systems due to changes in habitat availabity and hydrological stress. Our findings also indicated that damming buffers fluvial ecosystems from the adverse environmental conditions inflicted by seasonal summer droughts, which occur recurrently in Mediterranean areas of the Iberian Peninsula. Finally, results suggest that the application of FA could therefore be promising for revealing integral ecological responses to different and often combined forms of anthropogenic and natural disturbances.

BB.10

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BRANCHIOPODS AND COPEPODS IN IBERIAN PENINSULA AND MONGOLIA: SIMILARITIES AND POSSIBLE USE OF MONGOLIAN ONES AS REFERENCE CONDITIONS FOR ECOLOGICAL QUALITY ASSESSMENT OF WATER BODIES IN SPAIN

A comparison of assemblages of Branchiopoda and Copepoda living in lakes and wetlands in two very distant territories in the Palaearctic Region: Iberian Peninsula and Mongolia is presented. Both territories have significant similarities in the hydromorphological and physicochemical characteristics of their water bodies, and also in the structure and composition of their fauna of branchiopods and copepods. Some species are coincident, others are taxonomically closely related and others behave as ecological vicariants. Most of these crustaceans are used as indicators of ecological quality of water bodies in European industrialized countries, where reference conditions are frequently difficult to find. Taking into account the undisturbed situation of Mongolian water bodies, the alternative of using their branchiopods and copepods, after the necessary statistical correspondence analysis between them and the Iberian ones, as reference communities to assess the ecological status in Spain is discussed.

SS5.2

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LONG TERM TROPHIC STATUS ASSESSMENT IN SANABRIA LAKE

Sanabria lake is a middle mountain glacier lake located in north-west Spain, in Zamora province being the largest lake in the Iberian peninsula. Since 1986 the lake has been object of a detailed limnological monitoring, result of which a twenty six years monthly data series of trophic status indicators can be presented. None of the mentioned indicators shows significant variations or tendencies along the whole temporal series. The analyzed information allows to conclude that the lake has maintained its oligo-mesotrophic character since the beginning of the monitoring.

BB.7

Álvarez-Cabria, Mario; *Peñas, Francisco J.; Estévez, Edurne; González, Alexia M.; Rodríguez-Castillo, Tamara; Silió-Calzada, Ana; Álvarez-Martínez, José M.; Lezcano, María; Barquín, José*

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ANALYSING THE SPATIAL DISTRIBUTION OF INVERTEBRATE COMMUNITIES UNDER THE NEUTRAL THEORY

Recent studies have described different relationships between the local number of taxa (Da) and the regional pool of taxa (Db) taking into account that Da is the dependent variable and Db the explanatory one. Following this approach two types of main relationships have been found. (1) Linear relationships, where Da is directly proportional to Db, as an increase in Db is followed by an increment in Da and (2) curvilinear relationships, in which Da might reach a ceiling above which it does not rise despite continued increases in Db. In this study we analyze these relationships using invertebrate communities from 9 different basins (regions) in northern Spain and if these relationships change regarding the dispersal capacity of the invertebrates. We are also interested in confronting two neutralist and non-neutralist predictions. As has been largely described, similarity between biological communities decreases as the geographical distance increases. The niche theory ascribes this pattern to the adaptive differences that organisms show along environmental gradients (Poff, 1997). On the other hand, neutralists believe that this fact is mainly determined by the dispersal capacity of organisms. In order to test both hypotheses we analysed the invertebrate communities developed in 1 spring and 2 streams in 3 of our 9 regions. Following the niche theory we would expect to find greater dissimilarities between the taxonomical composition of communities developed in streams and springs within the same region, and the contrary pattern under the neutral theory. Our preliminary results indicate that the relationships between Da and Db are linear rather than curvilinear, although we have found differences between taxa with different dispersal capability. We also found higher similarities between the taxonomical composition of spring communities from different regions than between communities of springs and streams from the same region. However, the distance between springs and streams has been revealed as an important factor in the taxonomical composition of the invertebrate communities.

BG.3

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SHORT-TERM NUTRIENT FLUXES OF A GROUNDWATER-FED, FLOWTHROUGH LAKE IN A DRY AGRICULTURAL CATCHMENT DURING MID STRATIFICATION

Nutrient fluxes take place in lakes through different flowpaths whose importance changes depending upon the biogeochemical processes involved. In flowthrough lakes hydrological control of these processes appears to be very important but the significance of other processes have been neglected. To test this significance, we analyzed C, N and P fluxes on a weekly scale during mid stratification in a Spanish lake fed by N-rich streams and groundwater. The water renewal time was short, and this enhanced hydrological control of many nutrient fluxes. The lake nutrient concentration and retention were not related to each other, and the C:P and N:P ratios increased in the groundwater export. The short-term variability was high for all nutrient fluxes. The CO2 degassing was one order of magnitude higher than the sedimentation of particulate organic carbon, and the formation of calcium carbonate could be a source of CO2. The net photosynthesis by emergent plants produced the highest input of biological C. While phytoplankton net photosynthesis was 28% of that of emergent plants, benthic algae attained 11% of phytoplankton net C fixation on the average. The ratio between C biogenic inputs (as net photosynthesis of phytoplankton, benthos and emergent plants) and C hydrological inputs ranged 6-29%, which was reduced to 1-7% when the contribution of emergent plants was discarded. Denitrification and particulate N settling rates were similar, but the particulate P settling rate was almost negligible, likely due to very fast recycling in the water column, which in turn reduced strong limitation to water-column primary production arising from imbalanced N:P ratios on account of high inputs of N of agricultural origin. The nutrient retention was low, and the export of nitrogen, phosphorus and organic carbon was frequently dominant and often occurred through groundwater flowpaths. Water renewal rate was unrelated with nutrient retention, which was contrary to expectations, thus emphasizing the role of biogenic fluxes on nutrient retention.

SS4.2

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A REMOTE-SENSING BASED APPROACH FOR EVALUATING LAND COVER CHANGE EFFECTS ON HYDROLOGICAL PROCESSES: A CASE STUDY IN A MOUNTAINOUS LANDSCAPE OF NW SPAIN

Land use and cover changes (LUCC) are the result of many interacting processes that have modified landscape structure and functioning since historical times. In mountainous lands of Europe, the Common Agricultural Policy (CAP) subsidies, rural depopulation and land abandonment have been specifically important during last decades, driving forest expansion and fire regimes. Taking into account the spatial heterogeneity and steep slopes of these areas, together with a higher rainfall variability and warmer temperatures under climate change, past-to-present LUCC may strongly affect surface runoff, soil erosion and nutrient transport towards receiving streams. Evaluating the effects of these changes in stream hydrology over the last 3 decades requires a multi-level approach for assessing the complex relationships established at different scales. As a case study, we analysed landscape dynamics in the Cantabrian Cordillera, northern Spain. First, two satellite TM images were acquired for the years 1984 and 2010 from USGS (NASA). Each image was corrected for geometric, radiometric and topographic distortions and classified on eight major land covers. We used a supervised classification approach with a maximum likelihood algorithm. Subsequently, an spatially-explicit assessment of spectral uncertainty was applied on the hard classified images using fuzzy memberships and confusion indices, allowing to assess how much (and where) of the resulting maps contained a substantial amount of error and the partial probability of each land cover at each point in time. Changes occurred in transitional areas between forests and shrublands (related to secondary succession) and fires in heather communities characterized landscape dynamics. Nevertheless, maps obtained through post-classification comparisons and maps based on change probabilities showed large differences in some areas. Afterwards, using both approaches, we selected a set of basins across the whole territory that maximized the gradient of observed major changes. Finally, we used bootstrapped GLMMs to assess the relationship between the observed rates of change and several contemporary hydrological parameters obtained from Water Boards, as seasonal surface runoff. This allowed us to understand how land cover dynamics and land use legacies may affect hydrology at different spatial scales. This constitutes a useful first step towards a scientific-based planning and locally-tailored territory management.

AER.3

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MONITORING OF THE BENTHIC MACROINVERTEBRATE COMMUNITY IN THE STREAMS OF CASTELO CITY, ESPÍRITO SANTO, BRAZIL, AFTER DREDGING

This study evaluated the recovery process eight streams of the Castelo city, Espirito Santo, by monitoring of the development of the benthic macroinvertebrate community, after dredging the edges. The streams studied (identified as C1 to C7) are located in rural areas, receiving the influence of agriculture and mining marble activities. Samples of 2,565 cm³ of sediment were taken from each stream and washed over a sieve with 0.5 mm mesh. Macroinvertebrates found were preserved in alcohol 70% for identification and counting. Two samplings were performed: the first 15 days after cleaning the edges, and the second, one year after cleaning. The results of the first sample were: C1: 01 Araneida; C2: 02 Mollusca ‹I›Lymnaea‹I› and 05 Mollusca Ancylidae; C3: 37 Mollusca ‹I›Melanoides‹I›; C4: 01 Araneida, 19 Diptera Chironomidae, 05 Annelida Oligochaeta, 01 Coleoptera Dytiscidae, 01 Coleoptera Curculionidae and 01 Crustacea ‹I›Trichodactylus fluviatilis‹I›; C5: 01 Araneida, 05 Mollusca ‹I›Melanoides‹I› and 01 Lepidoptera; C6: 04 Odonata ‹I›Phyllogomphoides‹I›; C7: without macroinvertebrates; C8: 12 Mollusca ‹I›Melanoides‹I›, 01 Annelida Hirudinida. The second sample showed the following results: C1: 20 Mollusca Pisidiidae, 01 Annelida Oligochaeta, 01 Odonata ‹I›Idiataphe‹I› and 13 Diptera Chironomidae; C2: 01 Mollusca ‹I›Lymnaea‹I›, 03 Mollusca ‹I›Melanoides‹I›, 01 Mollusca Pisidiidae, 02 Annelida Oligochaeta, 02 Annelida Hirudunida and 01 Diptera Chironomidae; C3: 02 Mollusca Lymnaea, 07 Mollusca Melanoides, 16 Mollusca Pisidiidae, 01 Coleoptera ‹I›Macrelmis‹I›; C4: 01 Odonata Calopterigidae, 01 Hemiptera Belostomatidae; C5: 01 Diptera Chironomidae; C6: 01 Odonata ‹I›Phyllogomphoides‹I›, 01 Odonata Calopterigidae; C7: without macroinvertebrates; P8: 136 Mollusca ‹I›Melanoides‹I›, 20 Annelida Oligochaeta, 01 Odonata ‹I›Aphylla‹I›. In the two-sample species richness and abundance were low in all streams studied. In the second sampling was observed an increase in the number of species and individuals, with the exception of C4 and C5, which decreased the number of species and individuals. C7 showed similar results in both samples. The prevalence of resistant macroinvertebrates to pollution, such as snails and chironomids, and the absence of sensitive macroinvertebrates, coupled with low richness and abundance, show that the environment has not been recovered, with cleaning the margins.

EH.5

Andrade, Fernando[1]*; Marques, Marcelo*[2]*; Okawa, Cristhiane M. P.*[2]*; Vital, Elaine*[2]*; Pereira, Osni*[2]

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SIMULATION OF THE WAVE FIELDS GENERATED BY SEVERE WINDS IN THE MANGUEIRA LAGOON, SOUTHERN BRAZIL

In inland waters the margins of the water body influence the wave formation process by reducing the rate of energy transfer from the wind to the water surface. In the present work these effects were analyzed by simulations of the wave fields using a two-dimensional parametric modeling technique that requires only the fetch and the wind intensity and orientation as input parameters. The wave fields generated by severe winds were simulated to the Mangueira Lagoon in southern Brazil, which is 123 km long and has an area of 800 km2. The severe winds data that correspond to the intensities of 5, 10, 15 and 20 ms-1 and to sixteen different directions were adopted in the study, resulting in the development of sixty four maps of wave distribution. Location maps of the maximum wave heights were determined and the associated wind intensity and directions were presented. The simulations of the wave fields were performed by a model named ONDACAD, which allows the automation of the two-dimensional parametric modeling technique. The results are displayed in a web-based system named HIDRONDA available online at *http://www.hidronda.com*.

BG.8

Arce, Maria I.[1]*; Sánchez-Montoya, María del M.*[2]*; Suárez, Maria L.*[1]*; Vidal-Abarca, Maria del R.*[1]*; Gómez, Rosa*[1]

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NITROGEN AVAILABILITY AND DENITRIFICATION RATES FOLLOWING SHORT-TERM INUNDATION OF DRY SEDIMENTS IN A HIGH-NITROGEN MEDITERRANEAN TEMPORARY STREAM

Mediterranean climate regions predispose streams to experience long drought periods. Hydrological shifts affect nitrogen (N) biogeochemical processes, which can have important consequences for nitrate (NO3-) retention, especially when streams drain agricultural landscapes. During drying, continued microbial N mineralization and reduced denitrification can lead to NO3- accumulation in streambed sediments. These dry periods are usually punctuated by water pulses because of summer rainstorms. Such events initially take form as isolated pools through the stream channel, which can remain for hours to days. Here, we conducted a microcosm experiment to evaluate the N availability and denitrification rates in pools through 14 days of sediment inundation after a 3 months dry period.
Our results showed that flooding of dry sediments induced a rapid stimulation of sediment denitrification rates. During the first 24h of inundation, a slight increase of NO3- concentration in the water column was found, however, the sediment NO3- content decreased substantially over the experiment. Such finding suggested that, at least during the first 24h, an important part of NO3- stored in sediments could be denitrified rather than being totally released to the water column. After 24 h of inundation, we observed a considerable reduction of NO3- both in sediments and water column until the end of the experimental period. However, ammonium (NH4+) increased substantially in both compartments, probably derived from the dissimilatory reduction of NO3- under anaerobic conditions as those supported by pools. We demonstrated that after 3 months of sediment desiccation, stream functionality, in terms of N processing, can be significantly activated after a short-term inundation period. Our results suggest that denitrification may reduce the pulse of NO3- from sediments to the water column during the first 24 h after rewetting. However, inorganic N concentration may remain high within streams. We highlight that, although stream are able to rapidly recover their capacity to transform N after a drought, catchment management plans at local scale are needed to reduce N inputs from agricultural lands to stream ecosystems.
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AMWQ.17

Argudo, Celso

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RATING EUTROPHIC STATE OF LAKE “YAHUARCOCHA” (ECUADOR) AND PROPOSING SOLUTIONS FOR THE RECOVERY OF MIRROR’S WATER

The lakes are located in The Imbabura province of Ecuador; they have incredible heritage tourism with over 20 lakes that coexist in harmony with nature, some supporting processes of environmental degradation resulting from improper operation of shores and watersheds.

In this scenario is vital to recover and protect the lake “Yahuarcocha”, urban water mass is located to an altitude of 2200 masl. with a water surface of 270 hectares , it is the tourism hub around which help to develop and accelerate the decomposition process . Inside the integral concept of action there was defined a methodology that allows restoring the mirror’s water as basic vector of the protection model. Diagnosis plan through control of key parameters: chlorophyll “a”, series of phosphorus and nitrogen, secchi disk and other complementary services that allowed us to evaluate the degree of eutrophication gradients of temperature, dissolved oxygen to determined their level of stratification. The continuous monitoring of the tributaries that contribute to the lake and control flow, [contributions of the river Tahuando: 30 L/s; EDAR with basic treatment : 4 L/s; which increases the rate of nutrient that feeds the algae population , also affects the presence of colla and totora aggravated by the low rainfalls.

We used the rate of Carlson [Aizaki modification (1981)] and OECD classification , agrees that water mass it is at the beginning of the hypertrophic state; TSI [65-70] , chlorophyll › 25 mg/m3, secchi disk depth ‹ 1.5 m The lake does not present stratification for his small depth ‹ 5 m. and 9 m. maximum water column . This implies urgent steps to reverse the eutrophic process: 1) Increased intake flow 60-70 L/s of treated water; 2) Remove the EDAR contribution or include a tertiary system; 3) Control of discharges; 4) eliminated the excess of algae; 5) bathymetry to determine the degree of sedimentation and subsequent controlled dredging; 6) Recover the shores of the lake effect of resilience has withstood the attacks received; 7) Establishment of a sustainable model.

Keywords: eutrophic lake, nutrients, sewage, index, model.

SS2.4

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EFFECTS OF WASTEWATER TREATMENT PLANT EFFLUENTS ON THE METABOLISM OF A MEDITERRANEAN RIVER

Wastewater treatment plants (WWTP) are a point source of many pollutants such as nutrients, pollutants, hormones, pharmaceuticals, pesticides or microorganisms, which affect ecosystem functioning. The aim of this study was to see how WWTP effluents in Puigcerdà (Ebro River) affected river metabolism and how this response changed with distance. Metabolism was measured in a control reach upstream from a WWTP, and an impact reach, beginning at 500 m downstream from the effluent, with 4 consecutive sites (1000 m each site). Additionally, physical, chemical, organic matter (suspended and benthic) and biofilm samples were taken in each site. Discharge, width and light increased along the river. Chemicals (nutrients and pharmaceuticals) increased due to effluent input, but decreased with distance. Organic matter showed similar trends. Ecosystem respiration increased 3-fold in average in the impact reach, but showed a trend to decrease along the reach. Primary production did not increase in the first 2 sites (500-2500m) but increased 4-fold in the 3rd site . The Photosynthesis-Irradiance relationship revealed that production was inhibited in these first sites of the impact reach. Respiration was correlated to enzymatic activities and production with the photosynthetic capacity of the biofilm. Overall, the WWTP effluent produced large changes in river ecosystem functioning, the effects differing between respiration and primary production. The self-purification capacity of the Ebro River resulted in considerable improvement of the functioning along the study reach.

BG.7

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RECENT HISTORY OF PALMONES RIVER BASIN (SOUTHERN IBERIAN PENINSULA) THROUGH C/N RATIO, Δ13C AND Δ15N PROFILES

Estuarine sediments record the history of the water masses in the river basins. In this study C/N ratio, δ13C and δ15N, among other state variables, has been recorded from 1980 to 2010 in a core of 20 cm depth, and used as markers to detect change of land uses in the Palmones River basin. The profiles obtained presented clear discontinuities related with the “before and after” of the basin since the Charco Redondo dam was built up.
Changes in the profiles of organic matter, C/N, δ13C and δ15N, have clear inflexions in changes of the basin changes.

AEBC.1

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NECESIDAD DE REVISIÓN DE LAS ESPECIES DE PECES INCLUIDAS EN LAS DESCRIPCIONES DE LOS ESPACIOS RED NATURA

Con la redacción y la aprobación de los nuevos planes de Cuenca, ha surgido la preocupación por los gestores del agua de si ha sido suficiente el esfuerzo, para establecer las medidas de conservación en los espacios protegidos, que se encuentran ligados al medio acuático. Los Espacios Protegidos de la Cuenca del Duero ligados al medio hídrico se justifican por presentar una serie de valores, entre los cuales se encuentran poblaciones de peces recogidas en los Anexos de la Directiva Hábitat. La presencia de estas especies se recoge en las fichas descriptivas de los mismos que se elaboraron hace tiempo y necesitan actualización; porque en algunos casos se observa que, no están recogidas todas las especies que podrían tener interés y por otro lado, no están actualizados ni sus nombres científicos, ni posiblemente identificadas correctamente, como ocurre con la boga del Duero.

Para comprobar estas hipótesis se ha recogido información de inventarios piscícolas de 77 Espacios Protegidos de la Cuenca del Duero. Nuestro objetivo es doble, por un lado queremos constatar con inventarios actuales la presencia de esas especies condicionantes, en los tramos de ríos incluidos en zona Red Natura. Y por otro lado verificar, si es necesario actualizar la información, para redefinir la descripción de valores incluidos en las fichas descriptivas de los Espacios Protegidos.
Para esto, se han consultado dos grupos de inventarios de peces. Por un lado la base de datos del proyecto EFI+ y por otro datos de la Junta de Castilla y León. En cada Espacio se ha determinado en estas bases de datos, la presencia o ausencia de los peces condicionantes incluidos en cada ficha descriptiva del Espacio Protegido. Tras esto se aplicó el Índice cualitativo de Sorensen (1948) para constatar las coincidencias y las diferencias.
Finalmente interpretamos los resultados agrupándolos en cuatro grupos: muestreos donde no hay datos, muestreos donde no hay coincidencias y muestreos con coincidencia baja y alta.
De los resultados obtenidos podemos concluir que en 12 Espacios Protegidos no hay inventarios recientes, en 41 no hay coincidencias con los peces representativos del Espacio, y solo en 16 hay coincidencia alta.

EF.10

Bambi, Paulino; *Rios, Bruna*

Universidade de Brasília

ORGANIC-MATTER DYNAMICS IN THE FLOOD RIPARIAN ZONE: RONCADOR IN THE CENTRAL OF BRAZIL

The flooded riparian vegetation presents floristic differences when inserted in different biomes, working as ecological corridor and species disperser. Tropical riparian zone are poorly studied and most of studies are related to phytosociology aspects. However, little is known about the functional of riparian zone. We evaluated the dynamics of allochthonous coarse particulate organic matter (CPOM) and determined the structure of preserved riparian vegetation. We tested the hypothesis that: the majority of riparian plant species along tropical headwater streams are perennial, and therefore the input of CPOM tends to be continuous during the year, the composition of riparian vegetation influences the amount of CPOM in the stream; and the variation of CPOM in the stream is influenced by climatic factors. The CPOM was estimated monthly by buckets suspended stream above by cord between edges (Vertical input, VI), nylon nets on the edge sides (Horizontal input, HI) and on the riparian zone (Terrestrial input, TI) and by Surber (benthic stocks, SB) sampled from the stream channel and the CPOM was divided into categories (leaf, fruit, twigs and miscellaneous) and weighed. The riparian vegetation's structure was determined by plots method allocated in the riparian zone along the experiment area. The annual CPOM was 8933±2137, 2450±371, 688±183 and 506±117 gm-2 SB, HI, TI and VI, respectively. The Leaves contributions were 9, 34, 62 and 57 % also of SB, HI, TI and VI, respectively. We find 39 species of 27 families which 3 of them (Araliaceae, Rubiaceae and Proteaceae) were only sampled in the regeneration plots. Families with greater distribution in the sample were: Anacardiaceae (Tapirira sp.), Anonaceae (Xilopia emarginata) Phylantacee (Richeria grandis), Clusiaceae (Calophylum brasiliensis and Clusia criuva), Aquafaoliaceae (Ilex brasiliensis), Myrtaceae (Myrcia laruoteana) and Bruceraceae (Protium sp.).The litter fall is unsynchronized, increasing toward the end of the dry season (September to October) because the riparian vegetation is associated to deciduous and semi-deciduous plant species. The CPOM dynamics varies temporally, with the rain influencing the SB and HI and the wind and temperature influencing VI and TI.

IS.3

Banha, Filipe[1]*; Gimeno, Irene*[2]*; Lanao, Munia*[3]*; Touya, Vincent*[4]*; Durán, Concha*[4]*; Peribáñez, Miguel A.*[5]*; Anastácio, Pedro M.*[1]

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A COMPARISON OF THE POTENTIAL FOR ZEBRA MUSSEL LARVAE TRANSPORT BY WATERBIRDS VERSUS FISHERMEN

The extremely invasive zebra mussel (Dreissena polymorpha (Pallas, 1771)), arrived to the Iberian Peninsula in 2001. Thenceforward like in other invaded environments, this species caused huge negative impacts in the ecosystem and severe economical loses in the region. Navigation has been considered the primary zebra mussel vector and the Spanish authorities adopted important measures and legislation regarding this issue (restrictions to navigation and disinfection protocols). Additionally, measures were also applied to all freshwater sport and recreational activities and these have helped to slow down the spread. Nevertheless, monitorization, implementation and user acceptance of navigation rules has been much easier than for smaller equipment, like fishing gear. In fact, the importance of recreational fishing vectors and natural vectors, like birds, is a poorly studied subject.

Using an experimental approach under field conditions, we evaluated and compared zebra mussel larvae adherence and survival rate on fishing gear (waders and keep net) versus mallard ducks. In addition, the zebra mussel larvae desiccation survival was assessed under a set of controlled temperature and humidity conditions. Results showed that zebra mussel larvae can survive out of water more than 3 hours at 17.5ºC and 80 % relative humidity, and that this capacity decreases for drier and warmer conditions. Fishing tackle presented higher propensity for zebra mussel larvae adherence than ducks did. The larvae survival rate was three times higher on human vectors than on a duck. Our findings demonstrate that human vectors presented the highest potential for transport of zebra mussel larvae. Therefore it is fundamental to continue the implementation of legislation regarding human vectors in order to reduce the risk of zebra mussel dispersion throughout the Iberian Peninsula river basins.

MSF.5

Bárcena, Javier F.; *Gómez, Aina G.; García, Andrés; Álvarez, César; Juanes, José A.*

Environmental Hydraulics Institute "IH Cantabria", University of Cantabria

ESTUARINE VULNERABILITY ASSESSMENT: QUANTIFYING THE ACCEPTABILITY OF MIXING ZONES GENERATED BY POINT DISCHARGES. AN APPLICATION TO SUANCES ESTUARY (N SPAIN)

State Members may designate approaches and methodologies to define mixing zones (Directive 2008/105/EC). Mixing zones (MZ) are defined as areas, adjacent to point discharges, where Environmental Quality Standards (EQS) can be exceeded. While, EQSs are established to ensure an effective surface water protection.

Taken into account the variability of European waters, it is not adequate to set general methods applicable to all water body types. Moreover, MZs in complex ecosystems such as estuaries, need careful judgments combining the necessity of more accurate numerical modeling to calculate EQSs exceedances and the acceptability criteria for the extent of MZs.

A holistic methodological procedure to assess the estuarine vulnerability in a spatio-temporal framework analysis is presented. This approach provides the acceptability criteria of the size of MZs and location of point discharges in order to guarantee an effective decision-making process.

Estuarine Vulnerability (EV) is referred to characteristics of an ecosystem that describes its potential to be harmed. Thus, vulnerability is presented as a combination of susceptibility and the state of conservation. Susceptibility is related to the flushing capacity, and it is estimated by means of numerical models. Meanwhile, the state of conservation is determined as a combination of naturalness and ecological value by means of GIS techniques. Naturalness is defined as the absence of physical anthropogenic modifications. Ecological value is described as the building capacity to support species of flora and fauna. Indicators, metrics, assessment criteria for each vulnerability parameter and a formula to integrate them are presented. Finally, Estuarine Vulnerability has been assessed in Suances Estuary (N Spain) to allocate a hypothetical point discharge. For this task, the spatio-temporal variation of EQSs exceedances (MZs) has been computed in several points along the estuary. Next, Estuarine Vulnerability values have been crossed with the extents of the MZs to find out the optimal location. Results from Suances Estuary confirmed the suitability of the proposal methodology and the conceptual approaches as a comprehensive and practical management tool.

SS2.12

Benichou, Fatima; *Santamans, Anna C.; Miralles, Javier; Picazo, Antonio; Rochera, Carlos; Camacho, Antonio*

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A PRELIMINARY MODEL OF THE NET CARBON BALANCE IN MEDITERRANEAN COASTAL WETLANDS TO ASSESS THEIR CONTRIBUTION TO THE GREENHOUSE GAS EMISSIONS

In global terms, wetlands entail almost 14% of the terrestrial biosphere carbon pool, yet they only are occupying roughly 6% of the land. Further, wetlands in temperate regions containing organic sediments are expected to act as carbon sinks, thus theoretically contributing in a significant way to the atmospheric carbon balance. To assess this idea, we are running a project called CARBONSINK, funded by Fundación Biodiversidad, which tries to evaluate the potential role of the main Spanish wetland types in battling climate change. An important typology is that formed by Mediterranean coastal wetlands (i.e., saltmarshes and coastal lagoons, being two representative The Marjal of Pego-Oliva (Alicante) and Marjal dels Moros (Valencia), the results obtained being presented here. Shifts in the balance of carbon sequestration/emission are expected to occur during the annual cycle. It is for this reason that a bi-monthly sampling schedule is being carried out in the project, covering at least one annual hydrological period. Here, we show preliminary results obtained during initial surveys performed at winter and spring seasons of 2014. We are quantifying the main carbon pools in these wetlands (i.e., dissolved carbon, plankton and benthic compartments, riparian plants, etc.,) and the main processes linked to its mobilization. In relation to the latter, we are measuring in situ primary production and respiratory processes, both in plankton and benthic compartments. Other than aerobic respiration, dissimilative metabolisms such as methane production export carbon from wetlands. We have attempted to experimentally measure methane emission with infrared sensors in these wetlands and we have obtained only partial results in this regard. However, our findings show a higher methane production in coastal wetlands containing organic-rich sediments. This methane production results are significantly higher when compared with wetlands typologies characterized by an elevated salinity, which are also in the framework of the main project. Our studies also involve a qualitative characterization of dissolved organic matter by fluorescence methods to determine its nature and origin, which jointly with regular stoichiometric analyses of water and sediments will allow us to determine the bioavailability of these carbon pools and thus its potential outflow from the wetland.

RLWE.4

Benito, Xavier; *Trobajo, Rosa; Ibáñez, Carles*

IRTA, Aquatic Ecosystems Program

BENTHIC DIATOMS AS INDICATORS OF COASTAL WETLAND HABITATS IN A MEDITERRANEAN DELTA

In coastal wetlands, the use of benthic diatoms as ecological indicators has been much less developed than freshwaters systems. We focused our study in the Ebro Delta (NE Iberian Peninsula) as one of the major deltas of the western Mediterranean and highly sensitive to to climatic and anthropogenic impacts. We aimed i) to investigate the main ecological factors affecting the distribution of benthic diatom assemblages in the Delta and ii) to identify indicative taxa representative of deltaic habitats. For this purpose, 27 sites across the Delta plain were selected to encompass the habitat types of the area: coastal lagoons, salt and brackish marshes, tidal flats, bays and nearshore marine waters. Sediment surface diatoms (top 0.5 cm) were sampled for each habitat. Furthermore, sediment composition and water physicochemical properties were also measured for each sampling site. A total of 424 diatom taxa representing 82 genera were identified. Correspondence Analysis (CA) identified four main diatom groups along gradients related to salinity and shallowness. Thus, groups 1 and 2 corresponded to samples of fresh/brackish and brackish/marine coastal lagoons respectively, and groups 3 and 4 to diatom assemblages of brackish and saline marsh habitats. Group 3 comprised samples with the widest variation of water conductivity while the highest conductivities were recorded among group 4 samples.

The representative diatom taxa of these groups were identified: small Fragilaria species such as F. geocollegarum and F. atomus were typical of the fresh/brackish coastal lagoons, while Planothidium delicatulum and Opephora guenter-grassii were typical of the brackish/marine coastal lagoons. In the shallow marsh habitats, Mastogloia braunii and Navicymbula pusilla were representative of the more saline marshes, while Denticula subtilis, Navicula perminuta and Nitzschia inconspicua were representative of the more brackish ones.

Our study shows that the main factors affecting the spatial and temporal distribution of the benthic diatoms in the Ebro Delta are related to salinity and shallowness gradients, and no clear seasonal influence was observed. The results also show that benthic diatoms can be used as indicators of the different coastal wetland habitats of a Mediterranean delta which may prove useful in future paleoecological studies.

BB.8

Bonada, Núria[1]*; Múrria, Cesc*[2]*; Dolédec, Sylvain*[3]*; Papadopoulou, Anna*[4]*; Vogler, Alfried P.*[5]

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TRAIT DIVERSITY INCREASES WITH CLADE AGE ACROSS THE TREE-OF-LIFE OF FRESHWATER MACROINVERTEBRATES

Global biodiversity is not evenly distributed across the Tree-of-Life. Some lineages contain millions of species whereas others only contain a few hundred. Despite recent studies done for the whole eukaryotic tree have shown that species richness and clade age are decoupled, studies on trait diversity patterns (i.e. functional and ecological traits) across lineages and on the underlying processes that drive these patterns remain rare. Functional and ecological diversification may increase with clade age because of continuing niche expansion (time-dependence), or decrease as ecological space becomes occupied (density-dependence). Using a clock-calibrated phylogenetic tree for 143 families of freshwater macroinvertebrates (›95% of freshwater families in Europe), we measured functional and ecological diversity for 18 independent freshwater clades and related it with the relative clade origin. Functional and ecological diversity for each freshwater clade was measured using published data on biological and ecological traits for ›6400 species, respectively. As expected, taxonomic richness within a lineage was not related to lineage age. However, functional and ecological diversity were strongly correlated to clade age. When analysing the characteristic traits of younger and older clades, the former had a higher diversity of traits that included terrestrial adaptations and salinity tolerance, whereas older clades were completely adapted to freshwater habitats. Together, the findings suggest density-dependence of trait diversification, as incumbent lineages limit the accumulation of variation in younger lineages, giving new insights into the evolution of freshwater faunas.

EF.22

Boyero, Luz[1]*; Pérez, Javier*[1]*; Landeira-Dabarca, Andrea*[2]*; Ferreira, Verónica*[3]*; Graça, Manuel*[4]

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GLOBAL-SCALE PATTERNS OF LEAF LITTER DECOMPOSITION IN STREAMS

The decomposition of plant litter is one of the most important ecosystem processes in the biosphere. Terrestrial plants produce c. 120 billion tons of organic carbon each year, but only a small fraction of it is removed by herbivores, while up to 90% enters the pool of dead organic matter. The rate at which plant litter is lost and transformed to other forms of organic and inorganic carbon determines both the capacity for carbon storage in ecosystems, and the rate at which greenhouse gasses such as CO2 are outgassed, which in turn may alter the climate. By using a latitudinal temperature gradient in an unprecedented global experiment in streams we show that, even if overall decomposition rates should remain unchanged, the process would be profoundly altered as a result of climate warming. While microbial litter decomposition will be hastened, there will be an equivalent decline in detritivore-mediated decomposition rates. This shift in importance from detritivores to microbes in warmer climates will likely increase CO2 production and decrease the generation and sequestration of recalcitrant organic particles. In view of recent estimates showing that inland waters are a significant component of the global carbon cycle, this implies changes in global biogeochemistry and a possible positive climate feedback.

FW.2

Bullejos, Francisco J.[1]*; Carrillo, Presentación*[1]*; Gorokhova, Elena*[2]*; Medina-Sánchez, Juan M.*[3]*; Balseiro, Esteban G.*[4]*; Villar, Manuel*[3]

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SHIFTS IN FOOD QUALITY FOR HERBIVOROUS CONSUMER GROWTH: MULTIPLE GOLDEN MEANS IN THE LIFE HISTORY

Consumer growth can be affected by imbalances between the nutrient content of the consumer and its food resource. Although ontogenetic-driven changes in animal composition are well documented, their potential consequences for the organism's sensitivity to food quality constraints have remained elusive. Here we show that the potential growth response of the copepod Mixodiaptomus laciniatus (as %RNA and RNA:DNA ratio) to the natural gradient of seston carbon (C):nutrient ratio is unimodal and stage-specific. Solution of the equation given by the first derivative function provided the optimum C:nutrient ratio for maximum stage-specific growth, which increased during ontogeny. The peakedness of the function indicated that animal vulnerability to suboptimal food quality decreased as juveniles reached adulthood. Consistent with these results, a field experiment demonstrated that potential consumer growth responded to variations in seston C:phosphorus ratio, and that early life stages were particularly vulnerable to suboptimal food quality.

AER.2

Caiola, Nuno; *Prado, Patricia; Alcaraz, Carles; Ibáñez, Carles*

IRTA, Aquatic Ecosystems Program

EFFECTS OF HYDROLOGICAL CONNECTIVITY RESTORATION IN FISH ASSEMBLAGES WITH EMPHASIS ON THE ENDANGERED SPANISH TOOTHCARP (APHANIUS IBERUS)

The restoration of abandoned commercial aquaculture facilities into natural coastal wetlands in the Ebro Delta (NE Spain) was undertaken within the Delta-Lagoon LIFE Nature project. The restoration allowed the recovery of two habitat types: coastal lagoons and salt marshes. The specific actions to restore the habitat included, basically, the renaturalization of the aquaculture fish ponds (some of them made of cement) and the enhancement of the hydrological connectivity with the sea. The benthic fish community was monitored before and during two consecutive years after the restoration took place. In addition, a range of environmental variables were measured to determine which factors were more important for assemblages' structure. Results showed a significant increase (by ca. 1.5 times) in the number of fish species after the restoration, whereas at the assemblages' level, differences between zones were still more important than interannual variability (R= 0.195 and 0.573, respectively). Environmental variables explained 29.7% of variability species composition, with distance to the sea (associated to zone) accounting for most of the variability of CCA axis 1 and 2. For the endangered Spanish toothcarp, Aphanius iberus, numbers were consistently higher at higher distances from the sea, but a decline occurred in both zones and in controls ponds after restoration works that was attributed to interannual differences in recruitment success (population ages ≤ 1 year). In fact, the best habitat model explaining abundance of individuals also included distance to the sea (i.e., zonal differences) and year among central factors (Adjusted R=0.74). In all, habitat restoration resulted on improved aesthetic landscape features and enhanced the access of fish species into the salt marsh, although changes in assemblages' structure might be more parsimonious. For A. iberus, there was a clear tendency to aggregate in more isolated salt marsh areas, but certain dispersal of individuals and future colonization of other areas is presumed to occur after restoration of hydrologic connections.

SS3.6

Callisto, Marcos[1]*; de Morais, Leticia*[1]*; Farias, Rafaela*[1]*; Martins, Isabela*[1]*; Anacleto, Maria*[1]*; Barbosa, José E. de L.*[2]*; Molozzi, Joseline*[2]*; Hughes, Robert M.*[3]*; Kaufmann, Philip R.*[4]

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THE INFLUENCE OF MACRO- AND MESO-SCALES AND LAND USES ON BENTHIC MACROINVERTEBRATES IN SAVANNA AND SEMI-ARID BRAZILIAN HYDROPOWER DAMS: SUPPORT TO MANAGEMENT STRATEGIES

Large rivers have been fragmented by hydropower dam constructions worldwide altering land uses, physical habitats and benthic assemblages. Our objective was to assess macro- and meso-scale metrics and land uses to evaluate management strategies of resources for hydropower dams to rehabilitate and conserve environmental conditions in savanna and semi-arid Brazilian basins. Forty sampling sites in four savanna hydropower reservoirs (N=160) and twenty sites in three semi-arid reservoirs (N=60) were assessed for land uses, riparian and littoral condition, along a disturbance gradient. An Integrated Disturbance Index was used to assess local- and catchment-scale disturbance and then related to benthic assemblages. Over 42,000 invertebrates were collected, among them chironomids (29 genera, 62%), oligochaets (10%) and alien species (Melanoides tuberculatus, Corbicula fluminea, Limnoperna fortunei, Macrobrachium amazonicum – 10%). We conclude that 1) each hydropower watershed has different land uses, percentage of natural cover and, thus, physical habitat conditions; 2) benthic richness and alien species presence are associated with environmental condition; 3) benthic assemblages are efficient bioindicators to assess macro- and meso-scale environmental conditions in hydropower watersheds and for developing resource management strategies in savanna and semi-arid Brazilian basins.

BB.11

Camacho, Antonio[1]*; Picazo, Antonio*[2]*; Ghai, Rohit*[3]*; Santamans, Anna C.*[2]*; Rodriguez-Valera, Francisco*[3]

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METAGENOMICS UNMASK MICROALGAL DIVERSITY IN LENITIC ENVIRONMENTS: WHAT DIVERSITY INDICES TELL US.

Diversity indices, based on species richness and the sharing of individuals among species, have usually been used as a main descriptor of community structure. Classically, for taxa other than prokaryotes, morphological features have been used to establish the assignation of an individual to a particular species. With the advent of the genomic era, genetic features, based on the sequence similarity of specific genes, have progressively increased their relevance as tools to identify the species assignation of individuals. In the case of protists, and more particularly of microalgae (but also for some cyanobacteria), microscopic determinations following the Utermöhl sedimentation method have been widely used and are nowadays the main method to determine taxonomic diversity of phytoplankton, being recognized as standardized methods for the monitoring of water quality and ecosystem condition.

In the postgenomic era, next generation sequencing (NGS) techniques allow to obtain the sequences of all the genetic material present in an environmental sample, consisting of the genomes of many individual organisms, the so-called "metagenome". This avoids most biases linked to PCR amplification techniques, and provides a more comprehensive overview of the composition of the microbial community in the analyzed environment. So far, only a few dozens of metagenomes from planktonic environments are available, mostly marine, and no attention has yet been paid to the patterns of diversity obtained by NGS compared to classical microscopic methods. In this work we have completed the metagenome of three environmental samples obtained from lenitic ecosystems located in the Spanish Mediterranean coast, Albufera de Valencia, Mar Menor, and Amadorio Reservoir, which present quite different ecological features. We used all sequences corresponding to the gene encoding for the 18SRNA from each sample (several millions of sequences) to test the most used diversity indices in ecology, and to compare these results with the diversity indices calculated from community composition data of the same samples obtained by classical microscopic methods based on morphological determinations. The obtained results are discussed in the framework of current ecological theories about ecological diversity, and the goodness of NGS techniques in providing a detailed description of the diversity of lenitic ecosystems is evaluated.

SS5.1

Camacho, Antonio[1]*; Toro, Manuel*[2]*; Martínez, Guillermo*[3]*; Corrochano, Alfredo*[4]

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MÉTODOS ESTANDARIZADOS PARA LA EVALUACIÓN DEL ESTADO ECOLÓGICO DE LAGOS NATURALES: EL CÓMO Y EL POR QUÉ

La evaluación del estado ecológico de los ecosistemas es una herramienta para su manejo y gestión, ya que permite conocer su calidad estructural y su funcionalidad, y puede ser asociada a medidas específicas para el mantenimiento o mejora de su salud ecológica. De manera general, dicha evaluación se realiza utilizando variables, bióticas o abióticas, que son indicadoras del estado de componentes estructurales y procesos claves para el buen funcionamiento del ecosistema y para el mantenimiento de los servicios que este proporciona. En los ecosistemas acuáticos naturales, y más concretamente en los de tipo lenítico, lagos, lagunas y humedales, a los clásicos indicadores físico-químicos y microbiológicos descriptores de la calidad del agua, se han ido sumando en las últimas décadas indicadores biológicos que resultan más integrativos del estado ecológico del ecosistema, y que son complementarios entre ellos por responder de manera específica a distintos tipos de alteraciones. De entre los componentes de la comunidad biótica que habita los lagos, grupos tales como las microalgas (fitoplancton y fitobentos), las plantas acuáticas, distintos tipos de invertebrados, y los peces, se han postulado generalmente como buenos indicadores de la respuesta de la comunidad a presiones e impactos experimentados por este tipo de ecosistemas, y son objeto de monitorización periódica en muchos lagos del mundo para describir su estado ecológico, incluyendo la Unión Europea especialmente tras la puesta en marcha de la DMA. Sin embargo, para que dichos indicadores puedan incorporarse con fiabilidad para la evaluación de la calidad ecológica de los ecosistemas leníticos es necesaria una estandarización de los métodos, tanto de muestreo como de determinación, que permita hacer intercomparables los resultados, y comparar también estos con unos valores de referencia propios del tipo de ecosistema en cuestión. En esta comunicación, y a modo introductorio de la sesión especial sobre el estado ecológico del Lago de Sanabria, se hace un breve repaso a la manera en que, para alcanzar la fiabilidad e intercompatibilidad necesarias, deben realizarse los muestreos y determinaciones de las variables (métricas) descriptoras de algunos de estos elementos biológicos de calidad. Se explican también los motivos por lo que dichos indicadores y sus métodos de muestreo y determinación, que están internacionalmente homologados y estandarizados, pueden ser aplicados con confianza para la evaluación del estado ecológico de los lagos, y más concretamente del Lago de Sanabria.

SS4.5

Camargo, Antonio F. M.*; Siqueira, Tadeu*

Universidade Estadual Paulista -UNESP

LONG TERM ECOLOGICAL RESEARCH: STRUCTURE AND DYNAMICS IN COASTAL RIVERS AND STREAMS FROM THE ATLANTIC FOREST (ITANHAÉM RIVER BASIN, BRAZIL)

Long Term Ecological Research (LTER) is essential to respond theoretical and applied questions that normally are not possible by short-term studies. The Brazilian Council of Research (CNPq) and São Paulo Research Foundation (FAPESP) have a program to support LTER (PELD-Programa de Pesquisas Ecológicas de Longa Duração). We have been developing LTER in Itanhaém River basin (PELD-ITA) located in south coast of São Paulo State. Within PELD-ITA we aim to study different aquatic communities (fish, aquatic macrophytes, macroinvertebrates and perifiton) with concomitant samples and within a georeferenced basin. We already have data about landscape, riparian zone, and limnological variables that allows us to monitor spatial and temporal changes in land use and relate these changes with biotic and abiotic characteristics of water bodies. Data on fish and aquatic macrophytes distribution show a mouth-headwater gradient in the watershed. Fish communities form four fish zones based in the dominance of families that are determined by the marine influence (salt and brackish water), declivity, barriers and food availability. Aquatic macrophytes also show a longitudinal gradient, with species tolerant to salinity in the lower portion of the watershed (Spartina alterniflora, Crinum procerum) and submersed species close to the headwaters (Egeria densa, Cabomba furcata). The spatial distribution of macrophytes is also related with water temperature, turbidity and nutrient concentrations, and canal characteristics (depth, margin declivity, riparian plant cover). The Itanhaém watershed has rivers with different water types (white, black and clear). Limnological characteristics of these rivers are distinct and black waters have low pH values, whereas white waters have higher turbidity and higher nitrogen and phosphorus concentrations. However, only the perifiton respond to different water types. In the white water, perifiton has higher values of biomass than in black waters. Macroinvertebrates from headwater streams have characteristic taxa of coastal basins, such as shrimps and freshwater decapods, and characteristic groups of preserved streams with well-oxygenated water and rocky substratum, such as plecopterans and riffle beetles. Regarding the temporal scale, our preliminary analyses suggest that taxonomic composition of most groups remain constant throughout the year. It seems the rainy season only reduces species abundance but not species occurrence.

AMWQ.18

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VEGETACIÓN EN LOS CAUCES VS RETENCION DE NUTRIENTES: EFECTOS EN UNA CUENCA LACUSTRE

La reserva natural Complejo Lagunar de Manjavacas está formado por las lagunas de Alcahozo, Sánchez Gómez, Dehesilla, Navalengua, Melgarejo y Manjavacas. Se trata de lagunas endorreicas, de carácter salino y aguas temporales, cuyos aportes son fundamentalmente superficiales. Entre ellas, la de mayor tamaño es la Laguna de Manjavacas (1,6 km2). Está ubicada en el termino municipal de Mota del Cuervo, a unos 8 km al sur de la localidad. De manera natural sería una laguna estacional, como el resto de lagunas del complejo, pero recibe el aporte del vertido de aguas residuales o depuradas procedente de Mota del Cuervo a través de una acequia que recorre la distancia entre la localidad y la laguna, lo que condiciona enormemente su periodo de inundación, habiendo años en los que no llega a secarse. A lo largo de un ciclo hidrológico, se determinaron mensualmente la carga de nutrientes y materia orgánica aportada por el vertido de Mota del Cuervo sobre muestras tomadas en diferentes puntos del recorrido del vertido. Estos muestreos coincidieron en el tiempo con la limpieza de la vegetación helofítica y nitrófila que recubre el cauce de la acequia, lo que nos permitió comparar nuestros resultados con los resultados de un estudio similar realizado años anteriores por nuestro mismo equipo. Las cargas contaminantes del vertido por unidad de volumen son altas, comparables a cualquier otro vertido de aguas residuales urbanas. Tras la eliminación de la cubierta vegetal del cauce, se observó que, con respecto a los estudios anteriores donde la vegetación permaneció intacta, los porcentajes de reducción de nutrientes en el tránsito por el cauce fueron inferiores. La retirada de vegetación provocó que el impacto eutrofizador del vertido se viese incrementado, lo que explicó en parte el gran desarrollo fitoplanctónico, con la consecuente ausencia de macrófitos, así como las altísimas abundancias de bacterias heterótrofas encontrados la laguna, ambas reflejadas en las tasas productivas y de respiración del sistema. Este trabajo ha sido financiado por el proyecto ECOLAKE (CGL2012-38909).

SS2.8

Casas, Joan P.[1]*; Tittel, Jörg*[2]*; von Schiller, Daniel*[1]*; Catalán, Núria*[3]*; Obrador, Biel*[4]*; Gómez, Lluís*[4]*; Proia, Lorenzo*[1]*; Abril, Meritxell*[4]*; Zwirnmann, Elke*[5]*; Sabater, Sergi*[1]*; Pilar, López*[4]*; Marcé, Rafael*[1]

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DISSOLVED ORGANIC MATTER COMPOSITION AND USE IN THE HETEROGENEOUS HABITATS OF A TEMPORARY RIVER DURING SEASONAL DROUGHT

The important role of freshwater ecosystems on the global carbon (C) cycle has been recently recognized, but the factors governing C retention and transformation in river networks remain unclear. Even though alterations in either flow or temperature regime have been shown to affect organic matter processing in freshwaters, the effects of seasonal events such as summer drought periods are poorly understood, and they are usually not considered in global estimates of C fluxes. In the present study we aimed to evaluate the composition and use of dissolved organic matter (DOM) along different hydrological habitats typically found in a river network during a summer drought period (stagnant waters in weirs, running waters, and isolated pools in dry reaches). We applied a multi-faceted approach to characterize DOM including size exclusion chromatography (SEC), C isotope concentrations, spectroscopic techniques (UV/vis absorbance and fluorescence spectra), and biodegradation experiments. DOM composition varied between the different habitats. Low molecular weight (LMW) compounds dominated the DOM reservoir in running waters and weirs (84 and 77% of bulk DOC respectively), while isolated pools presented similar percentages of LMW compounds (49%) and humic substances (43%). Relatively high concentrations of high molecular weight substances (7%) were also found in isolated pools, being the predominant fraction used by bacteria during the biodegradation experiments. The higher residence time and the accumulation of organic matter debris in isolated pools seem to define them as very active environments for organic matter processing. Preliminary results from DOM concentration, spectroscopy, and isotopic analysis indicate an increase in the proportion of autochthonous (aquatic) vs. allochthonous (terrestrial) DOM in the higher water residence time habitats relative to that found in running waters. All in all, our results suggest a remarkable importance of fresh in-stream produced DOC during the seasonal drought period promoted by the lentification of the river network.

BB.9

Castillo-Escrivà, Andreu[1]*; Valls, Luis*[1]*; Armengol, Xavier*[1]*; Camacho, Antonio*[1]*; Florín, Máximo*[2]*; Gil-Delgado, José A.*[1]*; Gosálvez, Rafael U.*[3]*; Laguna, Celia*[4]*; Rochera, Carlos*[1]*; Velasco, Ángel*[5]*; Mesquita-Joanes, Francesc*[1]

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METACOMMUNITY MULTI-SCALE SPATIAL ANALYSIS FROM SHALLOW LAKES IN CENTRAL SPAIN

Historically, studies about ecological communities have been developed on a single spatial scale, considering they were both isolated and closed systems. However, other ecological processes occur on multiple scales, such as source-sink dynamics The metacommunity concept helps ecologists to understand this multi-scale nature, although applied works are still scarce. Nowadays an effort exists to standardize this research and provide comprehensive software. This study aims to analyze one metacommunity in a multi-scale framework, using ostracods from shallow lakes in Central Spain (Biosphere Reserve of La Mancha Húmeda). For this purpose, twenty-five shallow lakes were sampled in January-May 2013 with hand-nets (250 µm mesh) on a wide ecological gradient in order to obtain the highest ostracod diversity. A set of environmental variables were collected for each lake and MEMs (Moran Eigenvector Maps) were calculated to represent both broad-scale and fine-scale spatial fractions. Environmental variables explained a significant proportion of the species variance ($R^2 = 0.26$, $P = 0.005$), being conductivity and mean annual precipitation the most important variables. However, the scalograms for the first two axes indicated accumulation of variance in broad-scale spatial components. Variation partitioning identified a significant pure broad-scale spatial fraction ($R^2 = 0.23$, $P = 0.04$), a significant pure environmental fraction ($R^2 = 0.25$, $P = 0.05$), a fraction belonging to broad-scale structured environment ($R^2 = 0.05$) and another fraction corresponding to fine-scale structured environment ($R^2 = 0.06$). Pure fine-scale spatial fraction was non-significant ($R^2 = 0.11$, $P = 0.16$). Results revealed important effects of habitat features and broad-scale drivers on the spatial structure of ostracod communities. A multi-scale spatial view is a powerful tool to understand metacommunity structure and a helpful basis for future territorial management and responsible decisions. This work was supported by the project ECOLAKE (CGL2012-38909).

GC.6

Castro, Bruno B.[1]***;*** *Loureiro, Cláudia*[1]*; Cuco, Ana P.*[1]*; Claro, Maria Teresa*[1]*; Santos, Joana I.*[1]*; Pedrosa, M. Arminda*[2]*; Gonçalves, Fernando*[1]

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INTERACTIVE EFFECTS OF SALINITY AND TEMPERATURE IN A PROGRESSIVE ACCLIMATION SCENARIO OF EXPERIMENTAL DAPHNIA GALEATA POPULATIONS

Climate change is an important source of environmental change, giving rise to interacting environmental stress scenarios. One of such scenarios is the putative rise in temperature and salinity (due to sea level rise, increased evaporation, or saline intrusion) in coastal freshwaters. To properly predict the impacts of such interactions in natural populations, research must take into consideration the ability of organisms to adapt to such changes. Daphniids are privileged model organisms for studying adaptation phenomena to environmental stress and they are particularly intolerant even to low salinity levels. Moreover, the local extinction of these filter-feeders can lead to loss of the ecosystem services they provide (e.g., regulation of biogenic turbidity and prevention of cyanobacterial blooms). Bearing this in mind, the phenotypic adaptability of a Daphnia galeata genotype to salinity and temperature was investigated, by evaluating its halotolerance at two different temperatures, along a short multigenerational acclimation scenario. Daphniids were acclimated to different temperatures (20ºC and 25ºC) and salinities (0 g/L and 1 g/L, using NaCl as a proxy) in a fully crossed design in order to understand whether acclimation to environmental stress (dual combinations of temperature and salinity) influenced the response to the latter exposure to these stressors. We hypothesized that acclimation to culture conditions (temperature × salinity regimes) should elicit an acclimation response of daphniids to saline stress or its interaction with temperature. Acute (survival time) and chronic (decrease in juvenile growth) halotolerance measures were obtained at discrete timings along the acclimation period (generations F1, F3 and F9). Overall, exposure temperature was the main determinant of the acute and chronic toxicity of NaCl; daphniid sensitivity (measured as the decrease of survival time or juvenile growth) was consistently higher at the highest temperature, irrespective of the background conditions. However, this temperature-dependent effect was nullified after nine generations, but only when animals had been acclimated to both stressors (high salinity and high temperature). Such a complex interaction scenario must be taken into account when predicting the environmental impacts of climate change.

SS2.6

Catalán, Núria[1]*; von Schiller, Daniel*[2]*; Zwirnmann, Elke*[3]*; Proia, Lorenzo*[2]*; Casas, Joan P.*[2]*; Obrador, Biel*[4]*; Marcé, Rafael*[2]

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BIODEGRADATION DYNAMICS OF DISSOLVED ORGANIC MATTER: THE ROLE OF ORIGIN AND RESIDENCE TIME

Dissolved Organic Matter (DOM) is a complex mixture of compounds with different reactivity. It has been hypothesized that both the origin and the residence time of DOM directly determine its reactivity. Here, we evaluated the biodegradation dynamics of DOM from 3 freshwater systems differing in origin and residence time of DOM. We incubated water from a river (allochthonous DOM, shorter residence time), an isolated pool (autochthonous-microbial DOM, intermediate residence time) and a dam (autocthonous-algal DOM, longer residence time). During the incubations we traced the biodegradation dynamics of both the bulk DOM and its main fractions: High molecular weight substances (HMWS), low molecular weight substances (LMWS) and humic substances-building blocks (HS-BB). Bulk DOM decay patterns were adjusted to the reactivity continuum (RC) biodegradation model. The obtained parameters attributed a very low average lifetime to the modeled as more reactive species of DOM (between 4 and 28 hours). Also, the preponderance of the recalcitrant fraction was low in the three water types. The RC estimates depicted river water samples as the ones presenting a more reactive DOM type. Regarding the dynamics of the different fractions,we were able to determine to which actual fraction in the samples corresponded each modeled fraction obtained from the RC in the bulk DOM. In the most reactive DOM type (river) a decrease in the LMWS fraction was observed, whereas a decrease in HMWS was found for the less reactive waters (pool and dam). This result shows that contrary to usual assumptions, the highest reactivity was observed in waters with higher proportion of allochthonous DOM. Our study provides a first insight into the contribution of different DOM fractions to the RC of bulk DOM and shows that, above its origin, the more reactive pool of DOM is a function of the DOM residence time within the systems.

IS.5

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PREDATOR-PREY RELATIONSHIPS BETWEEN THE INVASIVE WATERBOATMEN TRICHOCORIXA VERTICALIS AND THE NATIVE CRUSTACEAN ARTEMIA PARTHENOGENETICA

Trichocorixa verticalis, originally distributed in North America and the Caribbean islands, has been registered as an invasive species in South Africa, New Caledonia, Morocco, Portugal and Spain. In natural populations of the United States, it has been described that its predatory activity can control populations of Artemia sp., with important top-down effects on phytoplankton communities. Here we have studied the predator-prey predator relationship between the native brine shrimp Artemia parthenogenetica, and the invasive corixidae T.verticalis, in SW Spain. We investigated the effect of the life stages of Artemia (nauplius, young and adults), its abundance (3, 6 and 12 adult individuals) and its parasitic status (infected with the avian cestode F. liguloides and uninfected) on T.verticalis predation rate, as well as the sex and size of T.verticalis at two different salinities (25 g/l and 55g/l) The results of this study showed that T.verticalis predated extensively on Artemia, irrespective of its lifes stages. However, T.verticalis selectively predated on Flamingo lepisliguloides- infected Artemia, which is more visible than uninfected individuals due to the effect of the parasite on Artemia colour. We also observed a higher predation rate with increasing the number of prey. The results of this study suggest that T.verticalis may be also important controlling Artemia populations in wetland of the invaded range.

EF.3

Chappuis, Eglantine[1]*; Lumbreras, Ana*[2]*; Ballesteros, Enric*[1]*; Gacia, Esperança*[1]

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EFFECTS OF LIGHT REDUCTION AND SEDIMENT FERTILIZATION ON ISOETES LACUSTRIS GROWTH, SURVIVAL AND CARBON STORAGE

Light and sediment organic matter are important factors for plant growth and survival. Light reduction and increased sediment organic load often occur together in lakes undergoing eutrophication. We aimed at experimentally testing the relative importance of light availability, sediment fertilization and its interaction in the collapse of healthy populations of I. lacustris. We conducted an in situ shading (65% and 35% of incident light) and sediment fertilization (10% organic matter enrichment) experiment in a Pyrenean pond (NE Spain). We followed plant performance by using growth indicators, carbon balance indicators and individual survival.

Severe light reduction (35%) resulted in a general enlargement of the new leaves to increase the photosynthetic surface, a slight decrease of the number of new leaves produced and no effects on mortality. Sediment fertilization resulted in leaf deterioration, higher leaf mortality, lower number of new leaves produced, lower production and increased individual mortality. These effects were more extreme and mortality was the highest under conditions of light reduction and fertilization.

At reference conditions, the corm was the main carbohydrate reservoir of the plant containing high levels of starch (19,7% of DW on average). Sucrose was more abundant in the leaves, especially in new young leaves (an average of 15.2% of DW in the 1st and 2nd youngest leaves). Corm starch percentage tended to increase at 65% of light. However, under severe light reduction (35%), plants used corm starch to keep growing. Consequently, starch percentage reduced and sucrose percentage increased as it was transported to the growing leaves. Fertilization produced similar but smaller changes. The most extreme changes were observed under severe light reduction and fertilization, which extremely increased the ratio between sucrose and total non-structural carbohydrates (TNC). I. lacustris carbohydrate concentration is a good indicator of light changes but it is less suitable to indicate fertilization stress.

Isoetes performed slightly better at 65% of incident light, which may indicate photo-inhibition or UV stress at reference conditions. Mortality did not increase under light reduction and moderate mortality resulted under fertilization. The combination of light reduction and fertilization highly enhances mortality and helps explaining isoetes die-offs observed after damming.

BB.13

Compte, Sergi[1]*; Puigmal, Núria*[1]*; Subirats, Jèssica*[1]*; Fillol, Mireia*[2]*; Sánchez, Àlex*[1]*; Marcé, Rafael*[1]*; Borrego, Carles*[2]

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ABUNDANCE AND DIVERSITY OF UNCULTURED ARCHAEA OF THE MISCELLANEOUS CRENARCHAEOTIC GROUP ALONG DEPTH PROFILES OF SEDIMENTS COLLECTED AT TWO EUTROPHIC RESERVOIRS

Archaea are widespread and diverse in sediments collected from both marine and freshwater environments. Traditionally, the presence and activity of archaea in freshwater sediments have been related to methane cycle and its impact on C fluxes between the sediment and the water column. However, recent results have shown that archaeal communities inhabiting marine subsurface sediments are dominated by uncultured members of lineages such as the Miscellaneous Crenarchaeotic Group (MCG) and the Marine Benthic Group-B. Despite their abundance and widespread distribution in marine sediments, very few data are available for lacustrine sediments, especially in relation to physico-chemical gradients along sediment depth. In this study, the abundance and phylogenetic composition of archaeal communities, with special focus on members of the MCG lineage, were studied in sediment corers collected from two Spanish reservoirs (Sau and Santa Fe) characterized by high inputs of organic matter from anthropogenic and natural sources, respectively. Sediment corers were laminated at 2-cm intervals and both DNA and RNA were extracted using standardized protocols. DNA and cDNA extracts obtained from each depth interval were analyzed to determine bacterial, archaeal and MCG abundance along the vertical profile using qPCR and specific primers to each microbial group. Besides, DNA- and RNA-based fingerprints targeting the 16S rRNA gene from MCG were compared to discriminate between latent and active community members, respectively. Although bacteria outnumbered archaea at all sediment depths from both environments, MCG gene biomarkers were detected in all layers. All sequences recovered from DGGE fingerprints affiliated to subgroup MCG-6 agreeing with results obtained from sediments collected from other freshwater environments (see Subirats et. al., this meeting). These results indicate that MCG archaea are widespread not only in the marine deep biosphere but also in shallower freshwater sediments.

SS1.3

Conde-Porcuna, José M.*; Moreno, Emilio J. ; Pérez-Martínez, Carmen*

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RELATIVE IMPORTANCE OF SALINITY ON ZOOPLANKTON DYNAMICS: EFFECTS ON THE HATCHING RATE OF ZOOPLANKTON RESTING EGGS.

Salinity is becoming a serious threat to freshwater ecosystems due to global change, and it is known as a driving factor determining the presence and dominance of aquatic organisms. Zooplankton may produce resting eggs, which maintain its viability during long periods, being the egg banks research of interest to many biological phenomena, such as migration from the past, dispersal, temporal heterogeneity and biodiversity. In this study, the effects of salinity on zooplankton are mainly investigated by inducing hatching of zooplankton resting eggs. These eggs were isolated from surface sediment samples in lakes Santa Olalla and Dulce (Doñana National Park, Spain). To study factors affecting hatching rates, resting eggs were incubated at two temperatures (15 and 25 ºC) under a gradient of salinity (0.3-9 psu), which includes salinities that were usually observed in these lakes. Additionally, the temporal dynamic of zooplankton in the lakes during several years was studied. Our results showed that salinity concentration affect the hatching rates of rotifers, but this effect was species-specific and could be modified by temperature. Moreover, we observed differences in the hatching response of zooplankton regarding of the origin of the eggs and, in some cases, the day of hatching was positively related with salinity. These results will be discussed with the dynamic of zooplankton in these lakes. The potential contribution of the resting eggs bank to freshwater zooplankton resilience after increased salinity will also be considered.

AMWQ.9

Cortes, Rui[1]*; Hughes, Samantha J.*[1]*; Varandas, Simone*[1]*; Pereira, Vitor*[2]*; Pereira, Sandra*[1]*; Pinto, Ana*[1]*; Lopes, Marisa*[1]*; Santos, Catia*[2]*; Coimbra, Ana*[1]*; Monteiro, Sandra*[1]*; Sampaio, Ana*[1]

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CHALLENGES IN ECOLOGICAL ASSESSMENT UNDER WFD: INTEGRATION OF DIFFERENT LEVELS OF ORGANIZATION

Bioindicators can be classified into effect (or reaction) indicators and accumulation indicators. The former, commonly designated also by biomarkers, respond to stress (relatively) quickly in an observable or measurable manner, and should display low-resistance and low adaptive potential. Accumulation indicators, in contrast, must dispose of a fairly high amount of strain resistance which enables them to incorporate potentially toxic substances for a considerable time without injury and are based on proportions tolerance-intolerance taxa. Ecological assessment methods are mainly based on the 2nd group; for example, the Water Framework Directive (WFD) uses selected biological quality elements (BQE) to quantify disturbance of surface water bodies. Functional indicators, even if recognized as a valuable tool, are only sparsely used in monitoring. By using the Forest Random technique we combined these three distinct levels of biological organization to obtain an integrative index that is simultaneously sensitive to ecological disturbances and that detects cause-effect relations. Invertebrate and fish communities were included for analyses together with parameters related to river functioning. We took into consideration parameters ranging from lower scales, like histopathological and biochemical change in fish liver and gills, to higher levels of organization such as fish guilds, or invertebrate taxa (based on the whole assemblages and on chironomid pupal exuviae), metrics/traits, litter breakdown and colonizing invertebrates were used to express ecosystem function and trophic dynamics. This index was tested performed in a regional setting, from data collected at sites in northern Portuguese rivers covering a quality gradient ranging from reference conditions to highly disturbed. However this integrative procedure can be extended to any spatial scale and contribute to fill gaps in the present WFD assessment methodology.

AEBC.5

De Gispert, Quim[1]*; Alfenas, Guilherme*[2]*; Bonada, Núria*[1]

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GRAIN SIZE SELECTION BY THE MOUNTAIN CASED-CADDISFLY SPECIES POTAMOPHYLAX LATIPENNIS (CURTIS, 1834)

Many Trichoptera species build cases to facilitate breathing, to camouflage, or to be better protected against predators. However, building cases requires significant energetic costs and time, which may involve a trade-off with the size of grain used. Thus, large grain sizes would require less time and higher individual survival than small grain sizes. However, large grain sizes would involve higher energetic costs for manipulation and an extra cost to further case repair and compaction. This study aims to investigate grain size selection during case building of the Trichoptera species Potamophylax latipennis. This species, which is widely distributed in mountain rivers in Europe, builds cases with mineral grains during its last instars. Last instar larvae were collected in the Ritort river (Pyrenees, Catalonia/Spain) and were used in a laboratory experiment. Individuals were removed from their cases and forced to rebuild their cases using 7 combinations of grain sizes: small (0.5-1 mm), medium (1-1.5 mm) and large (1.5-2 mm). Time spent until the individuals were completely free was recorded. The proportion of each grain size selected to build the new cases was measured and compared to the original case to account for the individual aspects. All individuals built heavier cases than the original ones but overall maintained the proportional grain sizes. Medium sizes were preferred followed by large sizes. Small sizes were never preferred when individuals were exposed to medium or large sizes. Despite the potential higher costs of using large sizes, individuals seem to prioritize fast building than optimal sizes.

EH.2

Death, Russell*; Fuller, Ian; Death, Amanda*

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QUANTIFYING HABITAT QUALITY – THE MISSING DIMENSION

Concern about the ecological health and biodiversity status of the fauna in the world's rivers has led to many national governments and international bodies instigating policies, laws, education programs and action plans to combat declining water quality and quantity. However, if the purpose of these programs is to halt, or even enhance, the ecological condition and biodiversity values of those waterbodies then we must also ensure adequate and quality habitat is available for those organisms. An abundance of clean water alone does not improve ecological condition if there is nowhere for the organisms to live or no way for them to reach those habitats. The use of habitat quality in resource management activities has been hampered by the lack of a simple and effective method to quantify the quality of that habitat. Here we use an assessment of river geomorphology to develop an index of natural character (Natural Character Index or NCI), which provides a geomorphic framework to quantify habitat condition. This approach assesses the degree to which reach geomorphology has changed from a 'natural benchmark' derived from the historical (pre-modification) condition at that reach. We provide examples deriving NCI in rivers subject to ongoing management in the lower North Island of New Zealand.

AE.4

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Universidad de Jaén

COULD NITRATE CONCENTRATIONS WITHIN LEGAL LIMITS ALTER PLANKTON COMMUNITY?

Freshwater biodiversity is being depleted worldwide owing to anthropic pressures such as agriculture linked to an increase in food demand from an exponentially growing population. Intensive agriculture socio-economic importance cannot be neglected. However, it is the leading perturbation mainly due to agrochemical exposures to aquatic systems compromising biodiversity and ecosystem services. So then, there is a challenge to find a balance between economic and environmental values. The present study uses agrochemical (nitrate used as fertilizer) legal limits concentrations established by the Water Framework Directive (WFD 60/EC/2000) to investigate if even assumed protective limits impact on freshwater ecosystems. The aim is to determine how sublethal toxicant concentrations will shape community viability and biodiversity. This information will assist policy makers with more realistic and ecological relevant results to establish legal limit concentrations that neither over- nor underestimated environmental risks. An experiment using mesocosms was done to assess the ecotoxicological effect of a single pulse of nitrate on plankton communities. The mesocosms (Circular containers ¿of? 50 L) were established outdoors with plankton from local wetlands. After seven weeks of stabilization, two disturbance treatments were spiked, each with 5 replicates: 1) Low treatment (L) of 25 mg L-1 of nitrate, 2) High treatment (H) of 50 mg L-1 of nitrate, and the controls. The experiment lasted 8 weeks. Zooplankton abundance and community structure were used as structural endpoint. Chlorophyll-a concentration and ecosystem productivity, approximated by diurnal oxygen fluctuations, were used as functional endpoints. ANOVA ¿GLM? detected significant differences between treatments and controls at structural and functional endpoints. Principal Response Curve (PRC) of plankton showed perturbation effects. Specifically, a) zooplankton taxa shifted from a cladocera-dominated to a copepod-dominated community in response to the nitrate exposure, b) both L and H nitrate treatments had the same effect on the zooplankton community and, c) productivity was affected most likely linked to indirect and combined effect of grazing zooplankton pressures changes linked to nitrates availability for phytoplankton. These results indicate changes in abundance and community integrity (structural and functional aspects), raising concerns about long term impacts on community viability and biodiversity.

EF.14

del Campo, Rubén[1]*; Arce, Maria I.*[1]*; Sánchez-Montoya, María del M.*[2]*; Suárez, Maria L.*[1]*; Vidal-Abarca, Maria del R.*[1]*; Gómez, Rosa*[1]

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ORGANIC MATTER DECOMPOSITION IN MEDITERRANEAN ARID STREAMS. IMPORTANCE OF ORGANIC MATTER EXPOSURE IN FLOODPLAINS

Temporary streams represent a large proportion of the total number of world's rivers. These streams have a great hydrological dynamic that results in a heterogeneous riverine ecosystem, where the terrestrial environments, as floodplains, have an important role in some ecosystem processes, as the organic matter decomposition. Concretely in arid regions, the scarcity of flood events results in an accumulation of organic matter in the floodplain for a long time. The harsh climatic conditions of these environments cause some changes in the chemical composition of organic matter, conditioning the subsequent decomposition rates in streams. In this study, we analyzed how the exposure of wood in floodplains affects its chemical composition and their subsequent aquatic decomposition. To address this question, we put a set of wood sticks in a stream floodplain during three and four months that were placed later in in two streams of the Región de Murcia. To complete the experiment, we put a control set (wood sticks not exposed in floodplain) along with the exposed sticks sets in the streams.

Results showed a wood mass loss associated with a lignin content decrease, after the period of floodplain exposure probably due to photodegradation effects. However, differences in wood breakdown rates in streams were not affected by the time of exposure in the floodplain.. Our results seem to indicate that local conditions such as flow velocity, were more important in wood decomposition than floodplain preconditioning in the. Even so, it is expected that under other environmental conditions, as a longer floodplain exposure time, may exert a greater influence on wood breakdown.

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SS2.7

Dos Santos, Andre C.A.*; Miwa, Adriana P.; Cunha, Davi G.F.; Calijuri, Maria do C.*

Universidade de São Paulo

SEASONAL DYNAMICS OF CARBON IN A SUBTROPICAL RESERVOIR

The input and transfer of carbon in ecosystems is a key element to understand its dynamics. With the aim to evaluate the differences of carbon dynamics in two periods (rainy and dry seasons) in a subtropical reservoir loads of input and output of dissolved organic, particulate and inorganic carbon, phytoplankton and macrophytes primary production, the secondary production of zooplankton and bacterioplankton were analyzed, together with the carbon stocks in water and sediment and in the communities benthonic, planktonic and macrophyte. we used data from three stations in the center of the reservoir with six samples in each period. The reservoir studied is located in one of the richest and most populous areas of Brazil and has been going through a gradual increase in trophic index. The higher loads of carbon in the reservoir were observed in the wet season. The load balancing indicates that the reservoir is an exporter of carbon especially in the dry season, exporting downstream double what comes the upstream. In both periods, the most abundant fraction of carbon in the input and output of the reservoir is inorganic. Phytoplankton primary production and secondary production of zooplankton and bacteria are higher in wet season than in the dry season. Most of the biomass of plankton community is zooplankton, indicating the importance of the detritus chain in this environment. The phytoplankton biomass is higher in the dry season while the zooplankton biomass is highest in the rainy season, mainly due to the presence of high density of larvae of Chaoborus sp. showing the importance of top-down controls on planktonic food chain. The biomass of macrophytes is also higher in the rainy season, while biomass of bacteria, benthos and carbon concentrations in water and sediment from the reservoir has little seasonal variation. The reservoir metabolizes carbon differently during periods of drought and rain, which has important implications for multiple uses and the management of this ecosystem.

BB.4

Duarte, Sofia[1]*; Trabulo, José*[1]*; Bärlocher, Felix*[2]*; Cássio, Fernanda*[1]*; Pascoal, Cláudia*[1]

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DIVERSITY OF STREAM-DWELLING FUNGAL DECOMPOSER COMMUNITIES UNRAVELLED BY 454 PYROSEQUENCING

Fungi, specially aquatic hyphomycetes, play a critical role in the processing of plant-litter in freshwaters by increasing its palatability to invertebrate shredders. Traditionally, communities of aquatic hyphomycetes have been assessed through the identification of spores but this misses non-sporulating taxa. Among new technologies, pyrosequencing stands out as most promising for large-scale species identification. But very few attempts have been made to validate the effectiveness of this technique for assessing the diversity of stream-dwelling fungal communities.

In this study, we attempted to gain greater insight into the diversity of aquatic fungal communities on decomposing leaf-litter in streams impacted by various degrees of eutrophication by using the 454 pyrosequencing technology. A total of 173,889 ITS2 pyrosequencing reads with hits for fungi were obtained from the 5 investigated streams.

The majority of operational taxonomic units (OTUs) belonged to Ascomycota and identification until the genus level was achieved for 169 OTUs. Of the total, 135,257 reads showed close affinities to aquatic hyphomycete species. Pyrosequencing showed declining fungal diversity at the most eutrophic streams, which was congruent with a reduced diversity found through spore identification. Dominance patterns revealed by connecting representative OTUs to ITS sequences from aquatic hyphomycetes were similar to those determined by traditional spore identification techniques. However, 454 pyrosequencing provided a more comprehensive view of fungal diversity; it captured almost twice as many taxa as spore counts, and the difference between the two approaches increased at the most eutrophic streams. In addition, slight differences between streams were found in the contributions of fungal classes and at the intraspecific level. This study validates the effectiveness of 454 pyrosequencing for surveying the diversity of stream-dwelling fungal decomposer communities. Its application will accelerate the use of fungal decomposer communities for monitoring the integrity of freshwater ecosystems.

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EF.9

Dunck, Bárbara[1]*; Fernandes, Eva*[2]*; Cássio, Fernanda*[2]*; Rodrigues, Liliana*[1]*; Pascoal, Cláudia*[2]

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EFFECTS OF STREAM EUTROPHICATION ON PRIMARY PRODUCTION, LITTER DECOMPOSITION AND THE ASSOCIATED COMMUNITIES OF PERIPHYTIC ALGAE, FUNGI AND MACROINVERTEBRATES

The aim of this study was to assess the effects of eutrophication on biodiversity and functioning of stream ecosystems focusing on two key ecosystem processes, namely leaf litter decomposition and primary production. We expected that streams with intermediate levels of eutrophication had higher rates of litter decomposition and primary production as well as higher taxonomic and functional diversity of periphytic algae, fungi and macroinvertebrates. The experiment was carried out in five streams of the Ave river basin (NW Portugal) along a gradient of eutrophication during 28 days (May 2013). Leaves of Castanea sativa Mill. were enclosed in coarse-mesh bags and immersed in the streams to allow microbial and invertebrate colonization and to follow leaf decomposition. Artificial substrates were attached to the mesh bags to allow algae colonization and to follow primary production. Rates of primary production and leaf litter decomposition peaked in streams with moderate eutrophication and decreased in oligotrophic and hypertrophic streams. Taxonomic and functional diversity of periphytic algae better explained primary productivity, while taxonomic diversity of fungi and macroinvertebrates explained well litter decomposition pattern.

SS2.5

Elosegi, Arturo[1]*; Aristi, Ibon*[1]*; Arroita, Maite*[1]*; Díez, Joserra*[1]*; Flores, Lorea*[1]*; González, José M.*[2]*; Ibisate, Askoa*[1]*; Larrañaga, Aitor*[1]*; Martínez, Miren*[1]*; Pereda, Olatz*[1]*; Solagaistua, Libe*[1]

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WATER ABSTRACTION AND THE FLUX OF CARBON IN RIVER ECOSYSTEMS: THE ABSTRACT PROJECT

Water abstraction is one of the most prevalent impacts on Iberian streams and rivers, but its consequences on ecosystem functioning are still poorly understood. The ABSTRACT project, funded by the Spanish Ministry for Economy and Competiveness, aims at measuring the impact of water abstraction produced by small diversion hydropower schemes. Much of the carbon flux along river ecosystems is either blocked in low dams or diverted from channels by hydropower and other water-diversion schemes such as irrigation canals. By-passed channels, on the other hand, are subject to strong reduction of discharge, what decreases the width and depth of the wetted channel, reduces water velocity, and increases the relative importance of parafluvial areas and hyporheic processes. Geomorphic impacts such as sediment starvation and channel incision are also common, and exert strong influence on stream habitats, communities, and functioning. Field and laboratory experiments performed so far point out at a strong effect of water diversion on stream ecosystem functioning per km of channel length. Nevertheless, biological activities at the diversion channels can be important and complicate the picture at the scale of the river network.

SS2.3

Estévez, Edurne*; Rodríguez-Castillo, Tamara; Álvarez-Cabria, Mario; Peñas, Francisco J.; González, Alexia M.; Silió-Calzada, Ana; Álvarez-Martínez, José M.; Lezcano, María; Barquín, José*

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A COMPARISON OF APPROACHES TO ESTIMATE STREAM METABOLISM IN NATURAL AND IMPAIRED MOUNTAIN STREAMS

Traditionally, river health monitoring has concentrated on the use of structural measurements (e.g. concentration of nutrients, benthic macroinvertebrates, periphyton biomass); however, defining the health state of an ecosystem should consider the mutual contribution of structural and functional ecosystem components. The stream metabolism (SM) is an integrative measurement of ecosystem functioning and its principal processes, respiration and primary production, largely depend on the rates of activity of all biotic components within the aquatic foodweb. Moreover, SM responds to factors that are commonly influenced by human impairments such as nutrient concentration, water turbidity, canopy cover or water temperature. Thus, SM could be used as a functional measurement of ecosystem health. There are two approaches to estimate SM: the open-channel method, in which whole stream metabolism is measured based on the diel changes in oxygen and the measurement of the metabolism of stream substrata in incubation chambers. Although incubation chambers estimate the metabolism of a specific component of the streambed (typically cobble-boulders) few relationships have been established between these measurements and whole-stream metabolism. This might be highly useful when the open-channel method cannot be utilized to estimate SM (e.g. small steep streams or highly shaded rivers).

In the present study we evaluated the effects that sewage outflows and nutrient runoff have on stream metabolism and biofilm biomass in 8 impaired and 5 control mountain streams. We also were interested in the comparison of results obtained by estimating SM following the two different approaches and how these SM estimates related to periphyton biomass on stream substrata. Distinct effects on stream metabolism were recorded depending on the types of impairments affecting each stream. In summary, a linear relationship was obtained between primary productivity and respiration. However, impaired reaches presented higher oxygen consumptions for the same oxygen productions and higher oxygen productions than the unimpaired ones. Additionally, the open-channel method was highly correlated with the SM estimates obtained from the incubation chambers and also to periphyton biomass. This suggests that incubation chambers could substitute the open-channel method for ecosystem health monitoring in case of difficulties in recording diel changes in water oxygen concentration in mountain streams.

BG.6

Feijoó, Claudia; *García, Victoria; Hegoburu, Cecilia; Giménez, Loreta; Gantes, Patricia*

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HIGH NUTRIENT RETENTION IN CHRONICALLY NUTRIENT-RICH PAMPEAN STREAMS

Nutrient retention was generally analyzed in streams with low nutrient concentrations or in impaired streams with high nutrient levels, but information about nutrient retention in chronically enriched streams is scarce. We measured nutrient (PO4 and NH4) retention in two enriched Pampean streams without nutrient point sources along the year. We also measured several variables that could influence nutrient uptake, including physico-chemical (pH, conductivity, dissolved oxygen and nutrient concentrations), hydrological (flow, size of the transient storage zone or As/A), and biological (biomass of the different basal compartments) variables. Metabolism was also estimated using the chamber method for the basal compartments (macrophytes, macroalgae, epiphyton, epipelon) and the open-channel one-station technique for the whole ecosystem metabolism.

We observed a high percentage of nutrient retention in both streams (63 and 49 % for PO4, and 87 and 84 % for NH4) despite their high dissolved phosphorus concentrations (0.11 and 0.15 mg P-PO4/l). Phosphorus retention was more variable along the year than ammonium retention, and showed no saturation within the range of the observed basal dissolved phosphorus concentrations. Nutrient retention was not associated to As/A and the biomass of aquatic macrophytes. Phosphorus retention was positively related to water temperature, the degree of heterotrophy of epiphyton and epipelon (measured by the autotrophic index), and the ecosystem respiration, while ammonium retention was related to water temperature, the degree of heterotrophy of epiphyton and seston, epiphyton biomass and the ecosystem P/R. In addition, nutrient uptake rates (U) of PO4 and NH4 were positively associated to each other, indicating an stoichiometric regulation of nutrient uptake. High nutrient retention in these streams may be influence by the activity of several functional compartments, but the heterotrophic processing may play a preponderant role in this process.

EF.6

Feio, Maria J.[1]*; Almeida, Salomé F.P.*[2]*; Aguiar, Francisca C.*[3]

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WHO NEEDS WHO AND WHERE? CONCEPTUALIZING AND TESTING FUNCTIONAL RELATIONS BETWEEN AQUATIC ELEMENTS.

Ecologists have tried to explain the ecological structure and function of lotic ecosystems through complex concepts such as the River Continuum Concept, the Serial Discontinuity Concept, the Flood Pulse Concept or the integrative Riverine Ecosystem Synthesis. Such models when viewed as the best approximations can be useful as a basis for testing theories and comprehend why concordance or incongruity emerge. Here we adapted such theories to build conceptual models focused on the potential functional interactions (such as feeding, refuge) between plants associated to the aquatic systems (from riparian trees to hydrophytes), diatoms and macroinvertebrates in five different river types covering a longitudinal gradient from headwaters to large river sections and from permanent Atlantic-humid to semi-arid temporary streams. In addition proportions of functional traits for each river section were hypothesized for diatoms (biovolume, life form), invertebrates (feeding-group, fixation), and macrophytes (relation with water). To test those predictions we used data from the three biological elements collected at 82 river sites in reference conditions, sampled in Spring. For each river type, classification analyses allowed the determination of the strongest associations (with more than 85% of Bray-Curtis similarity) between those elements. The associations found were different and characteristic for each river type. For example, in small mountain streams associations with woody species dominated, along with species with strong association with water; while in large river sections associations with riparian woody species loose importance and invertebrates are especially linked to macrophytes and diatoms. Bryophytes seem to have an important role as refuge for diatoms in certain river types (e.g. granitic mountain streams). On the other hand, invertebrates appear in almost all associations found in small streams in dense and humid woodlands with both diatoms and plants. While contributing to increase the knowledge on river ecosystems functionality this work is a basis for assessing the effect of anthropogenic disturbance in ecosystem functioning through interactions between key aquatic elements.

EF.20

Ferreira, Verónica[1]*; Castagneyrol, Bastien*[2]*; Koricheva, Julia*[3]*; Gulis, Vladislav*[4]*; Chauvet, Eric*[5]*; Graça, Manuel*[1]

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NUTRIENT ENRICHMENT AFFECTS LITTER DECOMPOSITION IN STREAMS: A META-ANALYSIS

The trophic state of many streams is likely to deteriorate in the future due to the continuing increase in human-induced nutrient availability. Here we present a meta-analysis of 99 studies published between 1970 and 2012 that reported the effects of nutrient enrichment on litter decomposition in running waters. When considering the entire database (840 cases), nutrient enrichment stimulated litter decomposition rate by ca. 50%. The stimulation was higher when the background nutrient concentrations were low and the magnitude of the nutrient enrichment was high, suggesting that oligotrophic streams are most vulnerable to nutrient enrichment. The magnitude of nutrient enrichment effect on litter decomposition was higher in the laboratory than in the field experiments, suggesting that laboratory experiments overestimate the effect. Among field experiments, effects of nutrient enrichment were smaller in the correlative than in the manipulative experiments since in the former the effects of nutrient enrichment on litter decomposition were likely confounded by other environmental factors. In field manipulative experiments, the effect of nutrient enrichment on litter decomposition depended on the scale at which the nutrients were added: stream reach › streamside channel › litter bag. This may have resulted from a more uniform and continuous exposure of microbes and detritivores to nutrient enrichment at the stream reach scale, while nutrient enrichment at the litter bag scale does not provide uniform controllable nutrient release at either temporal or spatial scales, suggesting that this approach should be abandoned. In field manipulative experiments, the addition of both nitrogen (N) and phosphorus (P) resulted in a stronger stimulation of litter decomposition than the addition of N or P alone, indicating that there might be nutrient co-limitation of decomposition in streams. The magnitude of the nutrient enrichment effect on litter decomposition was higher for wood than for leaves, and for low than for high quality leaves. The effect of nutrient enrichment on litter decomposition may also depend on climate. Although studies in temperate environments were overrepresented in our database (77%), this study reveals that the effect of nutrient enrichment might be strongest in cold oligotrophic streams that depend on low quality plant litter inputs.

RLWE.7

Fillol, Mireia[1]*; Villanueva, Laura*[2]*; Hopmans, Ellen C.*[2]*; Borrego, Carles*[3]*; Sinninghe, Jaap S.*[2]

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CHARACTERIZATION AND TEMPORAL CHANGES OF ARCHAEAL COMMUNITIES IN SEDIMENTS FROM TWO KARSTIC LAKES USING ISOPRENOID GDGT MEMBRANE LIPID AND GENE-BASED MOLECULAR ANALYSES

Stratified lakes are considered as important sources of archaeal diversity. We surveyed temporal changes of the archaeal community in sediments from two karstic lakes differing on their nutrient status and limnological dynamics. Lake Vilar is mesotrophic, oxic during winter mixing while Lake Cisó is eutrophic and permanently anoxic. In this study, we combined gene-based molecular and lipid analyses to identify uncultured groups of sedimentary archaea. Archaeal community diversity has been previously evaluated by pyrosequencing being Thermoplasmata the most abundant euryarchaeotal phylum in both lakes, while the uncultured Miscellaneous Crenarchaeotic Group (MCG) was the only representative of the Crenarchaeota.

Isoprenoid glycerol dialkyl glycerol tetraether (GDGT) lipids are found in membranes of most archaeal groups. Previous studies have pointed to uncultured crenarchaeota as important source of GDGT-0 (GDGT with no ring moieties) in stratified lakes, while Thermoplasmata has been characterized by GDGT-0 to 4. Here, we analyzed the concentration and distribution of GDGTs , archaeal and MCG 16S rRNA genes by qPCR (DNA, abundance, and RNA, transcriptional activity) in two sediment cores from Lake Vilar (0-18 cm depth) and in two sediment samples from Lake Cisó (0–3 cm depth) collected during autumn mixing (November) and stratification (March) periods.

In Lake Vilar, archaeal abundance based on GDGT and 16S rRNA gene quantification was higher in March, coinciding with higher abundance of MCG by 16S rRNA genes. On the contrary, RNA/DNA ratio was higher on November for both Archaea and MCG. GDGT-0 was predominant followed by GDGT-1 in both periods but dramatic differences on GDGT-1 relative abundances were observed in Lake Vilar, which seems counterintuitive with the permanent anoxic conditions found in the sediment. Lake Cisó did not show differences on the main GDGT composition, which may indicate more stable conditions in this system. Results obtained by the applied lipid-based characterization of archaeal communities complemented the abundance determination based on 16S rRNA gene quantification avoiding potential biases introduced by the PCR-based method. In addition, it has shed further light on the GDGT found in uncultured Crenarchaeota supporting the presence of GDGT-0 in MCG archaeal membranes.

AMWQ.6

Flor-Arnau, Núria[1]*; Real, Montserrat*[2]*; González, Gloria*[2]*; Cambra, Jaume*[3]*; Moreno, Jose L.*[4]*; Solà, Carolina*[5]*; Munné, Toni*[5]

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THE FLUVIAL MACROPHYTE INDEX (IMF), A NEW TOOL TO ASSESS THE ECOLOGICAL STATUS OF MEDITERRANEAN RIVERS

The implementation of the Water Framework Directive (WFD) requires that the establishment of the ecological status of water bodies is made by the assessment of biological quality elements, including the aquatic flora. According to the Directive, benthic diatoms and macrophytes are used in the case of rivers. The latter group includes vegetal organisms like angiosperms, bryophytes and algae that are visible to the naked eye.

Due to the lack of a suitable index for the macrophyte species and physicochemical characteristics of the rivers placed in the Mediterranean region, and in order to satisfy regulatory requirements derived from the WFD, the new Fluvial Macrophyte Index (IMF) has been designed. This index considers both the composition and abundance of the macrophyte species of the Mediterranean region in the Iberian Peninsula. The collected samples from 298 sites have been identified and the IMF includes the tolerance values and the coefficients of eury-stenoecie for 124 different taxa (50 angiosperms, 31 algae, 30 mosses, 8 liverworts and 5 pteridophytes). The IMF score is obtained from the Zelinka and Marvan (1961) formula and the value is then assigned to the correspondent quality class determined by the WFD. This assignment is based on the fluvial group to whom the sampling site corresponds. Each group includes several Mediterranean river types based on their similarity of macrophyte inventories and for each of them the reference values and thresholds between quality classes have been calculated.

The IMF has been correlated with other macrophyte indices, as well as with hydromorphological indices and physicochemical variables. Most of the correlations are significant and the obtained coefficients are high. In addition, the IMF is able to statistically discriminate reference sites from perturbed sites in most of the fluvial groups. Moreover, if the indices contained in the Water Planning Instruction (Ministerial Order ARM/2656/2008, 10 September) are applied, the IMF shows a high discrimination efficiency between sites that fit with the environmental objectives of the WFD and those that do not. Therefore, the IMF is an effective ecological tool to assess the ecological status of Mediterranean rivers.

AMWQ.10

Formigo, Nuno*; Flávio, Hugo*

FCUP

TAXONOMIC STANDARDIZATION OF THE BENTHIC MACRO-INVERTEBRATE MAIN SOURCES USED FOR THE CALCULATION OF THE PORTUGUESE OFFICIAL WATER QUALITY INDEXES

As required by the Water Framework Directive (WFD), Portugal has prepared a set of official protocols for the sampling, processing and calculation of the water quality value based on the different biological indicators.

One of the components of the official quality index for macroinvertebrates (IPTIN and IPTIS) is the biotic index IBMWP. When calculating this index we noticed that there is more than one version of this index circulating in the scientific community, leading to differences in the water quality values obtained for water bodies. Faced with the necessity of choosing one of the existing versions, we decided to choose the table that was published in GUADALMED Protocol, since the author of the IBMWP index, Alba-Torcedor, was one of the researchers of that project. Then, the chosen version was compared with the list of macroinvertebrate species published by the Portuguese Water Authority (APA). When we made this comparison, we found that there were several taxonomic discrepancies between the two (actually, there were taxonomic discrepancies with either version of the IBMWP calculation table). Since these discrepancies could lead to significant differences in the values obtained for the water quality of a given water body, the next step was to propose a revised version of the Portuguese official list, which is the one presented in this communication.

Departing from the chosen version of the IBMWP table, the revision was based in the main bibliographic references accepted in this area, namely the work by Tachet, 2010; an online identification key hosted by a Portuguese university; a book edited by a group of researchers from the same university; and the data set corresponding to the macroinvertebrates identified during the sampling campaigns (400 sampling points in the all country) that took place in the years 2003-2004, under the process of implementing the WFD in Portugal.

A revised identification key for the Portuguese families of macroinvertebrates is being prepared, which will be in accordance with the revised official list of macroinvertebrates for Portugal.

EF.5

Freixa, Anna[1]*; Rubol, Simonetta*[2]*; Carles-Brangarí, Albert*[3]*; Fernàndez-Garcia, Daniel*[3]*; Sanchez-Vila, Xavier*[3]*; Butturini, Andrea*[4]*; Romaní, Anna M.*[1]

[1]*Institute of Aquatic Ecology, University of Girona;* [2]*Dept. of Mechanic, Civil and Environmental Engineering, University of Trento;* [3]*Hydrogeology Group, Dept. Geotechnical Engineering and Geosciences, UPC;* [4]*Department of Ecology, University of Barcelona*

SEDIMENT DEPTH ZONATION OF MICROBIAL ORGANIC MATTER USE

Water flowing through the hyporheic river sediments or in artificial recharge procedures promotes the development of a microbial community in depth. In this study, we investigated how microbial organic matter use changed in sediment depth and how physical and chemical conditions interact with microbial metabolism. To this purpose, an 83 day-long mesocosm infiltration experiment, consisting of 1m depth sediment tank, was conducted. Microbial functioning (extracellular enzyme activities and carbon substrate utilization profiles) and physical and chemical parameters were analysed with depth in a sediment profile. Indications were found that microbial activity and physicochemical parameters varied dynamically in space and time. In particular, surface sediment layers were colonized by microbes capable to use a wider range of substrates with preference to degrade carbon polymeric compounds as shown by higher βglucosidase activity and higher capacity to use polymers and carbohydrates. In contrast, at 50 cm depth, the microbial community become specialized in time decreasing its functional diversity and showing a preference to decompose peptides (higher leucine-aminopeptidase activity) and to use compounds with nitrogen in their chemical structure (as amino acids and carboxyl acids). Moreover, after 83 days of experiment, the sediment showed a clear reduction of oxygen in depth up to anoxia at the bottom of the column. The oxygen gradient produced a shift in the microbial community functional fingerprint also suggesting changes in community composition. Variations in nitrate and ammonium in depth also suggest denitrification processes occurring at the end of the experiment. The results indicated that the microbial community was developed throughout the whole column depth and was adapted to use the available organic matter sources as well as to the oxygen gradient conditions. We concluded that the physical and chemical changes in sediment interact with the microbial development and metabolism producing heterogeneous biogeochemical processes occurring at different sediment depth profile.

IS.1

Gallardo Armas, Belinda

Department of Integrative Ecology, Spanish National Research Council

MODELLING THE POTENTIAL DISTRIBUTION OF AQUATIC INVASIVE SPECIES: CHALLENGES, OPPORTUNITIES AND WAYS FORWARD

Species Distribution Models (SDMs) allows investigating spatial patterns of species occurrence and are thus increasingly used to address questions in conservation biology, ecology and evolution. SDMs have gained popularity in the last years because of the development of software to calibrate models and the increased availability of information on species global occurrences through global repositories such as GBIF.
In this talk, three case studies focusing on important aquatic invasive species, such as the zebra mussel (Dreissena polymorpha), the signal crayfish (Pascifastacus leniusculus) and the killer shrimp (Dikerogammarus villosus) will illustrate how SDMs can: (i) test hypotheses relating niche dynamics in space and time, (ii) anticipate future changes in the species' geographical range with climate change, and (iii) provide a basis for invasive species prevention and management.
The bottom line of this presentation is that, SDMs provide a powerful tool for prioritizing species and areas at highest risk of invasion that is worth developing further.

RLWE.3

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THE NEED TO INCORPORATE THE NATURAL VARIABILITY OF SALINITY REGIME TO UNDERSTAND THE ECOLOGICAL FUNCTIONING OF THE ESTUARY

Salinity is one of the most important variables to explain the distribution of species within estuaries, considering both average conditions and extreme events. Nevertheless, the existing schemes of zonation are only based on average values due to the lack of spatial and temporal high resolution long-term data required to characterize extremes. As consequence, the natural variability of salinity has been frequently underestimated in ecological studies despite its ability to alter the ecosystem functioning. Nowadays, numerical models emerge as a powerful tool to deal with the characterization of the estuarine regime and thus, the identification of ecologically significant salinity zones. In order to tackle this complex task, two steps methodological approach was developed. i) The first step was the reconstruction of long salinity time series (15 years) through the selection of a subset of representative cases of river flow and astronomical tidal level from historical data. A reconstruction by analogs was carried out based on a database with the salinity results of the 361 simulations belonging to all possible combinations of both subsets of representative cases as boundary conditions. The numerical validation of the reconstructed series confirms the ability of the developed methodology for such purpose. ii) The second step was the identification of different salinity types using eight descriptors of salinity regime (median, range and intensity, duration and frequency of extreme events, flooding and drought) and applying two clustering techniques (Self Organizing Maps and k-means). As a result of this process five salinity types representative of the estuarine variability and ecology were obtained. This methodology was applied in an estuary located in the northern Spain. All typologies were related to the distribution of benthic fauna and flora along the estuarine gradient from the river to the open sea. A high level of variability was associated to lower richness values comparing to more stable zones, especially those with high salinity.

AE.1

García, Andrea[1]*; Amouroux, David*[2]*; Dominik, Janus*[1]

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THE FATE OF MERCURY EMITTED BY A CHLOR-ALKALI PLANT: FROM THE INDUSTRY TO THE HUMAN HAIR

The Chlor-alkali plants are one of the most important point sources of mercury to aquatic environment. The problem of Hg contamination has been studied in a region, Rm Valcea (Romania), impacted by the wastewater discharge of a chlor-alkali plant. The purpose of this study was to evaluate the current status of mercury pollution in the Babeni reservoir (Olt River) and the exposure of local population via fish consumption to mercury originating from the chlor-alkali plant. We examined mercury (Hg) biogeochemistry and biomagnification in the Babeni Reservoir. Total mercury (THg) concentrations, in the river water directly receiving the wastewater discharge of the chlor-alkali plant, reached 88 ng L-1 but decreased rapidly in the reservoir (to 9 ng L-1). In contrast, monomethylmercury (MMHg) concentrations increased from the upstream part of the reservoir to the central part (0.7 ng L-1), suggesting high methylation within the reservoir. Moreover, vertical water column profiles of THg and MMHg indicated that Hg methylation mainly occurred deep in the water column and at the sediment-water interface. MMHg concentrations and bioconcentration factors (BCF) of plankton and macrophytes revealed that the highest biomagnification of MMHg takes place in primary producers. MMHg concentrations in fish were well above the World Health Organisation guidelines for fish consumption and caused the highest MMHg concentrations ever found in non-piscivorous fish worldwide. Local population consuming fish from the Babeni reservoir had THg concentrations in hair significantly higher than those consuming fish from upstream reservoirs and/or from the shops and reached a median value of 2.5 mg/kg (IQR=3.6). Therefore, the remnant pollution in the fish of this reservoir, and probably many other lakes and reservoirs receiving Hg polluted wastewater, represents a considerable health risk for the local fish consumers.

SS3.3

García, Jara[1]*; Rojo, Carmen*[1]*; Piñón, María A.*[2]*; Armengol, Xavier*[1]

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ZOOPLANKTON IN MEDITERRANEAN RESERVOIRS IN ACCORDANCE TO DIVERSITY-PRODUCTION PARADIGM

How zooplankton diversity responds to geographical, physical, chemical and biological features in Mediterranean reservoirs? Do zooplankton assemblages follow the diversity-producction paradigm in these artificial ecosystems? To answer these questions we have studied zooplankton in 20 reservoirs from several Mediterranean hydrological basins (all belonging to Confederación Hidrográfica del Júcar). The reservoirs were studied between 2006 and 2009, in two different seasons (summer and winter). Samples were taken with a 2-liters Ruttner bottle at the deepest zone of the reservoir, close to the dam. Three depths covering the oxygenated water column were integrated in a unique sample. We counted the zooplankton (microcrustaceans and rotifers) to species level, we obtained their densities and we estimated their biomass; with both data, indices of dominance, Shannon-Winer, Simpson, Margalef, specific richness and eveness were calculated. We also analyzed the relationship of diversity indicators with a set of environmental variables used to characterize the reservoirs: altitude, surface, depth, temperature, conductivity, turbidity, Secchi disc depth, pH, dissolved O2; nutrient concentrations (NO3, NH4, total-Nitrogen, PO4, total-Phosphorous) and primary producers (chlorophyll a and phytoplankton biomass). Accumulated richness by reservoir, ranged between 42-39 in Tous, Escalona and Loriguilla, oligotrophic reservoirs; and between 27-25 in Beniarrés and Tibi, both hypereutrophic. In general terms specific richness and diversity were higher in summer than in winter and were also higher for rotifers than for microcrustaceans. Specific richness and Margalef index were the most sensitive diversity indicators to changes in environmental variables; particularly to those factors related with eutrophication as microalgae biomass, chlorophyll a, phosphorous and nitrogen concentrations.

SS3.1

García, Juan C.[1]*; Valero, Fernando*[1]*; Rodíguez, José J.*[1]*; Comerma, Marta*[2]*; Ordóñez, Jaime*[2]*; Gallego, Angeles M.*[2]*; Marcé, Rafael*[3]

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50 YEARS MONITORING SAU RESERVOIR, OR HOW THE INTERACTION BETWEEN WATER RESOURCE MANAGEMENT AND SCIENCE IMPROVES EACH OTHER

Sau Reservoir (NE Spain), the first of the three in series reservoirs of Ter river, was first filled in 1963 to allow a variety of activities: flood control, drinking water supply, hydroelectric power generation, agricultural irrigation and recreational activities. From 1964 successive entities responsible for water supply such as "Confederación Hidrográfica del Pirineo Oriental", "Junta d'Aigües de la Generalitat de Catalunya", "Ens d'Abastament Aigües Ter Llobregat" and now "ATLL Concesionaria de la Generalitat de Catalunya", have conducted a monitoring program to assess water quality changes in the reservoir and to improve water quality.

Under the direction of Antoni Vidal first, and Joan Armengol afterwards, the monitoring program identified the increasing process of eutrophication of the reservoir. The monitoring program has provided important knowledge to be applied on decision tools to handle different critical situations (drought periods, algal blooms, etc.) in order to assure the best quality possible of raw water for different uses including mainly drinking water production. At present, the Agència Catalana de l'Aigua, through ATLL Concesionaria de la Generalitat de Catalunya, continues the monitoring program, becoming one of the most prominent high-quality long-term records available from lakes and reservoirs worldwide.

Throughout 50 years, Sau Reservoir has proven to be an excellent framework for ecological studies, particularly with the collaboration of Prof. Dr. Joan Armengol, (University of Barcelona). Studies conducted in Sau Reservoir includes spatial heterogeneity of primary production and bacterial activity, empirical studies of eutrophication processes, sediment diagenesis, physical modeling, ecological consequences of damming rivers, fish assemblages, physical-biological couplings, effects of antibiotic pollution on planktonic communities, global change effects on water quality, and more.

However, the work carried out in the Ter Reservoir system is even more important as a paradigmatic example on how fundamental and applied sciences benefits each other, impacting at the same time the way managers and users understand water as a resource, and reservoirs as living systems prone to provide a myriad of ecosystem services. This conference should be a travel along the ecological history of Sau Reservoir within the context of research and water resource management.

SS1.1

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BASES TO INCLUDE ZOOPLANKTON IN THE ECOLOGICAL QUALITY ASSESSMENT OF RESERVOIRS: THE CASE OF ZOOPLANKTON IN SPANISH MEDITERRANEAN RESERVOIRS

The implementation of the EU Water Framework Directive does not include zooplankton as a biological quality element (BQE) despite it is largely know as an important and integrated component of the pelagic systems. Recent works are illustrating the scientific bases to claim for their inclusion. It is in this way, and because we dispose of an extent information on zooplankton in reservoirs across a wide trophic gradient, that we try to demonstrate its close relationship with quality of water in reservoirs and then its indicator value.

Zooplankton was studied in 20 reservoirs from several Mediterranean hydrological basins (Confederación Hidrográfica del Júcar). The study included two seasons (summer and winter) along three hydrological years (2006-2009). We obtained density and biomass of zooplankton populations and we analyzed limnological variables: age of the system, morphology (area, depth,...), environmental conditions (temperature, conductivity, turbidity, Secchi disc depth, pH, dissolved O2), resource's concentration (NO3, NH4, total-Nitrogen, PO4, total-Phosphorous) and pelagic primary producers (chlorophyll a concentration and phytoplankton biomass). Different zooplankton metrics were calculated. We conducted an ordination analysis based on the Jaccard similarity index and subsequent ANOSIM to study the reservoirs grouping based on zooplankton composition. Statistical relationship between zooplankton and environmental variables was analyzed by redundancy analysis and multiple correlations.

According to our results zooplankton composition and abundance are mainly related to variables associated to aquatic trophic state (light penetration, total phosphorous and primary producers concentrations). The clusters of reservoirs, obtained using zooplankton composition, are mostly related to their trophic status, separating to a greater degree the more eutrophic systems; thus, they can be considered as a good bioindicators for these features. Nevertheless, the likely co-variation and overlapping with different variables and the cost of obtaining the zooplankton metrics is an issue to consider in order to find the most useful metrics at the regional level through Europe. We have demonstrate that zooplankton respond to changes in the environmental conditions, and as other BQEs is a good indicator and should be considered in order to evaluate the ecological status of reservoirs.

EH.6

García-Rodriguez, Ezequiel*; Calvillo-Garcia, Ulises; Rodriguez-Castro, J. Alberto; Ochoa-Franco, Luis*

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A PROPOSAL FOR THE MODIFICATION OF THE "EL INFIERNILLO" DAM DISCHARGES REGIME, LOCATED IN THE CENTRAL-WEST REGION OF MEXICO, CONSIDERING ECOLOGICAL FLOWS.

This work proposes a discharges regime modification for the Infiernillo dam, located at the low area of the Balsas river basin, within the 18th Mexican Hydrological region, including the ecological conservation usage altogether with the other usages of water.

The Hydrological region number 18 Balsas, is located at the South-West region of Mexico, encompassing a hydrological surface of 117,405 square Kilometers, which equals a 6% of the national territory, including different parts from nine States and from Mexico City. It is limited by the Sierra Madre del Sur and Sierra de Juarez, as well as by the Trans-Mexican Volcanic Belt. It is an elongated depression with narrow valleys, where most of the territory is formed by high reaches with steep slopes. This is a difficult geological arrangement for controlling and saving the run-off from an average annual precipitation of 900 millimeters.

In the Balsas Hydrological Region it is used a total of 47,332.70 million cubic meters of water by year, where 45,477.84 million refer to surface water (i.e. 96.1%) and the remaining 1,885.86 million refer to underground water.

The main user of the surface water in the Balsas hydrological Region is the Electricity Federal Agency (CFE), who uses 80.99% of the water through hydroelectric power stations. One of these power stations was built in The Infiernillo dam, with a power of 920 Megawatts. This dam is located in the lower area of the Balsas River Basin, generating a 400 square kilometers for the reservoir, with a saving capacity of 12,000 million cubic meters.

Operational politics for The Infiernillo dam reservoir includes energy generation and flows control, but it does not consider ecological conservation discharges (i.e. environmental flows). This is why this work proposes a discharges regime modification to include an environmental flows regime, through a methodology based on historical flows (Mexican Norm NMX-AA-159-SCFI-2012), where the system operation is optimized through a reservoir zoning therefore its operation curve, penalizing deviations. The optimization problem consists in minimizing penalties during the water accumulation phase and using the genetic algorithm NSGA II (Non-dominated Sorting Genetic Algorithm II) to find the optimal proposal.

SS1.5

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ENVIRONMENTAL FORCING OF CRUSTACEAN ZOOPLANKTON IN A MEDITERRANEAN RESERVOIR (RIVER DOURO WATERSHED, NORTH-WESTERN IBERIA): EFFECTS ON SPECIES ABUNDANCE AND VARIABILITY

A 8-yr record of monthly observations (2000-2002 and 2007-2011) in Azibo Reservoir were used (1) to describe crustacean zooplankton interannual and seasonal variability; (2) to understand the environmental forcing underlying zooplankton dynamics. This reservoir was chosen because unlike the majority of existing reservoirs, water level fluctuations are not very pronounced, never exceeding 3m. Furthermore, the introduction of pike (Esox lucius L.) in the 1990's led to a marked reduction of cyprinid fish abundance. Consequently, fish predatory pressure is regarded to be too low to drive zooplankton community. Without the interference of internal disturbances generated by extreme anthropogenic water level fluctuations and by fish predation on the zooplankton, this reservoir provides a good environment for studying the reservoir general limnology, filling the lack of long term data on this kind of aquatic ecosystems. ANCOVA and Pearson correlation analyses indicated that total phosphorus, Secchi depth, conductivity and pH, as well as, cyanobacteria and diatoms abundance were significantly related to precipitation. A seasonal cycle in zooplankton composition common to all the years sampled was identified. This pattern consisted of a marked separation between a winter and a summer assemblage (ANOSIM: R=0.841; p=0.01). The winter zooplankton assemblage was characterized by a higher abundance of Daphnia longispina/pulex. By contrast, in summer and autumn Ceriodaphnia pulchella, Diaphanosoma brachyurum and the copepod C. numidicus were dominant. BIOENV analysis identified temperature, conductivity, Secchi depth, diatoms and cyanobacteria abundance as the environmental variables most highly forcing seasonal zooplankton composition and species abundance. Results also provided evidence of interannual variability in the timing of zooplankton succession. In fact, the timing of appearance and/or annual peak densities varied among years. These data on crustacean zooplankton assemblage will certainly to provide a baseline against which future changes on this reservoir can be measured, allowing the evaluation and the prediction of the impacts of land use modifications and of climate change on ecosystem integrity. Furthermore, the obtained information can also be extrapolated to other Mediterranean reservoirs.

MSF.4

Gómez, Aina G.; *Velarde, Victor; Ondiviela, Bárbara; Juanes, José A.*

Environmental Hydraulics Institute "IH Cantabria", University of Cantabria

A GIS TOOLBOX FOR ASSESSING THE IMPACT OF DIFFUSE CONTAMINANT SOURCES IN ESTUARIES (DIA)

In this contribution, a methodology to assess the impact of diffuse contaminant sources using Geographical Information System (GIS) techniques is presented. Traditionally, environmental risk assessment on aquatic systems has been mainly focused on point contaminant sources. Numerical models have allowed interpreting, simulating and predicting responses of aquatic systems to these contaminant sources. Nevertheless, diffuse contaminant sources usually present a lack of information, making the use of numerical models an arduous, and sometimes impossible, task. To overcome these inconvenients, several authors have implemented the response-distance method, which considers an exposure directly proportional to the distance between the agent and the receptor. Radial proximity, assuming linear agent dispersion, has been widely used, ignoring environmental and agents' characteristics.

The developed methodology assesses the impact of a diffuse contaminant sources in four stages: i) identifying the activity liable to produce a diffuse contaminant source; ii) calculating an area around the activity, using a buffer tool and having into account agents' characteristics (nature, density, magnitude); ii) obtaining the affected area, using a conservative particle tool and computing the dispersion of virtual particles at given environmental hydrodynamic currents; iii) assessing the impact, using interpolation tools and classifying it into four categories (low, moderate, high, very high). To automate and simplify the process to obtain immediate and homogeneous results without miscalculation errors, a user-friendly toolbox (DIA, Diffuse Impact Assessment toolbox) has been developed in ArcGIS (9.3.1), using Python and ArcGIS scripting library to build a non-ambiguous geoprocessing workflow. The toolbox has been extensively tested by applying it to different locations. The results obtained at three estuaries: Bay of Santander (N Spain), Bay of Cadiz and Ria de Huelva (SW Spain) are presented.

We can conclude that the methodology to assess the impact of diffuse contaminant sources constitutes an advanced, precise and detailed procedure, being suitable for the management of this type of activities at any aquatic system. The use of GIS techniques allows to consider aspects from agent and environmental characteristics. Results provide spatial variation of impacts, essential data for a cost-benefit management.

SS2.9

Gómez, Lluís[1]; *Obrador, Biel*[1]; *von Schiller, Daniel*[2]; *Marcé, Rafael*[2]; *Casas, Joan P.*[2]; *Acuña, Vicenç*[2]; *Muñoz, Isabel*[1]; *Koschorreck, Matthias*[3]

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SPATIAL VARIABILITY OF CARBON EMISSIONS ALONG A MEDITERRANEAN RIVER NETWORK DURING SUMMER DROUGHT

During summer drought, Mediterranean river networks turn into a fragmented heterogeneous landscape conformed by different environments (i.e. running and stagnant waters combined with isolated water pools and exposed dry river beds). This hydrological setting results in the development of biogeochemically active areas that can potentially increase the rates of carbon emissions from the river network to the atmosphere. Here we aimed to quantify carbon emissions and to identify emission hotspots from a typical Mediterranean river during the summer drought period. Using chamber methods, we measured carbon dioxide (CO2) and methane (CH4) fluxes to the atmosphere in a selection of the different environments found along the Fluvià River (Catalonia, NE Spain). We identified dry river beds as hotspots of CO2 efflux (mean ± SD = 209.1 ± 17.0 mmol m-2 d-1) and stagnant waters as hotspots of CH4 efflux (13.9 ± 22.6 mmol m-2 d-1). We showed that while the diffusive CO2 and CH4 efflux is physically limited, the ebullitive CH4 efflux (bubbling), only detected in stagnant waters but accounting for more than 80% of the total CH4 efflux, is limited by the biological activity in the sediments. Using a heuristic approach, we showed that an increase of the surface area of temporally dry environments would result in an increase of the total CO2 emitted. Likewise, the transformation of running waters into stagnant waters (i.e. lentification) would increment the total CH4 emissions from the river network. We conclude that carbon emissions from dry river beds and small lentic environments should be explicitly considered an integral part of Mediterranean river networks, especially under predicted global change scenarios which are expected to increase the spatial and temporal extent of these environments.

FW.4

Gonçalves, Ana M. M.[1]; *Marques, João C.*[2]; *Gonçalves, Fernando*[3]

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ARE FATTY ACIDS PROFILES INDICATORS OF SPECIES STATUS IN AQUATIC FOOD WEBS?

Fatty acids (FA) are important indicators of food web dynamics, allowing the identification of the organisms' physiological status, particularly given their role on the growth and reproduction of consumers. Of particular interest in food web studies are the polyunsaturated fatty acids (PUFAs), as for the most part these must be first synthesized by primary producers and then consumed and incorporated into the tissues of grazers and secondary consumers. The so called essential fatty acids (EFAs) cannot be produced de novo, or at least not in sufficient amount by primary consumers, they constitute useful trophic markers, being used as indicators of specific food sources. Furthermore, lipids components are very sensitive to stressors and environmental changes, leading to an overall decrease in highly unsaturated fatty acids (HUFA) production in aquatic ecosystems with possible negative implications for the surrounding terrestrial communities. Therefore, variation in FA content at the base of aquatic food webs significantly influences the production of economically important species. Thus, the main aim of this work is to review the information stated in fatty acid profiles of aquatic species exposed to environmental and anthropogenic stressors and unravel dietary preferences according to feeding plasticity and food availability.

RLWE.8

***Gonçalves, Vítor**; Vilaverde, Joana; Pereira, Cátia L.; Marques, Helena S.; Raposeiro, Pedro M.*

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PHYTOPLANKTON IN OCEANIC ISLANDS LAKES': THE ROLE OF DIFFERENT SCALE FACTORS ON THE COMPOSITION AND STRUTURE OF PHYTOPLANKTON COMMUNITIES

Biodiversity on islands, especially on remote oceanic islands, is affected by is several environmental constrains that modulate the composition of local communities and ecosystem functioning. Located in the middle of the Atlantic Ocean, the Azores archipelago is very rich in freshwater ecosystems, which can be considered as hotspots of diversity.

We aim to characterize phytoplankton diversity and distribution in different lake types from several Azorean islands. The objective was to define the main key factors that influence the phytoplankton community composition in this particular vulnerable region, for which geographical, regional and local factors have been demonstrated to play a significant role.
A total of 247 species of phytoplankton were found in the 23 studied lakes. The major environmental drivers of phytoplankton communities were altitude, longitude and lakes' trophic state. These environmental drivers determine the occurrence of two main types of communities very different from each other (ANOSIM R=0.829; p<0.001). The shallow lakes at medium-high elevation, with low conductivity and alkalinity, neutral to slightly acidic, and oligo-mesotrophic are characterized by low phytoplankton biomass dominated by desmids, other small chlorophytes, dinoflagellates and chrysophytes. By contrast, deep lakes found at low altitudes, with moderate conductivity and alkalinity, mesotrophic to eutrophic, present high phytoplankton biomass with low diverse communities dominated by cyanobacteria and diatoms.

Though different phytoplankton communities among lakes were partly due to local variables such as lake morphometry and trophy, assemblages were mostly linked to regional (e.g. altitude) geographical variables (e.g. longitude). The geographical isolation of the islands seems to contribute significantly to the occurrence of different phytoplankton species composition between islands. Our findings reinforce the importance of geographical and regional factors in shaping insular freshwater communities. Furthermore, These results give essential information that allows us to predict the response of different phytoplankton species to different scale factors across the archipelago's lakes contributing providing the basis for the development of tools for the implementation of the Water Frame Directive.

RLWE.10

***González, Alexia M.**; Rodríguez-Castillo, Tamara; Estévez, Edurne; Álvarez-Cabria, Mario; Peñas, Francisco J.; Silió-Calzada, Ana; Álvarez-Martínez, José M.; Lezcano, María; Barquín, José*

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SPATIAL CORRELATION ANALYSIS OF RIVERINE CHARACTERISTICS THROUGH SPATIAL STATISTICAL NETWORK MODELS

Accurate information about aquatic ecosystems is essential for their conservation and management. Large databases now exist in many areas where measurement locations occur closer in space. Most spatial statistical techniques applied to data measured on river networks were developed for terrestrial systems and are not optimized for streams. In these cases, the independence among observations may be violated because river networks are hierarchically structured, with nested watersheds, and stream segments connected by flow. Moreover, euclidean distance fails to represent the spatial configuration, connectivity, directionality and relative position of sites in a stream network. For all these reasons, spatial analysis of riverine characteristics and modeling stream data should accommodate spatial autocorrelation.

The purpose of this study is to explore and quantify patterns of spatial correlation in morphological, water quality and biological response variables. We will use recently developed spatial statistical methods based on covariance structures to analyse and model riverine characteristics. The study area is located in several catchments of the north of Spain with different degrees of human impact. These models are a generalization of linear statistical models but allow the assumption of independence and allow spatial autocorrelation in the residuals. They use hydrologic distance, incorporate flow direction and allow covariance weighting when segments converge. We apply different covariance models based on moving average constructions that take into account flow-connected and flow-unconnected sites. It produces a flexible covariance structure which accounts for several types of spatial relationships. To visualize the spatial patterns in stream data we used Torgegrams which display semivariance as a function of hydrologic distance separately for flow-connected and flow-unconnected relationships. Our preliminary results show how the ranges and patterns of spatial correlation differ between different riverine characteristics and manifest that distances based on hydrologic connectivity should be considered for spatial modelling of riverine characteristics.

AER.1

***González del Tánago, Marta**[1]; García de Jalón, Diego[1]; Martínez, Vanesa[1]; Gurnell, Angela[2]; Rinaldi, Massimo[3]*

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HYDROMORPHOLOGICAL PROCESSES AND INDICATORS FOR RIVER CHARACTERIZATION AND RESTORATION

A multi-scale framework for characterizing hydro morphology (HYMO) in European rivers has been developed within the REFORM Project. Key controlling factors at each spatial scale have been identified together with relevant indicators to assess present and past conditions. This multi-scale, process-based approach seems to be crucial in understanding trajectories and controls of river changes. It also represents an essential help in the design of future scenarios and consequent restoration activities.
Examples of river characterization and temporal changes from the Upper Esla River are presented in which main HYMO processes and best indicators involved are described.

RLWE.12

Graça, Manuel[1]*; Ferreira, Wander*[2]*; Firmiano, Kele*[2]*; França, Juliana*[2]*; Callisto, Marcos*[3]

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MACROINVERTEBRATE IDENTITY, NOT DIVERSITY, IS AFFECTED BY SUBSTRATE PARTICLE SIZE IN SELECTED LOW ORDER TROPICAL STREAMS

Some human activities in land may cause siltation of flowing waters. Here we relate invertebrate community structure in tropical headwaters streams with substrate grain size. Macroinvertebrate abundance (20 - 26 individuals) and richness (7 -9 taxa / surber sample) did not differ (p › 0.377) among natural sandy and stony dominant substrates and leaf packs patches in eight headwaters in an Atlantic Forest (MG, Brazil). In stream substrate size manipulation resulted in similar number of taxa (14) and abundance (194; p › 0.369). However, in both cases, the number of invertebrates in sampled patched was positively correlated with the current velocity (r2 › 0.526, p ‹ 0.008; n= 24) and samples from the sandy substrates differed from the others (MDS, ANOSIM; global R= 0.278; p = 0.002) as a results of different taxa colonizing different substrate types. Additionally, in a larger river, with larger parches of sandy substrate (~50% of river area) we again found the same pattern of no difference in number of individuals and taxa (p › 0.700) between patches, but differences in taxa composition (MDS; ANOSIM, global R = 0.322; p= 0.008). Low invertebrate productivity in the studies streams and high diversity could be the reason for these results. However, the results unequivocally imply that siltation results in changes in aquatic macroinvertebrates.

IS.6

Andy Green[1]*; Lejeusne, Christophe*[1]*; Muñoz, Joaquin*[1]*; Frisch, Dagmar*[2]*; Sánchez, Javier*[1]

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COMPARING GENETIC DIVERSITY AND STRUCTURE IN ARTEMIA FRANCISCANA IN ITS NATIVE AND INTRODUCED RANGE.

Artemia franciscana (Branchiopoda: Anostraca) is a highly invasive brine shrimp species that has spread into the Mediterranean region and other parts of the world through its use as fish food in aquaculture. We present novel information on the genetic diversity of this species in its native North America, particularly in Saskatchewan province in Canada where the species is widespread in especially natural conditions, in endorreic hypersaline lakes in the prairies with relatively undeveloped catchment areas. Using a combination of seven microsatellites and mitochondrial DNA (COI sequences), we describe the population structure between 20 different lakes sampled in 2011. We show a high level of structure at this detailed geographical scale, despite the fact that this crustacean species is readily dispersed by migratory waterbirds in the region, as confirmed by the presence of viable resting eggs in the faeces of American Avocets Recurvirostra americana. We test for isolation by distance between the Saskatchewan lakes, and consider whether the genetic differences between lakes is related to the strongly divergent water chemistry in the region, which derives from the relatively recent glaciations in that region. This represents the first study to date of any brine shrimp species (and one of the first for any Anostracan) that uses both nuclear and mitochondrial markers to study a set of natural populations. We compare and contrast these results with similar studies conducted on Artemia franciscana in different salt ponds complexes (salinas) in its invasive range in the Iberian Peninsula, which was carried out over a similar geographical scale. The genetic variation between sites is much greater in the Canadian lakes than in the Iberian salt ponds, whose populations probably originated from only two sites in the USA. Nevertheless, in both areas there is strong evidence for local adaptation, monopolization effects, and for a role for migratory birds as major vectors in generating the patterns observed.

SS5.3

Guillén, Antonio*; Blanco, Andrés; Carjiguero, Laura; González, Ismael; Cortina, Ana*

Estación Biológica Internacional Duero-Douro, Buque Oceanográfico Helios Sanabria

ESTADO ACTUAL DEL LAGO DE SANABRIA Y POSIBILIDADES DE RECUPERACIÓN

La reciente ruptura del equilibrio ecológico en las aguas del Lago de Sanabria está desencadenando una serie de alteraciones secuenciadas que empezaron a detectarse desde la E.B.I. en el año 2012, año en el que la composición cuantitativa y cualitativa del fitoplancton experimentó un cambio sin precedentes conocidos en este ecosistema lacustre. Este cambio sustancial, marcado por la dominancia de la diatomea Tabellaria fenestrata, que en estos momentos representa cerca del 90% del biovolumen total, indica el progresivo avance de un proceso de eutrofización. El bloom de T. fenestrata aparece acompañado de una gradual alteración en los valores de otros parámetros biológicos, físico-químicos y está dejando su huella en el registro sedimentario.

El crecimiento y desarrollo de la población de T. fenestrata afecta a toda la columna de agua. El éxito de esta diatomea probablemente esté relacionado con su probada mixotrofia, tal y como se deduce de los trabajos de investigación llevados a cabo por la E.B.I. en cultivos experimentales bajo diferentes condiciones. Este hecho, unido a la posibilidad del cambio de configuración de las agrupaciones coloniales de esta especie, permite a T. fenestrata permanecer en la zona fótica o descender a zonas más profundas donde puede nutrirse de forma heterótrofa y se reproduce.

Todos los cambios señalados, que no afectan a masas de agua situadas aguas arriba en la misma cuenca vertiente, están relacionados directamente con los aportes de aguas residuales procedentes de vertidos directos, sistemas de depuración obsoletos y vertidos incontrolados.

En la zona fótica, los fondos del Lago, antes limpios, se han ido cubriendo de un manto continuo y denso de algas agrupadas en estructuras filamentosas constituidas por diferentes taxones de bacilariófitos y zignemataceas.

El estudio del material en vivo con diferentes técnicas microscópicas, variados sistemas de muestreo, alguno de novedoso desarrollo y un seguimiento semanal continuado, han permitido hallar más de 40 nuevos taxones para el Lago -más del 30% de todos los citados hasta la fecha, algunos desconocidos para la Península Ibérica- que hacen albergar la esperanza en la recuperación de la biodiversidad perdida si cesan las agresiones antrópicas a este Lago único y hermoso.

AMWQ.13

Guinda, Xabier[1]*; Pérez, María L.*[1]*; Puente, Araceli*[1]*; Juanes, José A.*[1]*; Seoane, Sergio*[2]

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IS IT A "BLOOM" OF COCCOIDS, SMALL FLAGELLATES, CRYPTOPHYTES OR DINOFLAGELLATES, ACCORDING TO THE EUROPEAN WATER FRAMEWORK DIRECTIVE?

Phytoplankton is one of the biological quality elements which must be considered for the ecological status assessment of water bodies according to the European Water Framework Directive (WFD). In the Spanish transitional waters of the NE Atlantic region, the assessment of phytoplankton is carried out according to chlorophyll-a concentrations and frequency of blooms, but the criteria established to define a bloom event (›750.000 cel/l of any single specie) may cause inconsistencies in monitoring works. In this work, the suitability of this criteria is analyzed, based on the results obtained in a coastal lagoon from the north of Spain. The data were collected in autumn 2013 and included chlorophyll-a concentration and abundance of phytoplankton species. The results showed an elevated chlorophyll-a concentration (9.5 microgram/l), suggesting the possible occurrence of a bloom event. The taxonomical analyses allowed testing three procedures to identify the species which were responsible of the bloom event; (a) cell abundance, (b) biovolume and (c) carbon content. According to the WFD criteria, the bloom was caused by coccoids (1.5•10exp7 cel/l) and flagellates (1.6•10exp6 cel/l) of small size (‹5 micrometers). Additionally, elevated cell densities were also counted for the cryptophytes Urgorri complanatus (6•10exp5 cel/l) and Plagioselmis sp. (5.4•10exp5 cel/l), but they were not enough to be considered as a bloom. Finally, the dinoflagellate Kryptoperidinium foliaceum showed also elevated cell densities (4.5•10exp5 cel/l), which were close to the limit established as a bloom event. Considering biovolume and carbon content results, estimated from cell shapes and sizes, K. foliaceum was responsible of the 72.5% of the total phytoplankton biovolume and 75% of the carbon content, and U. complanatus contributed with an additional 15.2% in biovolume and 9.7% in carbon. Thus, these two species accumulated the 87.7% of biovolume and 84.7% of the carbon content without supposing a bloom. On the other hand, coccoids and flagellates, which were the "real" responsible of the bloom, accumulated only a 3.2% of the biovolume and a 4.9% of the carbon content. These results suggest that the criteria established for the definition of bloom events in the WFD should be reconsidered.

AEBC.2

Guisande, Cástor[1]*; González-Vilas, Luis*[1]*; Pelayo-Villamil, Patricia*[2]*; Manjarrés-Hernández, Ana*[3]*; García-Roselló, Emilio*[4]*; González-Dacosta, Jacinto*[4]*; Heine, Jürgen*[4]*; Palau, Antoni*[5]*; Granado-Lorencio, Carlos*[6]

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CARTOGRAFÍA DE LOS SISTEMAS ACUÁTICOS DE AGUA DULCE DE EUROPA DISPONIBLE EN MODESTR

ModestR es una herramienta de libre distribución disponible en la página web *http://www.ipez.es/ModestR*. Se han cartografiado los sistemas acuáticos de agua dulce de Europa diferenciando entre ríos pequeños (arroyos, quebradas, etc.), ríos grandes, sistemas lénticos naturales (lagos, lagunas, etc.), embalses, humedales (ciénagas, marismas, etc.), acequias, drenajes y canales. Además de mostrar en un mapa la cartografía de estos sistemas, ModestR también permite: buscar especies presentes en cualquiera de estos hábitats, obtener el área que ocupan cada uno de ellos en celdas cuyo tamaño es definido por el usuario, hacer mapas de distribución de especies dulceacuícolas, corregir errores de georeferenciación para estudios macroecológicos, combinar la información con otras variables ambientales como temperatura, precipitación, altitud, etc., realizar modelos de distribución basados en convex hull, alpha-shape y distribución de kernel usando el nicho ecológico de las especies y, por último, localizar áreas de alta riqueza incluso pudiendo definir zonas como parques naturales, provincias, regiones, países, etc. Se uso la base de datos de la página web *http://www.openstreetmap.org*, la cual como está en continua actualización incorporando nuevos hábitats, ModestR también permite al usuario actualizarse, Por último, no solamente se sigue incorporando información de forma continuada de la cartografía de Europa, también se está incorporando las coordenadas geográficas de los sistemas acuáticos de agua de dulce de otros continentes, con el objetivo de tener una cobertura mundial.

EF.4

Hernández-del Amo, Elena*; Bañeras, Lluís; Gich, Frederic*

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DNRA, AN UNACCOUNTED NITRITE SINK IN EUROPA LAGOON

Denitrification accounts for most of nitrogen removal in constructed wetlands (CW). However, less-studied mechanisms such as dissimilatory nitrite reduction to ammonium (DNRA) and anaerobic ammonium oxidation (Anammox) may also play an important role in nitrite reduction. DNRA process may be of critical importance in engineered systems devoted to N removal since NO2- is reduced to NH4+ and maintained in solution instead of being converted to gaseous N species.

The aim of this study was to quantify dissimilatory NO2- reduction pathways in the sediment of a constructed wetland. Experiments were conducted in the Empuriabrava free water surface constructed wetlands (FWS-CW, Costa Brava, Spain). Sediment samples were collected from vegetated (Typha angustifolia) and non-vegetated areas. Potential nitrite reduction activities were determined in the laboratory. Functional genes involved in DNRA (nitrite reductase formate-dependent, nrfA), denitrification (nitrite reductases, nirS and nirK) and Anammox (hydrazine synthase, hzs) were quantified by qPCR and RT-qPCR.

Potential activity measurements showed that DNRA ranged between 15-25% of total NO2- reduction, while denitrification varied from 70 to 80% in the vegetated and non-vegetated areas. qPCR indicated that the ratio of functional gene/16S rRNA varied from 3.28±1.17•10-3 to 9.47±8.20•10-2 and were similar for DNRA and denitrification related genes. No significant differences were detected among studied areas. Relative transcript copy numbers (RT-qPCR values) was rather low for nrfA, nirK and nirS genes and accounted for about 2.37±1.52•10-4, 6.77±3.35•10-4 and 2.78±2.18•10-5 of the total gene copy numbers, respectively. cDNA/DNA values increased to 6.53±8.66•10-2 when hzs genes were considered, showing differences in the proportion of cells potentially active in the populations analysed.

Our study indicates that the presence of vegetation had no clear effect in the dissimilatory NO2- reduction of the sediment, at least in the studied conditions. Potential nitrite reduction activity distributed differently among all analysed populations, being higher for the conventional denitrification pathway. Nevertheless, DNRA accounted for a significant portion of nitrite reduction and, together with anammox bacteria, ammonia producers were among the most active populations. These results highlight the importance of considering alternative nitrite sinks to evaluate the N-removal efficiency of constructed wetlands.

AE.6

Eleazar Huarachi Olivera, Ronald; *Gonzalez, Rosaura*

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HYDRA VULGARIS PALLAS, 1766 (HYDROZOA: HYDRIDAE) AS BIOINDICATOR OF THE WATER QUALITY OF THE RIVER CHILI, AREQUIPA, PERU

The aim of this study was to use Hydra vulgaris Pallas, 1766 (Hydrozoa: Hydridae) as a bioindicator of water quality of the Chili River, Arequipa, Peru. The freshwater hydra were collected in the spring "Ojo del Milagro", Characato District, Arequipa, Peru. H. vulgaris was cultivated under standardized conditions and were fed Artemia sp. K2Cr2O7 was used as a positive control and as a reference toxin. Acute toxicity and morphological changes of H. vulgaris were evaluated on Tiabaya and Tingo, sampling points of the Chili River. The LC50 (median lethal concentration) showed: Tingo (LC50 -96h = 135,95% classifying it as non-toxic) and Tiabaya (LC50-24h = 61,83%, classifying it as moderately toxic; LC50-48h = 44,19% and LC50-72h = 38,28% classifying them as toxic; LC50-96h = 21,44% rating it as very toxic). Significant differences in the morphological changes of H. vulgaris were observed with regard to different concentrations and exposure time in waters sampled from Tingo from 48 h to 96 h and in Tiabaya, significant differences in morphological changes from 24 h to 96 h exposure. The results of the physicochemical parameters of the Chili River were compared with the Peruvian National Standards for Environmental Quality (ECA) for water (categories 3 and 4) and recorded high values of biochemical oxygen demand BOD5 , NH4 and (PO4)-3 , and low dissolved oxigen OD values for Tiabaya. In Tingo, NH4 and phosphate were high. In Tiabaya, water was considered more toxic than at Tingo.

AMWQ.7

Hughes, Samantha J.; *Oliveira, Bruno; Cortes, Rui*

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CHIRONOMID PUPAL EXUVIAE (DIPTERA: NEMATOCERA) AS BIOINDICATORS IN THE RIVERS OF NORTHERN PORTUGAL

Chironomid pupal exuviae were assessed as bioindicators as part of the FCT financed project "River biomonitoring: an integrative approach" which assesses and combines data from different levels of ecosystem organization (bioindicators, biomarkers and ecosystem function) to develop metrics and indices that identify ecologically relevant cause-effect associations. Seasonal collections of exuviae, habitat and physicochemical data made over 2 years across a quality gradient in rivers across northern Portugal yielded almost 10,000 exuviae from 62 genera. The most abundant sub family was the Orthocladiinae followed by the Tanytarsini, Chironomini, Tanypodinae, Diamesinae and the Prodiamesinae although seasonal shifts occured. PCA revealed an environmental quality gradient with reference, moderately impaired and degraded sites. Hierarchical clustering and nMDS revealed distinct chironomid communities across the quality gradient. Shannon diversity differed between sites and SIMPER analysis gave information on potential indicator genera. Differences in physicochemical and habitat quality were tested using the ANOVA and the Kruskall Wallis test. Distance-based redundancy analysis (dbRDA) and a linear based distance model (DISTLM ; "Best" model and the Akaike Information Criterion (AIC), 7 retained variables) revealed a strong separation of most sites along the 1st ordination axis based primarily on physical river habitat quality. The results indicate that the exuviae respond well to gradients of quality and can be used to develop indices such as the Chironomid Pupal Exuviae Technique (CEPT) in an integrated approach to assess rivers in northern Portugal.

SS5.6

Jambrina-Enríquez, Margarita[1]***;*** *Rico, Mayte*[2]*; Moreno, Ana*[2]*; Leira, Manel*[3]*; Bernárdez, Patricia*[4]*; Prego, Ricardo*[5]*; Recio, Clemente*[1]*; Vega, José C.*[6]*; Valero-Garcés, Blas L.*[2]

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THE LONG-TERM DYNAMICS OF LAKE SANABRIA: A PALEOLIMNOLOGICAL VIEW

A multiproxy study (sedimentology, geochemistry and diatoms) of sediment cores from Sanabria Lake with a robust 14C chronology provides a high-resolution reconstruction of past environmental dynamics in the lake during the last 26000 years. To better understand hydrological and carbon processes in the lake, a limnological survey was conducted from November-2009 to October-2011 in the eastern sub-basin (Zmax=51 m) and the Tera River (inflow of the Lake), including δ13C of POM and DIC, and δ18O and δD of precipitation, river and lake waters.
The development of a proglacial lake before 26000 years demonstrates the onset of deglaciation before the global Last Glacial Maximum. Rapid deglaciation occurred at the beginning of the GI-1e (14.6 cal ka BP). During the last 14 ka, biogeochemical indicators reflected major changes in lake primary productivity and terrestrial organic matter accumulation, pointing to profound environmental changes caused by climate variability and – during the last millennia - anthropogenic influence. Glacier re-advances occurred at 14.4-14.2 (GI-1d) and 13.0-12.4 (earlier than the onset of GS-1) cal ka BP. Rapid deglaciation during the Early Holocene (11.7-10.1 cal ka BP) was followed by a period of higher river discharge (10.1-8.2 cal ka BP). After 8.2 ka, the Holocene is characterized by a general decreasing trend in humidity, punctuated by the driest phase during the Mid Holocene (6.8-4.8 cal ka BP), a wetter interval at 4.8-3.3 cal ka BP, and a relatively decline of rainfall since then till present, with a minor increase in humidity during some phases (AD1670-1760) of the Little Ice Age. Discrete silt layers intercalated in the organic-rich Holocene deposits reflect large flooding events of the Tera River, synchronous with a number of North Atlantic cold and humid events.

The δ13CPOM in Tera River and Lake Sanabria revealed a higher contribution of allochthonous organic matter in winter and spring due to higher river inflow and lower primary productivity. Phytoplankton biomass in late summer correlates with higher pH, nutrients and Chl-a, and could also reflect tourism impact. No eutrophication has been detected. The variability of δ18O and δD in lake water is strongly linked to Tera River discharges and precipitation.

GC.4

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STUDY OF ECOLOGICAL SUCCESSION OF BENTHIC COMMUNITIES MACOINVERTEBRADOS IN THE PROCESS OF COLONIZATION OF A SMALL WATERCOURSE AFTER A LONG DROUGHT

The benthic macroinvertebrate community consists of a group of organisms that have a wide variety of anatomical, physiological and ecological. This diversity allows them to colonize all types of aquatic ecosystems and makes them one of the most popular indicators of biological quality of water through the use of a large number of methodologies since the use of diversity indices and richness to methods based on the structure of the communities. One of the main factors that affect the structure of benthic macroinvertebrate communities are the changes on the flow patterns induced by climatic changes or by human action.
The purpose of this work is to study the changes on the structure of benthic macroinvertebrate communities along the recolonization time after a period of total drought of a section of the Poço Negro creek, a small water course in the North of Portugal.

This study compare results (metrics and functional structure) of samples collected conducted prior to the total dry of creek with samples taken after the first rainfall along.

FW.3

Landeira-Dabarca, Andrea; *Álvarez, Maruxa[1]; Peckarsky, Barbara L.[2]*

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ORIGIN AND SPECIFICITY OF THE CUE THAT MAKES BAETIS LARVAE (INSECTA) TO RESPOND TO PREDATORY FISH

Chemical cues are commonly used by prey to assess predation risk. Preys typically respond to predator cues by altering their behavior, but the response may depend on predator diet and identity. There are few data on how predator feeding status and diet affect prey behavior, and on the specificity of the response of prey to different predator species. We present the results of four bioassays conducted in microcosms to evaluate the relationship between predatory fish diet, predator identity and the predator-avoidance behavior of mayfly prey of the genus Baetis to elucidate the origin and specificity of the anti-predator response. Results from the first bioassay indicate that Baetis response to trout is independent of fish feeding status, which enabled us to rule out the following potential origins of the signal: alarm cues emitted by wounded Baetis conspecifics, salivary enzymes released by feeding fish, and fish excretion products. Thus, we focused further experiments on the fish cutaneous mucus as the origin of the cues that cause Baetis to reduce its foraging activity. Further results suggest Baetis did not distinguish between five freshwater fish species, despite differences among their relative risks of predation (four predatory species and omnivorous species). However, in another bioassay, we observed that Baetis larvae did not respond to cutaneous mucus of novel predators (carp, seawater turbot or frog) indicating that Baetis may not show a general response to all mucus-donor organisms. Our bioassays identify mucus as the origin of the cue eliciting anti-predator behavior, and contribute to limited information with regard to the specificity of the fish-associated chemical cues that cause some prey to respond.

SS5.5

Leira, Manel[1]; *Jambrina-Enríquez, Margarita[1]; Negro, Ana I.[2]; Rico, Mayte[3]; Moreno, Ana[3]; Bernárdez, Patricia[4]; Prego, Ricardo[5]; Recio, Clemente[1]; Valero-Garcés, Blas L.[2]*

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LONG-TERM DYNAMICS OF DIATOM ASSEMBLAGES IN SANABRIA LAKE: A SEDIMENT CORE STUDY

Recent change in diatom assemblages in Sanabria Lake has been attributed to anthropogenic influences on the ecosystem, especially through pollution and cultural eutrophication. The diatom flora of the lake is currently dominated by a variety of species of Aulacoseira, Cyclotella and Fragilaria, and, more recently, Tabellaria species have become more common in the lake. These hypotheses are tested principally by diatom analyses of sediment cores from Sanabria Lake. The diatom record preserved in this core covered a 13000 year period. Together 124 taxa of diatoms were recorded; most of them pennate diatoms. Diatom analyses reveal that the diatom flora of Sanabria Lake has been constantly changing over at least the last 13000 years. Assemblages of diatoms in different layers of sediment varied in species composition and relative abundance. Aulacoseira subborealis dominates the diatom assemblages through most of the sediment record, while Tabellaria flocculosa varieties fluctuate and peak ca. 3500 yrs BP. In the upper part Cyclotella spp become increasingly abundant. We express quantitatively the degree of change that has occurred between past and current conditions. We also used odination and dissimilarity measures to identify the main patterns of variation in the diatom data, and we hypothesize that these fluctuations are probably responses to a number of different processes. Data on sediment chemistry help identifying possible factors responsible for the observed changes in diatom assemblages. Variation in the diatom sedimentary record as a result of natural causes or random variability rather than human activity and the problem of accounting for other changes, such as climate change, are discussed.

FW.5

***Leite, Gustavo F. M.**; Rezende, Renan de S.; Lima, Anderson; Silva, Luis A.B.; Chaves, Camila V. C.; Prette, Ana C.H.; Gonçalves, José F. Jr*

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EFFECTS OF DENSITY AND PREDATION RISK ON LEAF LITTER PROCESSING BY PHYLLOICUS SP.

The allochthonous detritus that accumulates in the streams is used by aquatics shredders invertebrates for shelter and food. Shredders are considered rare in tropical systems, but little information is known about density effect and risk of predation at resource use by those organisms. The aim of this study was to examine experimentally the increase of predation risk and density of Phylloicus sp. (biological relationships) on processing leaf litter of Nectandra megapotamica (Spreng.) Mez., which can be used for case-building and food resource. The density effect was measured using four treatments that differed only in the number of individuals (1, 2, 3 and 4). Five treatments were used to test the risk of non-lethal predation (T1: Phylloicus; T2: Phylloicus and Baetidae; T3: Phylloicus and Astyanax sp; T4: Phylloicus and Calopterygidae; T5: Phylloicus and Perlidae). In each recipient (0.002 m3) were placed: one Phylloicus and one other organism (on bottles of 250 ml, blocked with fine mesh of 0.5 mm). At experiment 1, despite the high importance of Phylloicus on leaf litter processing it was observed negative effect of density to per-capita litter consumption, this helps to explain why shredders could be scarce in tropical systems. The low density is a natural condition and a strategy of Phylloicus to avoid intraspecific competition. At experiment 2, the treatment with fish was the only one that showed a significant difference and the lowest leaf litter processing by Phylloicus, indicating a top-down control. Thus, fish diversity can influence the leaf litter processing in tropical streams. This also suggests that the predation effect is likely for specific predator-prey pairs. Therefore, density and predation risk on Phylloicus are important for leaf litter processing in tropical streams.

BG.1

***Leiva, Carmen**; Arrojo, María de los Á.; Niell, F. Xavier*

Universidad de Málaga

THE ROLE OF DOC IN SEDIMENTARY ESTUARINE ORGANIC MATTER DEGRADATION (SARCOCORNIA PERENNIS (MILL.) A. J. SCOTT)

DOC in estuaries is intimately involved in a range of locally important biogeochemical processes and its behavior during the process of organic matter degradation in the estuarine sediment has not yet been deeply studied. In order to understand the global carbon cycle, the accurate understanding of the role and dynamics of pore-water DOC pool in estuarine sediments is essential. One of the main processes providing DOC in sediments is the decomposition of plant litter, so with a view to estimate the degradation rates of Sarcocornia perennis and the interaction between the particulate and dissolved organic carbon concentrations derived from this decay, a laboratory incubation experiment was conducted under aerobic and anaerobic conditions, comparing the results with the DOC quantity in the natural sediment of the Palmones River estuary (Algeciras Bay, Southern Spain).

EF.17

***Lemes-Silva, Aurea L.**[1]; Petrucio, Mauricio M.[2]; Gonçalves, José F. Jr.[1]*

[1]Universidade de Brasília; [2]Universidade Federal de Santa Catarina

TEMPORAL EFFECTS ON PROCESSING OF THE COARSE ORGANIC MATTER IN A TROPICAL STREAM

Although the litterfall play an important role in the ecosystem processes in tropical streams, surprisingly few studies have assessed how its seasonal variability might affect the litter breakdown rates. The aim of this study was to quantify the litterfall over a yearly cycle and assessed if changes in their amount and quality modify the litter breakdown rates. For this, we selected a 100-meter section in 3rd order stream where by buckets we quantify the vertical input of litterfall directly into the stream. At monthly intervals, the litter accumulated into the buckets was removed, weighed wet and the bucket with the highest leaf mass was used for the breakdown experiments. Fifteen litterbags were incubated monthly and removed after 30 days to determine the percentage of leaf weight remaining, chemical composition, ATP, ergosterol and aquatic invertebrates. Water parameters (e.g. oC, DO, pH) were monthly measured in situ, and at laboratory concentrations of nitrite, nitrate, ammonia, ortho-phosphate and total alkalinity were determined. Our results demonstrated a temporal variation in all abiotic parameters measured with highlights for the rainfall and water temperature values that showed the higher values in the warm months. The leaf litter input varied monthly associated with the rainy periods and with higher wind velocity. The leaf breakdown (loss mass and k value) differed among sampling months. The highest values of the litter breakdown rates coincided with the period (February to April) where we observed the lower quantity of remanescent mass in the litter bags. Monthly variability in nitrogen and lignin concentration on the leaves was correlated with the breakdown rates, as well as, fungal biomass, microbial community and aquatic invertebrate total density, taxonomic richness and abundance of shredders and gathering-collectors. We found that there is a temporal variation in the litterfall as a result of regional environmental factors and characteristic of the riparian vegetation and we concluded that modifications in the quantity and quality of leaf detritus delivery to the stream influence in the decomposer community interfering monthly in the litter breakdown rates.

EH.3

Lezcano, María; *Álvarez-Cabria, Mario; Peñas, Francisco J.; Silió-Calzada, Ana; Álvarez-Martínez, José M.; Rodríguez-Castillo, Tamara; Estévez, Edurne; González, Alexia M.; Barquín, José*

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TEMPORAL VARIABILITY OF INVERTEBRATE ASSEMBLAGES STRUCTURE FROM HIGH MOUNTAIN STREAMS. HOW THEY ARE AFFECTED BY CHANGES IN THE FLOW REGIME?

The flow regime and its natural fluctuations have a clear impact in the structure and composition of fluvial invertebrate assemblages. Small differences in the temperature, precipitation, and snow/thaw regime can produce important changes in the flows of high mountain fluvial ecosystems between different years. Recent monitoring programs conducted in the Picos de Europa National Park (northern Spain) have revealed a great inter-annual difference in the macroinvertebrate assessment metrics, calculated to evaluate the river health in the period 2006-2008, and important differences in the flow regime during these 3 years, with low, intermediate and high levels of flood disturbances during summer. The aim of the present study is to determine how the stability/instability of the flow regime affects the structure and composition of macroinvertebrate communities and how these changes are finally reflected in the biomonitoring programs. In order to improve our knowledge about how the flow regime shapes invertebrate communities, we focused our study on taxonomic data and also on biological trait information of macroinvertebrate communities sampled in different seasons in 2006-2008 and 2012-2013. Finally, in order to evaluate how these ecological changes can affect evaluation reports of biomonitoring programs, we have calculated the macroinvertebrate multimetric index used by the regional water agency (Confederación Hidrográfica del Cantábrico; CHC) and the LIFE index, proposed for assessing the impact of variable flows on benthic populations (Extence, 1999). Our preliminary results reveal important differences in the structure and composition of macroinvertebrate communities from different years, and this is paralleled by specific changes in the flow regime. These results indicate that more resilient and resistant groups increase their relative importance in periods affected by flood disturbances, while less resistant and resilient organisms increase in more stable years. Since these types of organisms are also considered as organic pollution tolerant taxa, the CHC multimetric index decreased in years and season scarcely affected by floods and with important presence of droughts, following the opposite pattern in periods highly affected by floods. The results of the present study should be taken into account when evaluating the ecological status of mountain rivers, specifically in the framework of climatic change.

SS1.4

Lopes, Isabel *[1]; Venâncio, Cátia[1]; Loureiro, Cláudia[1]; Leitão, João[1]; Ribeiro, Rui[2]; Soares, Amadeu M.V.M.[1]; Castro, Bruno[1]*

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FRESHWATER ZOOPLANKTON AS A SENSITIVE INDICATOR OF STRESS CAUSED BY INCREASED SALINITY

Recent projections on the impacts of global climate change reiterate, among others, the awareness regarding sea level rise. In the 5th report, the International Panel for Climate Change predicts, as the best scenario, a global rise of 28-61 cm by the year 2100. Complementary to such rise, flooding of coastal regions and seawater intrusions into coastal aquifers are likely to occur. Therefore, a gradual salinisation of low-lying coastal freshwater ecosystems is most probably possible. This may lead to environmental and socio-economical negative consequences, since: (i) salt can be very toxic to organisms by interfering with basic ecological and physiological functions, adversely affecting species life histories and fitness, food supply, available habitat, breeding grounds diversity, ecological functions and (ii) low-lying coastal ecosystems are usually highly productive, harbouring a large and unique biodiversity (many constituting biodiversity hotspots), and providing commercial and recreational functions. It is, then, important to understand the risks associated with such increased salinity scenarios in order to develop efficient and sustainable protection schemes for these regions. This presentation will tackle topics related to the actual knowledge, and will identify gaps that must be filled, to contribute for comprehensively predicting the effects of salinisation on coastal ecosystems, through the use of freshwater zooplankton. This group of organisms is known to be a sensitive indicator of such perturbations, and severe alterations in zooplankton community structure and abundance are expected at very low salinity levels. Bearing this in mind, we will refer to the following issues: (i) the most sensitive ecological receptors to salinity within zooplankton assemblages, and their use to drive safety levels for salinity increases; (ii) zooplankton's ability to acclimate to low levels of salinity, as organisms are capable of evolving strategies to tolerate low levels of stressors, enabling their persistence in disturbed environments, which can greatly influence the resilience of ecosystems; (iii) the presence of co-resistance to salinity and other anthropogenic chemicals and how this would influence the response of populations from historically-contaminated sites to future salinity increases; (iv) effects of increased salinity on zooplankton ecological relationships, which would allow a more accurate extrapolation to natural environments.

AMWQ.5

Julio Luzón Ortega *[1]; Gallego, Irene[1]; Jáimez-Cuéllar, Pablo[1]; Palomino, José A.[1]; Durán, Concha[2]; Navarro-Barquero, Patricia[2]; Bonada, Núria[3]; Alba Tercedor, Javier[4]*

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RESETTING THE SCORES ASSIGNED TO TAXA OF BIOTIC INDEX IBMWP AND SET THE CLASS BOUNDARY OF ECOLOGICAL STATE FOR THE RIVER ECOTYPES EBRO RIVER BASIN.

Spain has a vast experience in the use of biological indicators, especially regarding macroinvertebrates. The most widely used biological method for benthic macroinvertebrates is the IBMWP (Iberian Biological Monitoring Working Party), as it is easy to use and its reliability has been demonstrated. It is based on the characterization of the macroinvertebrate community by assigning a value between 0 and 10 to each taxon. However, tolerance scores of the taxon in this index were originally assigned by expert opinion and not through an objective statistical method. This would allow establishing such scores in a more adjusted way to the major disturbances or alterations to which macroinvertebrates are subjected in the Ebro basin. To calculate the tolerance scores, a statistical method that is widely used in other fields such as Paleolimnology has been employed. This method involves the use of the median and interquartile range, which makes it less sensitive to extreme values ("Robust Optimum Method") than using the mean and standard deviation. The optimum value for an environmental variable is obtained by calculating its median, while the range of tolerance values is calculated from the values of quartile 1 (Q1: 25% of the data) and quartile 3 (Q3: 75% of the data). The results were obtained from 208 stations for macroinvertebrates. The ecological valence of 81 taxon found in the Ebro River Basin was calculated. For 38 of these taxon, lower scores than they had assigned in the IBMWP index were obtained (they are more tolerant than initially thought), for 10 taxon scores equal to those assigned by the IBMWP were obtained and for 33 taxon higher scores than they had assigned in the IBMWP were obtained (they are more intolerant than initially thought). After recalculating the values of IBMWP using the new scores, both for the taxon and threshold values of the ecological state, the trend found for the stations that changed their ecological status is to be upgraded. The reference condition and boundary values of the quality classes have been calculated in the different ecotypes that have reference stations in the Ebro basin.

BB.2

Manrique, Marta[1]*; Cirujano, Santos*[2]*; Santiago, N. Felicidad*[1]

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DISTRIBUTION AND CONSERVATION OF COMMUNITY INTEREST HABITAT IN A SEASONAL WETLAND MEDITERRANEAN: THE LAGUNA DE LA NAVA (PALENCIA, SPAIN)

Trowel areas have a high environmental value and are one of the most threatened ecosystems of the biosphere. Over half of the wetlands have been highly degraded over the last decades. These ecosystems are easily changeable, highly heterogeneous, and specially very dynamic and fluctuating, granting them very peculiar structural and functional characteristics, for these reasons nowadays the conservation and recovery of these ecosystems are taking greater importance.

In the north of the Iberian Peninsula we find a trowel area recovery example, La Nava wetland. This area is notable for the large number of species present in both floristic and faunistic levels. We analyzed the dynamic and the botany characterization of the La Nava wetland vegetation, identifying 7 different Habitats types of community interest according to the Habitats Directive 92/43/CEE relating to the conservation of natural habitats of wild fauna and flora. The presence of species such as Chara oedophylla , Utricularia vulgaris, Hippuris vulgaris or Buttomus umbellatus convert the wetland in a botanical point of interest that must be maintained.

The huge contributions of nutrients that is currently received by the wetland leads to eutrophication and silting up processes, producing a lush growth of vegetation that modifies the ecosystem and threatens the existing biodiversity.

BB.12

Manzanedo, María B.*; Picazo, Antonio; Rochera, Carlos; Castillo-Escrivà, Andreu; Mesquita-Joanes, Francesc; Camacho, Antonio*

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CRITICAL CHARACTERIZATION OF MICROBIAL COMMUNITY COMPOSITION AND BIODIVERSITY PATTERNS IN SHALLOW LAKES FROM CENTRAL SPAIN

In aquatic ecosystems microbial community patterns and diversity appear to be controlled by several factors such as biological interactions, ecosystem productivity, habitat size and heterogeneity, and other environmental conditions, though their relationships remain quite unclear. In this work, supported by the projects ECOLAKE (CGL2012-38909, MINECO) and CARBONSINK (Fundación Biodiversidad), 18 shallow lakes located at the "La Mancha Húmeda Biosphere Reserve (Central Spain)" were studied monthly along two limnological cycles to determine the microbial community composition patterns, richness and diversity of bacteria and archaea communities, and its relationship to the above mentioned factors. The monitored water bodies exhibited highly diverse conditions; most of them are temporal systems with high hydric stress, and there are some important gradients, namely the salinity gradient from fresh- to hypersaline waters, as well as a trophic gradient from oligotrophic to hypereutrophic status. Due to the high number of samples analysed (430 samples) we did a first screening with a DNA-fingerprinting approach using Denaturing Gradient Gel Electrophoresis (DGGE) to characterize the diversity of the prokaryotic communities inhabiting these lakes, which allowed to estimate diversity parameters such as OTU's commonness/rarity and different diversity indices. Differences observed in such community traits are discussed here based upon local environmental conditions (i.e., environmental filtering). Our study also aims to reveal patterns of diversity occurring between these unique aquatic ecosystems, which are a major issue if one wishes to ensure their biological conservation. Some of this water bodies are open systems with water inlets, although this incoming water does not seem to have a strong influence in the composition of the microbial communities nor in the diversity indices. Multivariate analysis show significant differences in community composition patterns, richness and diversity, both in the time-course and the comparative study of the different lakes, where the principal component of the variability is the gradient of salinity and, secondarily, the trophic gradient.

SS2.13

Marcé, Rafael[1]*; Obrador, Biel*[2]*; Morguí, Josep-Anton*[3]*; Riera, Joan L.*[2]*; López, Pilar*[2]*; Armengol, Joan*[2]

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THE BREATH OF THE ROCKS: LAKE CARBON DIOXIDE EMISSIONS FROM WEATHERING PROCESSES AT THE GLOBAL SCALE

Most lakes and reservoirs are known to have surface carbon dioxide (CO2) concentrations that are supersaturated with respect to the atmosphere, and hence nearly all of them are net emitters of CO2. Global carbon emissions from lakes account for 0.06 to 0.84 Pg C year-1, a substantial amount relative to other fluxes of the continental C balance. Therefore, a proper understanding of the land carbon cycle and its sensitivity to external perturbations requires detailed knowledge of drivers of global CO2 supersaturation in lakes. CO2 supersaturation has generally been attributed to a widespread imbalance of lake net ecosystem production towards net heterotrophy, but recent findings challenge this interpretation. Here we show that an integrated perspective including lake net ecosystem production together with precipitation and dissolution of carbonate minerals and inputs of dissolved inorganic carbon from the watershed, substantially improves our understanding of the processes leading to CO2 supersaturation in lakes with alkalinity above 1 meq L-1. Our results indicate that CO2 supersaturation is independent of net ecosystem production in many lakes, and that a significant amount of the CO2 evaded through their surface is directly related to weathering processes in the watershed that supply alkalinity to surface waters. After evaluation of the worldwide distribution of alkalinity across lakes we show that CO2 emissions related to weathering processes are relevant in tropical and temperate latitudes, but negligible in boreal regions.

SS3.4

Marcé, Rafael

Catalan Institute for Water Research (ICRA), Girona, Spain

RESERVOIRS UNDER THE SUN: BIOGEOCHEMISTRY IN THE MEDITERRANEAN TO IDENTIFY PATTERNS AT THE GLOBAL SCALE

The importance of water resources stored in reservoirs on a global scale is not matched with a sound knowledge of the possible impacts of climate change on reservoir water quality. This is especially relevant in the Mediterranean regions, where most countries rely on reservoirs to fulfill their water supply needs, and virtually all climate models predict increasing water shortage in the next 20 years. In this talk I summarize recent findings that stress the profound differences between lakes and reservoirs concerning their responses to global changes. The main conclusion is that application of the lake tool kit to solve management problems in reservoirs may lead to the wrong decisions, and we challenge the general empirical formulations and models usually applied in lakes with patterns observed in Mediterranean reservoirs that seem to apply at global scales. To exemplify this, I use long term data collected during 45 years in Sau Reservoir, the location of the most influential studies by Dr. Joan Armengol, and an inspiration for a generation of reservoir limnologists.

EH.4

Marques, Marcelo[1]*; Andrade, Fernando*[2]*; Arantes, Elaine P.*[1]*; Okawa, Cristhiane M. P.*[1]*; Pereira, Osni*[1]

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DETERMINATION OF THE MIXING DEPTH GENERATED BY SEVERE WINDS ON THE MAR MENOR

The lakes and reservoirs are complex environments with large economic, social and ecological importance. Limnological studies of these environments often require information associated to the hydrodynamics of the inland water body. The phenomenon of mixing, especially the effects of longitudinal dispersion caused by waves generated by the wind action, is a process of significant impact on the water quality, on the thermal stratification and on the development of macrophytes. In this study simulations of the mixing depth are performed for the Mar Menor. Herein, the mixing depth is defined as the vertical region affected by the wind generated waves. Two-dimensional distributions of the mixing depths were determined for sixteen wind directions and to wind intensities equal to 5, 10, 15 and 20ms-1.

AMWQ.15

Marquez, Elin*; Díaz, Luis A.*

Universidad de La Guajira

EVALUACIÓN DE LA CALIDAD BACTERIOLÓGICA DEL AGUA DEL FRENTE COSTERO DEL MUNICIPIO DE RIOHACHA, LA GUAJIRA, COLOMBIA

Durante los meses de junio a noviembre de 2013, se realizó un estudio con el objetivo de evaluar la calidad bacteriológica de las aguas del frente costero del municipio de Riohacha, La Guajira, Colombia. Para ello se establecieron cuatro estaciones de monitoreo donde se colectaron muestras de agua para el análisis de las densidades de coliformes totales (CT), coliformes fecales (CF) y enterococos (ET), a través filtración por membrana. Asimismo, se midieron in situ las variables fisicoquímicas oxígeno disuelto, temperatura, pH, conductividad, salinidad y turbidez. Las determinaciones de los nutrientes nitritos (NO2), nitratos (NO3), amonio (NH4) y fosfatos (PO4), se analizaron a través de espectrofotometría UV visible. Se usó el test no paramétrico de Kruskal-Wallis y el test T para muestras independientes para evaluar el comportamiento espacial y temporal, respectivamente, de los indicadores bacterianos estudiados y una análisis de componentes principales (ACP) para encontrar asociaciones entre las variables y su relación con las estaciones de monitoreo y los periodos climatológicos. Se encontró que las densidades medias de CT y CF, no difieren significativamente a lo largo de las estaciones de monitoreo ($p > 0.05$). Sin embargo, ET mostró diferencias significativas entre las estaciones E1 y E4, siendo mayor en esta última ($p < 0.05$), debido a que en esta estación se evidencia la disposición de residuos sólidos de las actividades pesqueras del municipio y la disposición de excretas de origen animal y humado que condicionan la presencia de estos organismos, asimismo, es la estación más cercana al punto de descarga de las aguas residuales del municipio al mar Caribe. El análisis temporal, mostró que las concentraciones medias de estos indicadores bacterianos son significativamente mayor en época de lluvias que en sequía ($p < 0.05$), esto obedece al lavado que realizan las aguas de escorrentías y la influencia que ejercen los brazos del rio Ranchería, Riito y Calancalá, que desembocan sus aguas en el mar caribe, en la zona donde se realizó este estudio.

Palabras claves: Calidad bacteriológica, coliformes fecales, coliformes totales, enterococos, variables fisicoquímicas.

SS2.15

Mazzeo, Nestor[1]*; M. Huszar, Vera L.*[2]*; Loverde-Oliveira, Simoni M.*[3]

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TURBID AND CLEAR REGIMES IN FLOODPLAIN LAKE AND CONNECTED RIVERS (PANTANAL-BRAZIL) AND THEIR INFLUENCE ON CO2 EMISSIONS

Several shallow lakes located in the Brazilian Pantanal show considerable spatial heterogeneity of abiotic and biotic attributes. The spatial distribution of turbid and clear water regimes in shallow lakes and connected rivers can be determined by a set of controlling factors such as: geology, geomorphology, hydrology, groups of dominant primary producers and trophic interactions. In this sense, we analyzed the spatial heterogeneity of physical, chemical and biological features in Sinhá Mariana lake (Northern Pantanal, Mato Grosso State) during a single low (LW) and two high (HW) water level phases and surveyed around 100 sampling points. CO2 partial pressure (pCO2) was analyzed in situ through direct measurements using a portable infrared gas analyzer (IRGA). Water level oscillation was ca. 2 meters of maximum depth. Enormous spatial gradients of turbidity were observed in both hydroperiods, the magnitude of these gradients were 0-13 and 0-110 NTU during HW and LW, respectively. The turbid regions also had the highest conductivities, with spatial gradients of 4-20 and 10-80 µS cm-1 during LW and HW, respectively. Significant relationships were detected between conductivity and water color, positive at LW and negative at HW. Moreover, phytoplankton biomass (and also the phycocyanin proxy) showed a direct relationship with turbidity during LW, and an inverse during the HW. The physical and chemical attributes of the main tributaries driven a complex spatial regimes which modulated other system metabolism attributes (e.g. oxygen and carbon retention/assimilation).

pCO2 was significantly correlated to turbidity and hydrologic phases. The heterotrophy was major prevalent, with higher fluxes of CO2 (31 ± 20 mmol C m-2 d-1) and larger spatial variability during HW, LW showed fluxes near the equilibrium (0.7± 5 mmol C m-2 d-1). Our study highlights that natural spatial gradients of turbidity and its temporal variability play a key role on the lake's metabolism and CO2 emissions.

EF.2

Medina-Sánchez, Juan M.[1]*; Dorado-García, Irene*[2]*; Herrera, Guillermo*[2]*; Cabrerizo, Marco J.*[2]*; Carrillo, Presentación*[3]

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CARBON AND PHOSPHOROUS CO-LIMITATION IN BACTERIOPLANKTON: THE ROLE OF ECOLOGICAL INTERACTIONS IN ECOSYSTEMS WITH CONTRASTING TROPHIC-NATURE STATES

The type of resource that limits bacterioplankton, either mineral nutrient, as phosphorus (P), or energetic source, as organic carbon (C), influences the ecosystem capability to accumulate organic C. We studied which resource (C, P, or both) limits bacterioplankton by a full factorial 2x2 experimental design (with the addition of C, P, or both combined) performed in situ in two Mediterranean freshwater ecosystems with contrasting trophic-nature states (oligo-autotrophic vs. eu-heterotrophic). Overall, bacterioplankton strongly responded to both resources combined, indicating a synergistic C-P co-limitation. However, in the oligo-autotrophic ecosystem, bacterioplankton did not respond to C alone, but positively did to P alone, while in the eu-heterotrophic ecosystem, bacterioplankton positively responded to C or P alone. Accordingly, the trophic-nature revealed as the key trait determining the type of resource co-limitation of bacterioplankton. The quantification of the dynamics of co-limitation indicates that ecological interactions, as predation by bacterivores, were responsible of a deviation of co-limitation towards less synergism, particularly in the eu-heterotrophic ecosystem. Our results highlights underline the key role of biotic interactions modulating the actual resource co-limitation of bacterioplankton, what may shape the ecosystem functioning as net sink or source of C according to its trophic-nature.

AE.5

Méndez, Leire; *Rodriguez, Pilar; Martínez, Maite*

UPV/EHU

WEIGHT OF EVIDENCE APPROACH IN METAL MINE-IMPACTED FRESHWATER SEDIMENTS IN NORTH SPAIN

A sound assessment of sediment quality requires an integrated approach of several independent Lines of Evidence (LOE), using a Weight of Evidence (WOE) procedure that assists in determining causation (Chapman, 2007). Each LOE should be analyzed in relation to the expected conditions derived from reference sites, in a Reference Condition Approach (Reynoldson et al. 1997), in agreement with the European Water Framework Directive (EC, 2000) for an Environmental Risk Assessment of water bodies. Four LOEs have been examined in present work: sediment chemistry, benthic invertebrate community, sediment toxicity, and tissue residue analysis, with focus in chronic toxicity and metal bioaccumulation by the aquatic oligochaete Tubifex tubifex (Müller). The interest of incorporating analysis on metal tissue residues in aquatic invertebrates is that this LOE provides evidences not only the bioavailability of chemicals, but also their potential for biomagnification (Krantzberg et al., 2000).

In Northern Spain, an integrated assessment of abandoned metal mines has never been conducted. The study area included three Zn/Pb mines in Basque Country (Oiartzun and Oria River basins) and Cantabria (Saja River basin), and two main areas in central Asturias were Cu and Hg were extracted (Nalón River basin).

The results showed that Zn/Pb mines in Cantabria contribute to sediment contamination and cause toxicity under laboratory conditions, but in situ benthic community is not altered (Saja River). In Basque Country mines, sediments are contaminated in different degree due to Zn-Pb concentration, and benthic community is altered. Metal tissue residues exceed threshold values only at one site (Oiartzun River), although sediment toxicity has not been demonstrated.

High sediment metal concentrations in the Nalón River basin have been reported, and is considered to likely cause adverse effects in 7 study sites, classified as Toxic. Sediment contamination is mainly due to As and Hg and has been identified as the source of high tissue residues for these metals, thus assessed as having bioaccumulation potential. However, high levels of metals not always have resulted in chronic toxicity. In Cu mines, low Cu tissue residues were measured, suggesting regulation by the worm, which can explain sites classification as Non Toxic.

SS1.2

Miracle, María R.; *Alfonso, Teresa; Soria, Juan M.*

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FLUSHING EFFECTS ON THE ZOOPLANKTON OF A HYPETROPHIC LAKE

This presentation is based on zooplankton data from the Albufera of Valencia coastal lagoon during several years. Strong fluctuations in the plankton community structure occur in this hypertrophic lake, largely determined by its hydrological regime, at present man regulated by means of sluicegates at its outlets to the sea. Traditional agricultural practices involved a flushing at the end of winter, when rice paddies are emptied after a period of flooding without culture. A flushing effect is evidenced by the increase of water transparency due to the flushing out of the dense cyanobacterial blooms characteristic of this lake. Flushing restarts succession and provides the conditions to the growth of spring edible phytoplankton that favors metazooplankton development. Zooplankton biomass mainly composed by cyclopoids with a lower proportion of rotifers shifts to Daphnia magna preponderance, peaking during winter flushing. A comparison between years, showed that flushing intensity is associated to water transparency, as well as to the abundance this large cladoceran and its facultative epibiont Brachionus variabilis. As soon as cyanobacterial dominance is reestablished copepod biomass predominate again and D. magna is succeeded by other cladoceran species, in mid-spring by Bosmina and later by Moina and Diapahanosoma. Rotifers also show a marked seasonal succession. The proportions of the different functional groups within the microbial food web has been also analyzed to uncover how the seasonal shifts in species composition of metazooplankton are reflected in structural and functional changes in the planktonic food web. The beneficial effect of flushing as a measure of restoration is also discussed.

GC.1

José Antonio Molina [1]***;*** *Benavent, Alberto*[1]*; Lumbreras, Ana*[2]*; Jabonero, Jorge*[1]

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IS VEGETATION MARKEDLY CHANGING IN MEDITERRANEAN FRESHWATER ECOSYSTEMS?

The vegetation of Mediterranean freshwater ecosystems includes communities characterized by aquatic Ranunculus and Callitriche species among others (Molina 2010). Their distribution is related to water pysicho-chemical factors at local scale (Lumbreras et al. 2009) besides to biogeographical patterns at regional scale (Lumbreras et al. 2013). Our study focuses on this vegetation type as bioindicator of ecosystem change.

45 sites were selected in the central Iberian Peninsula under Mediterranean climate between 237 and 1037 m a.s.l., delimited by the grid squares between 2°–7° W and 39°–41°N and corresponding to seasonal streams (26 sites), temporary ponds (9 sites) and rivers (10 sites).

Water was sampled in winter and spring of 2007, 2008, and 2009 and in spring of 2012 and 2013. It is noteworthy that the year 2012 was hydrologically drier than average and the year 2013 was wetter than average. Vegetation was checked in spring of 2007, 2008, 2009, 2011 and 2012. The following water parameters were measured in situ: pH, conductivity, O2 and water temperature. The following parameters were determined in the laboratory: alkalinity, ammonium, nitrites, nitrates, phosphates, sulphates, sodium, potassium, calcium and magnesium.
In a short-medium term, as the five years raised, our results answer the following questions: a) Is there any appreciably change related to disturbance, desiccation or disappearance in freshwater ecosystems; and b) is there any noticeable variation in water physico-chemistry related to vegetation? Results may help to understand how global change can be currently acting on freshwater ecosystems.

AMWQ.8

Monaghan, Kieran

Universidade de Aveiro

FOUR REASONS TO QUESTION THE ACCURACY OF BIOTIC INDEXES

Nature and artifact can bias biotic indexes through the variable influence of indicators' body size, abundance, richness, and ascribed tolerance scores. Using real and modeled data the effects of these four parameters were evaluated via a detailed analysis of a widely used index (the BMWP) and descriptive comparison with 24 index systems. Many indexes are characterized by smaller pollution tolerant organisms and larger sensitive species. In consequence, the propensity to collect a greater proportion of smaller organisms is associated with negative bias however, positive bias may occur when equipment selectively samples larger organisms. Most index systems are represented by skewed indicator distributions that can bias the derived index value in the direction of taxonomically rich indicators classes. Indicators that are misclassified cause positive and negative bias that varies with the magnitude of the misclassification and the relative abundance of indicators. These artifacts of index design result in predictable patterns of overall bias that are observed in index performance and may compromise the ability of biotic indexes to monitor a decline in biological quality. The statistical treatment of abundance data and the manipulation of indicator richness provide common themes that can be used to could be used to improve index accuracy.

EF.15

Monroy, Silvia; *Martínez, Aingeru; Pérez, Javier; Larrañaga, Aitor; Basaguren, Ana; Pozo, Jesús*

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EFECTO DE LA TEMPERATURA SOBRE LA DESCOMPOSICIÓN DE HOJARASCA EN RÍOS: INTERACCIÓN CON LA CALIDAD Y LAS CARACTERÍSTICAS DEL MEDIO

Aunque la temperatura es ampliamente aceptada como un factor fundamental que afecta los procesos ecológicos, sus efectos sobre el funcionamiento fluvial requieren clarificación debido a que interactúan con otros factores a nivel local. La descomposición de la materia orgánica en arroyos forestados de cabecera es un proceso clave que podría ser particularmente vulnerable al aumento de la temperatura en un escenario de cambio climático, y cuya respuesta podría afectar al funcionamiento del ecosistema fluvial. Este estudio pretende conocer las relaciones entre la temperatura y la descomposición de hojarascas que difieren en calidad, así como su posible interacción con otras características de las aguas. Para ello, se incubaron hojas de aliso (Alnus glutinosa) y de eucalipto (Eucalyptus globulus) en laboratorio a 5, 10 y 15 ºC, tras su previo acondicionamiento microbiano durante una semana en tres ríos que diferían en temperatura (rango 4.6-8.9 ºC). Las incubaciones se realizaron tanto con agua de cada uno de los ríos (problema) como con agua común procedente de un cuarto río (control), con el fin de discernir el papel de la fisicoquímica del agua propia de esos tres ríos sobre la actividad de las comunidades fúngicas y por tanto sobre la descomposición. Las tasas de descomposición de ambas especies en el experimento control mostraron una tendencia positiva con el aumento en la temperatura con independencia del río en el que se habían acondicionado. El experimento problema mostró diferencias entre especies en la magnitud de la respuesta del procesado a la temperatura, en general con un mayor efecto sobre el eucalipto. Estos resultados sugieren que el incremento en la temperatura de las aguas podría ocasionar diferente magnitud en la respuesta del proceso de descomposición en función de la calidad de la hojarasca, y por lo tanto de la vegetación riparia, y las características del río, pudiendo condicionar la eficiencia a la cual la materia orgánica alóctona es utilizada.

SS5.4

Monteoliva, Agustín P.; *Alonso de Santociles, Gonzalo*

Ecohydros S.L.

ESTIMATION OF PHOSPHORUS LOADS FROM DIFFERENT SOURCES TO SANABRIA LAKE, USING A SEMIEMPIRICAL MODELLING APPROACH

Sanabria Lake (Zamora, Spain), with 3.2 km2 and a maximum depth of 51 m, is the largest glacial lake in the Iberian Peninsula. The lake is an oligotrophic and low mineralized water body, and a key element in a protected natural area which includes its rural watershed.

A synthetic fluvial network has been generated using a suite of terrain analysis tools for the extraction and analysis of hydrologic information from topography as represented by a 5m horizontal resolution DEM. Over this hydrographical frame, a mid range complexity stream flow and nutrient loads model has been run. The model is based on the GWLF (Generalized Watershed Loading Functions) approach and the simulation, focused on phosphorus, comprises a six year period of data. It includes both non point and point nutrient sources and, in this case, precipitation on the lake and bathing activity loads have been specifically added. The overall mean phosphorus load estimation is 3.5 tonnes per year, 91% of which comes from nonpoint sources and less than 5% in average from urban waste waters, a figure of similar magnitude to direct precipitation. A significant amount (43% in average) of the total phosphorus load comes from extensive livestock farming. The fluctuations of the annual phosphorus loads are broad, in response to hydro-meteorological factors and land cover alterations, including the potential role of wildfires. When the estimated phosphorus load is normalized with the water resident time, the in lake concentration ranges between 14 and 23 µg-P/l, which is in accordance with the available data from official monitoring programmes.

SS1.7

Moreira-Santos, Matilde[1]*; Lopes, Isabel*[2]*; Araújo, Cristiano V.M.*[3]*; Ribeiro, Rui*[1]

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CONTAMINANT-DRIVEN AVOIDANCE OF ZOOPLANKERS

Currently, to assess the environmental impacts of contaminants, the vast majority of toxicity tests on aquatic organisms, including zooplankters, lack ecological relevance by (1) considering that organisms in nature are passively exposed to contaminants, i.e., ignoring that organisms are able to detect and avoid harmful contamination levels, and (2) by including measurements of classical responses (e.g. growth, reproduction), that imply time-delayed extrapolations from effects on individuals up to ecosystems. Although forced exposure at a given concentration is the classical scenario used in toxicity tests, it prevents the dislocation of organisms to less contaminated zones as expected under real conditions. On the contrary, non-forced exposure toxicity tests allow measuring the spatial dispersion of the organisms as an avoidance response to escape from contamination. Avoidance is highly relevant as it is generally a quick response to environmental disturbance that provokes direct and immediate effects on ecosystems functions (e.g. food shortage, impairment of grazing) comparable to the death of the entire population. Thus, its inclusion in the assessment of contaminant effects has been considered to increase ecological realism in risk assessment and decrease uncertainties in environmental decision making.

In recent years, results with various groups of organisms, including zooplankters, have signaled the use of avoidance tests as a major breakthrough to overcome limitations and uncertainties related to forced exposure and to the needed time-delayed extrapolations to assess ecosystem level effects. Moreover, the recently proposed new concept – the population immediate decline – also adds ecological realism to contaminant effects by integrating avoidance and survival in a single toxicity endpoint; when avoidance occurs at concentrations close to lethal levels, survival tests with forced exposure underestimate risk because organisms remaining in a natural population after a contamination event would be only those that did not perceive and avoid and were resistant enough to remain alive.
Given that zooplankton has been identified as a sensitive indicator of environmental contamination, research conducted in the last years to understand to what extent contaminant-driven avoidance plays a key role in the spatial distribution of zooplankters in disrupted habitats was carried out and will be discussed in this presentation.

RLWE.11

Marcelo da S., Moretti; *Thaís Z., Giuberti*

Universidade Vila Velha

INFLUENCE OF PERIPHYTON GROWTH ON INVERTEBRATE COLONIZATION IN STREAMS WITH DIFFERENT ENVIRONMENTAL CONDITIONS

The objective of this study was to evaluate the influence of periphyton growth on invertebrate colonization in streams with different environmental conditions. We hypothesized that periphyton growth and its influence on invertebrate assemblages would be higher in altered than in preserved streams. The same experiment was conducted in two streams of the Atlantic Forest, one with higher anthropogenic influence (Luxemburgo) and another with almost pristine conditions (Macuco). Stones of both streams were sterilized (500º C, 2h) in the laboratory and incubated for 7, 15, 30, 45 and 60 days in each stream to assess periphytic and invertebrate colonization. Daily average values of water temperature were higher in Luxemburgo while light availability values did not differ between streams. In both streams, concentrations of chlorophyll a found in control stones were higher than those found in experimental stones. A total of 1,234 individuals belonging to 29 taxa were found. Values of invertebrate abundance, taxa richness and biomass were higher in Luxemburgo throughout the experiment and no differences were observed among sampling periods. A NMDS analysis showed that invertebrate assemblages in Luxemburgo were similar throughout the experiment, with minor variation among the different sampling periods. An analysis of similarity (ANOSIM) indicated that invertebrate assemblages of Luxemburgo and Macuco streams showed differences in taxa composition. The indicator species analysis demonstrated that only three taxa were indicators for the assemblages found in the Luxemburgo stream. Scrapers presented the highest values of abundance after 45 days in Luxemburgo and after 7 and 45 days in Macuco stream. The biomass of these organisms in both streams was higher after 7 days of incubation. The results of this experiment showed that invertebrate assemblages associated with stones were influenced by stream environmental conditions and also demonstrated the importance of periphytic communities to invertebrate colonization on exposed substrates, given this relationship was best evidenced in the preserved stream.

AEBC.7

Mori, Nataša[1]*; Kandu, Tjaša*[2]*; Oz, Basak*[3]*; Brancelj, Anton*[1]

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MEIOFAUNAL DRIFT DISCHARGED FROM THE ALPINE SPRINGS: IMPLICATIONS FOR AQUIFER CHARACTERIZATION

Springs are the areas where groundwater discharges from the aquifer. Investigation of the variability in the physical and chemical characteristics, stable isotopes and groundwater fauna discharging from the springs can provide important insights into the aquifer ecological characteristics. Accordingly, the study investigated geochemistry, stable isotopes (β13CDIC, β13CPOC, β18O, βD, tritium) and groundwater meiofauna (Copepoda, Ostracoda: Crustacea) drifting from the aquifers in 12 alpine springs spreading across Southern Limestone Alps in Slovenia (SE Europe). The sampling was carried out 6 times over two year period. The hypothesis was that groundwater and spring invertebrate communities would differ between hydrogeologicaly different aquifers (i.e. retention times of groundwater, rock type, intermittent or permanent discharge). The geochemistry of the spring water indicated strong influence of chemical weathering of Mesozoic limestone in most springs, with the exception of one spring from Permo-Carbonian shales. The β13C of DIC ranged from -15.8‰ to -1.5‰ and indicated less and more vulnerable aquifers. Isotopic composition of oxygen (β18OH2O) and tritium values were from -12.2 to -9.3‰, and from 6.4 to 9.8 TU, respectively, indicating prevailing recharge from precipitation. The age of spring waters were estimated to be from 2.6 to 5.1 years. Altogether, 48 species of Copepoda nad Ostracoda were collected from 12 springs. Among them Cavernocypris subterranea (Ostracoda), Acanthocyclops sensitivus, Speocyclops infernus, Elaphoidella phreatica, Eucyclops serrulatus, Bryocamptus dacicus and Bryocamptus zschokkei (Copepoda) were the most abundant. The most wide spread species occurring in all springs was Bryocamptus dacicus (Harpacticoida, Copepoda). The comparison of crustacean assemblages by applying non-metric multidimensional scaling (NMDS) revealed high heterogeneity in species composition between the springs. The springs from the Julian Alps had the most abundant and also the most distinct communities indicating that we sampled small localized karstic aquifers with developed vertical and horizontal channels which provide extensive and diversified habitats for the groundwater fauna.

BB.1

Muñoz, Rocío; *Carmona, R.; Ruiz-Nieto, Miriam; Arrojo, María de los Á.; Niell, F. Xavier*

Universidad de Málaga

MICHAELIAN PARAMETERS DEFINE THE COMPETITION BETWEEN THREE SALTMARSH SPECIES OF MACROPHYTES

The values of the characteristic Michaelian parameters (Cp, Vmax and Km) are used to discuss the competition consequences among three coexisting saltmarsh plant species.

Nitrate, ammonia, phosphate and carbon uptake as well as light fixation performed by plants in different ways. The benefits for plants at different scenarios (nutrient concentration, light irradiance and CO2 air concentration, salinity and Eh in the sediment) were used as a support for discussion about which of the three species of plants living together could “win” in extreme conditions of salinity increasing, hypereutrophication and high air CO2 concentration.

This study provides a methodological tool to focus studies on competition between species in a wide extent that could be applied at several systems as a general procedure.

AMWQ.12

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ESTIMATING TAXONOMIC COMPOSITION OF BENTHIC MACROINVERTEBRATES FOR ESTUARINE REFERENCE CONDITIONS: THE MODELLING APPROACH

The definition of reference conditions (RC) has been a difficult task for estuaries, mainly due to the association of their natural variability and the historical intensive anthropogenic use of these areas. Yet, the Ecological Quality Status of water bodies must be calculated based on the deviation to RC, according to the Water Framework Directive (WFD). Among others, modelling is one of the possible methods predicted in WFD to define RC when true reference sites do note exist but that has been however seldom used due to inherent technical difficulties. This study aimed to determine the taxonomic composition of benthic macroinvertebrates on the Mondego estuary, by modelling the RC of five different salinity areas in the system (water bodies) from their environmental characteristics. The predictive modelling techniques used here, comprised in the AQUAWEB platform (***www.aquaweb.uc.pt***), are three machine learning techniques: k-nearest neighbour, multiple layer perceptron and support vector machines. Based on those techniques, four models were built by using: the combination of the three, and each of the techniques individually. The models were based on present data from five Portuguese estuaries belonging to the same typology as the Mondego: 368 taxa and 28 environmental variables describing the local characteristics and pressures (e.g., temperature, salinity, silicate, O2, Nitrate, stratification of water column, dimension of intertidal area,). Only taxa estimated in accuracy › 0.5 were retained for test sites analyses. In the following step, the pressure variables data of the five water bodies of Mondego were manipulated by replacing their values by reference values from literature and those new matrices were run through all four models as test sites. The model predicted the changes in distribution of taxa across different salinity stretches in the Mondego, as well as it anticipated that some taxa would not be present under the virtual RC defined for the Mondego.

SS2.11

***Obrador, Biel**[1]; Gómez-Gener, Lluís[2]; Koschorreck, Matthias[3]; Marcé, Rafael[4]; von Schiller, Daniel[4]; Catalán, Núria[2]*

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CARBON DIOXIDE EMISSIONS FROM MEDITERRANEAN TEMPORARY PONDS

Little is known about the rates and drivers of carbon emissions in small water bodies despite they are biogeochemically very active ecosystems and by far the most common type of inland water on Earth. Temporary ponds, one of the most frequent types of aquatic ecosystem in the Mediterranean area, have been particularly poorly studied.

We quantified the fluxes of carbon dioxide (CO2) from 12 temporary ponds located in the island of Menorca (Western Mediterranean). The studied ponds covered a wide range of physicochemical, lithological and land use characteristics. Direct gas fluxes from both the inundated and non -inundated (exposed sediments) areas of the ponds were measured by temporal monitoring of gas concentrations in enclosed chambers.
We showed that all the ponds were net emitters of CO2 to the atmosphere albeit with substantial differences between ponds (mean ± SD flux of CO2 = 121.3 ± 138.1 mmol m-2 d-1). Within each pond, high spatial variability was observed, with much higher CO2 fluxes in exposed sediments than in inundated areas, probably due to physical limitation of diffusion in the later. Fluxes of CO2 from inundated areas were comparable to those from other freshwater systems (12.5 ± 15.1 mmol m-2 d-1), whereas the fluxes from exposed sediments (118.9 ± 121.6 mmol m-2 d-1) were significantly higher in vegetated than in unvegetated areas. Contrary to expectations, the CO2 fluxes were not explained by the catchment properties and appeared to be more related to local factors within the inundation areas of the ponds.
The relevance of CO2 fluxes from temporary ponds at regional scales deserves further research, especially given the widespread distribution of temporary ponds in arid and semiarid regions. Moreover, temporary ponds appear to be attractive ecosystems to assess the effects of global and local pressures on the functional responses of aquatic-terrestrial transitional environments.

BG.5

***Pastor, Ada**[1]; Riera, Joan L.[1]; Peipoch, Marc[2]; Gomà, Joan[1]; Cañas, Lídia[1]; Martí, Eugènia[2]; Sabater, Francesc[1]*

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EFFECTS OF SUCCESSIONAL STAGE AND NUTRIENT AVAILABILITY ON THE 15N NATURAL ABUNDANCE OF EPILITHIC BIOFILMS IN STREAMS

Epilithic biofilms (i.e., microbial assemblages developed on stream cobbles) can substantially contribute to in-stream nitrogen (N) cycling, but how the variation in their biomass accrual influences this process still remains unclear. To address this question, we explored the variability of natural abundance of N stable isotopes (δ15N) of epilithic biofilm at early and late successional stages among streams differing in nutrient availability. The use of δ15N provides simple ecological tools to track N assimilation and mineralization because isotopic fractionation can result in changes of δ15N values. We expected that early-stage biofilm would assimilate N from the water at rates exceeding those of N mineralization; and thus, under the same isotopic N sources, would result in δ15N values lower than those of late-stage biofilm. We also predicted that differences between early- and late-stage biofilm would be more pronounced at high-nutrient streams, because fractionation associated to assimilation increases with nutrient availability. We used two approaches to examine the δ15N variability of different biofilms. First, we conducted a monthly-based survey, where early-stage biofilm (colonizing artificial substrates) and late-stage biofilm (attached to stream cobbles) was sampled during one year in four streams differing in nutrient concentrations. Second, biofilm development was examined for a month under low and high nutrient concentrations. The study covered a wide range of biofilm biomass (0.1 to 36.5 g ash-free dry mass [AFDM]/m2) and δ15N values (-3.6 to 22.7‰). In all streams, early-stage biofilm had lower biomass than late-stage biofilm. δ15N of biofilm was positively related to AFDM, and hence to successional stage, except in the stream with the lowest nutrient concentration. During biofilm colonization, δ15N increased with AFDM, and changes were more pronounced at the high nutrient stream. Overall, these results suggest epilithic biomass as a relevant factor controlling biofilm δ15N variability at the local scale.

RLWE.14

Pechar, Giuliano S.[1]*; Sánchez-Montoya, María del M.*[2]*; von Schiller, Daniel*[3]*; Ruhí, Albert*[4]*; Proia, Lorenzo*[3]*; Miñano, Jesús*[1]*; Vidal-Abarca, Maria del R.*[1]*; Suárez, Maria L.*[1]*; Tockner, Klement*[2]

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TERRESTRIAL INVERTEBRATE ASSEMBLAGES ALONG SPATIAL AND TEMPORAL GRADIENTS IN TEMPORARY STREAMS.

The transition of a riverbed from an aquatic to a terrestrial state represents a critical temporal ecotone that has been poorly explored. Dry river beds provide habitats for diverse aquatic and terrestrial assemblages, regulate the transfer and transformation of energy and materials, and define the resilience of the system. Although dry river beds have most recently been identified as habitat for a unique set of terrestrial invertebrates, and different from adjacent riparian zones, little is known about how the duration of the dry period affects the colonization by terrestrial invertebrates and how the transition from aquatic to terrestrial conditions influences terrestrial assemblages in adjacent areas (riparian and upland habitats).

We used pitfall traps to sample terrestrial invertebrates from three different habitat types (channel, riparian and upland) in two reaches (intermittent and permanent) of two temporary streams in Spain (Rogativa and Fuirosos streams). To follow the temporal dynamics of invertebrate assemblages, we sampled invertebrates 2, 4, 10, 15 and 29 days after complete surface desiccation in both reaches within each of the two rivers.

We collected a total of 12,637 invertebrates from 30 major taxonomic groups. Invertebrate assemblages differed significantly between the two study streams. Nonetheless, Aranea, Formicidae and Coleoptera were the most abundant groups in both streams. No major differences in terrestrial assemblages were observed between permanent and intermittent reaches within each stream, but differences among habitat types were more evident in intermittent reaches, where the abundance of dominant taxa tended to decrease from the channel towards the upland. Unexpectedly, no distinct differences among sampling dates were observed, reflecting stable invertebrate assemblages over time and no major effect of time since surface drying.

The present results clearly emphasize the importance of dry river beds for terrestrial assemblages that differ in their composition and density from the assemblages in riparian and uplands habitats. Dry river beds provide suitable habitats for ground-dwelling arthropods during the dry period.

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AE.3

Pedrosa, João A. da M.[1]*; Berardino, Cocchiararo*[2]*; Machado, Ana L.*[3]*; Soares, Amadeu M.V.M.*[3]*; Nowak, Carsten*[2]*; João, Pestana*[3]

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METAL CONTAMINATION, GENETIC DIVERSITY AND MACROINVERTEBRATE COMMUNITIES OF FRESHWATER ECOSYSTEMS: A MULTILEVEL APPROACH IN PORTUGUESE FRESHWATER ECOSYSTEMS

Genetic diversity is the raw material in which selection acts and subtle changes at this level have the capacity to impact higher levels of biological organization. In this context, long-term metal contamination is of major concern once decreased levels of genetic diversity may be observed in natural populations inhabiting metal polluted with possible negative consequences in the maintenance of long-term productivity and viability. According to this, quantifying effects on the genetic diversity of populations may contribute for a more comprehensive understanding about the dynamics and health of freshwater ecosystems and provide complementary information to the routinely environmental monitoring methods focused on community level endpoints.

In this study, we investigated if historical metal pollution affects the genetic variability and structure of natural populations. For this purpose, seven polymorphic microsatellites were analysed in the non-biting midge species C. riparius because it plays a key-role in aquatic ecosystems, it is widely distributed and it is a model organism used in sediment toxicity assays.

Genetic diversity was estimated for field populations of 4 historically metal contaminated sites located in different Portuguese river basins, the mining area of Panasqueira (Zêzere river) and industrial areas of Águeda (Águeda river), Braga (Este river) and Estarreja (Antuã river) and 4 adjacent reference points. Moreover, effects on the community level were also assessed and several metrics, including biotic and diversity indices, were used to compare macroinvertebrate communities of the reference and contaminated sites.

Finally, the results are discussed highlighting the importance of genetic measures of benthic freshwater species and their use as a biomarker of environmental contamination compared to traditional measures of community structure and composition. We also discuss the unique characteristics of C. riparius as a model organism in evolutionary toxicology studies.

EH.1

Peñas, Francisco J.; *González, Alexia M.; Estévez, Edurne; Rodríguez-Castillo, Tamara; Álvarez-Cabria, Mario; Silió-Calzada, Ana; Álvarez-Martínez, José M.; Lezcano, María; Barquín, José*

Environmental Hydraulics Institute "IH Cantabria", University of Cantabria

ALTERNATIVE STRATEGIES TO ASSESS HYDROLOGICAL ALTERATION ACCORDING TO DATA AVAILABILITY

The natural flow regime has been largely modified in rivers around the world. Understanding the extent to which flow regime deviates from natural conditions is a mandatory task to propose sound management and restoration measures. "Indicators of Hydrologic Alteration" is currently seen as an effective tool for assessing the hydrologic alteration (HA). However, several factors such as the climatic variability or land use modification between the pre and post-impacted series may greatly influence the hydrological assessment. Moreover, the scarcity of hydrological data in many impaired rivers prevents the application of this method. We present a protocol that provides 5 alternative designs to assess the hydrological alteration: 1) Paired-Before-After-Control-Impact (BACIP); 2) Before-After (BA); 3) Control-Impact (CI); 4) Hydrologic Classification (HC) and 5) Predicted Hydrologic Indices (HP). BACIP allows evaluating the alteration caused by the perturbation and it controls for natural changes between periods. Hence, it has been considered as the reference benchmark for all the other designs. The application of the protocol to 11 reservoirs situated in the northern third of the Iberian Peninsula highlighted that BA correctly evaluated 75 % of the HAs when it was compared with BACIP. This indicated the little influence of climate variability between the pre- and post-impact series. Similarly, the agreement between BACIP and CI indicated the suitability of hydrological classification for the selection of controls. Our results also pointed out that critical thresholds for the HA varied depending on the hydrological index been considered. This range went from less than 5% for the number of days with increasing and decreasing flows and over 64% for the duration of low flow pulses. Finally, the application of HC and HP designs revealed a significant degree of uncertainty related with the intra-class variability and the predictive error of the models. This inhibited the evaluation of 25% of the analysis. However, in the evaluable cases HC and HP designs correctly assessed over 75% of the HA which highlighted the potential usefulness of these methods when streamflow data is scarce.

EF.12

Pereda, Olatz; *Larrañaga, Aitor; Aristi, Ibon; Arroita, Maite; Flores, Lorea; Solagaistua, Libe; Elosegi, Arturo*

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EFFECTS OF AERATION AND SEDIMENT GRAIN SIZE ON INVERTEBRATE INTERACTIONS AND LITTER BREAKDOWN

Human impacts such as water abstraction reduce turbulence and create isolated pools in streams, thus reducing water oxygenation, what could affect invertebrate interactions and ultimately ecosystem functioning. These effects might differ between benthos and hyporheos, and depend, among others, on grain size, as it controls the permeability of organisms to the hyporheos. Additionally, breakdown of hyporheic organic matter could be affected by the availability of organic matter on the benthos, as this would be a preferred food source for large invertebrates. In a laboratory microcosm experiment that lasted 28 days, we manipulated levels of aeration, sediment size and availability of superficial organic matter (alder leaves). We enclosed 6 individuals of the mayfly Habroleptoides and 4 individuals of the stonefly Capnioneura in each microcosm, and studied the consumption of organic matter in the different treatments. Lack of aeration caused a reduction of oxygen saturation from 93% to 70%, and significantly reduced decomposition, especially on the benthos. The availability of alder leaves on the benthos significantly reduced the decomposition of hyporheic alder leaves. Death rates for Capnioneura were higher than for Habroleptoides (84% compared to 10%, on average), in part affected by predation by the mayfly. Death rates of Capnioneura were significantly higher in fine sediments, as low substrate permeability increased predation risk. Despite this reduction of the number of consumers in fine sediments, decomposition occurred significantly faster. Our results suggest that water abstraction can affect the trophic interactions among macroinvertebrates and the decomposition of organic matter, depending on substrate and spatial distribution of organic matter.

AE.2

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EFFECT OF SUNLIGHT ON CADMIUM CONTAINING NANOPARTICLES (QUANTUM DOTS) TOXICITY

Cadmium containing nanoparticles (NPs), known as quantum dots, are small, semiconductor NPs that are increasingly being applied in existent and emerging technologies, especially in biological applications due to their exceptional photophysical and functionalization properties. However, they are very toxic compounds due to the highly reactive and toxic cadmium core. The application of shell and surface capping to quantum dots has been used to improve their optical capabilities and reduce toxicity, though most existent studies focus on their cytotoxicity and the effect of UV light irradiation, as opposed to the effect on the ecosystems.

Therefore, this study aimed to determine the toxicity of three different NPs pre and post exposure to sunlight, in order to assess the effect of environmentally relevant irradiation levels in their toxicity, which will act after their release to the environment. A battery of ecotoxicological tests was performed with organisms that cover different functional and trophic levels (Daphnia magna, Raphidocelis subcapitata, Chlorella vulgaris and Vibrio fischeri) at defined concentrations in order to determine EC values.

The results showed that both quantum dots were very toxic to all tested species pre-exposure, while post-exposure tests caused an effective decrease in toxicity for CdSeS/ZnS and CdS 480, and an increase in CdS 380. The results of this study suggest that sunlight exposure has an effect in the aggregation and precipitation reactions of larger quantum dots, causing the degradation of functional groups and formation of larger bulks which are less prone to photo-oxidation due to their diminished surface area.

EF.8

Pereira, Ana[1]*; Trabulo, José*[1]*; Fernandes, Isabel*[1]*; Pascoal, Cláudia*[2]*; Cássio, Fernanda*[2]*; Duarte, Sofia*[1]

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SEASONAL EFFECTS OF EUTROPHICATION ON LITTER DECOMPOSITION AND ASSOCIATED FUNGAL AND INVERTEBRATE COMMUNITIES

In low-order forested streams allochthonous organic matter, from the riparian vegetation is the main source of nutrients and energy for aquatic biota. The decomposition of this organic matter, mainly leaves and twigs, is carried out mostly by microbes and invertebrate shredders. In particular, aquatic hyphomycetes are a group of fungi that produce a variety of extracellular enzymes that degrade the structural polysaccharides of plant-litter cell walls, improving leaf palatability to invertebrate shredders. Several studies have shown that seasonal alterations of water temperature strongly influence biological processes and freshwater decomposer communities. However, how these alterations affect stream-dwelling decomposer communities remains poorly understood, in particular in human-impacted streams. In this study, we immersed Quercus robur L. leaves in 5 streams along a gradient of eutrophication in the NW Portugal in autumn 2012 and spring 2013, during 43 days. We assessed leaf decomposition and activity and diversity of the associated fungal decomposers and invertebrates. We observed a significant interaction between season and eutrophication, as a result of higher decomposition rates and shredder biomass observed in spring, in streams with moderate levels of eutrophication. On the other hand, fungal sporulation and biomass was stimulated at moderate levels of eutrophication, and inhibited in the hypertrophic stream, but no differences were observed between seasons. Higher fungal diversity (from sporulating species) was also found in spring at moderate eutrophic streams. The dendrogram analyses of fungal communities assessed from sporulating species and DGGE fingerprints of fungal DNA on leaves revealed shifts in the community composition between seasons and along the gradient of eutrophication. Overall, our results suggest a significant interaction between season and eutrophication that resulted in higher leaf decomposition rates, shredder biomass and fungal diversity in moderately eutrophic streams in spring.

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EF.18

Gomes, Patrícia P.[1]*; Medeiros, Adriana O.*[2]*; Gonçalves, José F. Jr*[1]

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A QUÍMICA DO DETRITO INFLUENCIA A COLONIZAÇÃO FÚNGICA?

A diversidade de espécies vegetais em ambientes ripários tropicais resulta em detritos com uma ampla variedade de compostos químicos. Esta variedade promove uma colonização seletiva por hifomicetos aquáticos, os quais desempenham um papel chave no condicionamento e degradação do detrito foliar. Neste trabalho, nós avaliamos a diversidade de hifomicetos aquáticos associados a folhas de 15 espécies ripárias (14 nativas e uma exótica) incubadas em um córrego tropical. Sacos de folhas de malha fina (20x20 cm, 0,5 mm de malha) contendo 2,0 ± 0,01 g de cada espécie foram incubados por 10 dias no córrego. Após este período, os sacos foram retirados e levados para o laboratório. A esporulação fúngica foi induzida por aeração de 10 discos de folhas condicionadas (12,0 mm de diâmetro) de cada saco de malha fina em 30,0 mL de água destilada sob agitação (60 rpm), por 48 ± 4h a 20º C. Alíquotas de 2,0 a 10,0 mL da suspensão de esporos foram filtradas em membranas de 5,0 µm. Os filtros foram fixados e corados com uma solução de 0,1% de azul de algodão em lactofenol e examinadas em microscópio óptico para determinar o número total de esporos produzidos e identificar as espécies. Os resultados indicaram que a atividade reprodutora dos hifomicetos aquáticos variou em relação à espécie de folha colonizada, sendo os menores valores (1 esporo/PSLC/dia) registrados para Calophyllum brasiliensis e Emmtum nitens. O maior número de esporos (307 esporos/PSLC/dia) foi observado para Eucalyptus camaldulensis, seguido de Maprounea guianensis (175 esporos/PSLC/dia) e Protium sprucianum (128 esporos/PSLC/dia). A maior contribuição de hifomicetos aquáticos (seis espécies) foi observada em M. guianensis e Paullinia carpopodea. Por outro lado, as espécies C. brasiliensis, E. nitens e Richeria grandis foram colonizadas apenas por Anguilospora filliformi, espécie de hifomiceto aquático mais abundante em todos os detritos analisados. Estes resultados evidenciam que as diferentes espécies de hifomicetos aquáticos colonizam e se desenvolvem em uma ampla gama de substratos, todavia as características físicas e químicas destes substratos podem interferir na diversidade fúngica no ambiente.

IS.4

Pereira, Joana L.[1]*; Costa, Raquel*[2]

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SUSTAINABLE APPROACHES FOR THE MANAGEMENT OF THE INVASION BY THE ASIAN CLAM CORBICULA FLUMINEA

The invasive Asian clam Corbicula fluminea may severely affect freshwater ecosystems as well as act as an intense macrofouler in infested freshwater-dependent industries. Several research questions remain unaddressed that can contribute to the improvement of control methods and mitigation strategies for this pest. In this context, different studies addressing aspects such as economic impacts, particular traits of the species biology, alternative control techniques and suitability of the species as bioremediators will be presented. The invasion of the Asian clam in Portugal was monitored, by updating the species distribution, as well as assessing the target industries regarding biofouling-derived damage and costs. Despite the picture is not yet as severe as in other invaded countries, awareness was raised and the data collected may assist the implementation of effective pest management policies. The improvement of control strategies for the pest was addressed through (i) testing of chemicals that may assume dual function, as actors within the industrial process and as biocides; (ii) testing of chemicals proven effective against other bivalve biofoulers; (iii) assessing the efficiency of the combination of different chemical biocides and of these with depressed abiotic conditions; (iv) assessing the efficiency of biological control strategies. Results indicate e.g. low, environmentally acceptable concentrations, seem to deliver adequate control levels in long-term dosing schemes; the sensitivity of the clam to particular physiological stressors may constitute a breakthrough for increasing the efficiency of chemical control strategies; biological control methods may eventually have a chance on the basis of the clam's avoidance behaviour relatively to different predators. It is still prudent to recognise that the Asian clam is a particularly troublesome biofouler, and there might be a long way to go until control methods that are cumulatively efficient, cost-effective and environmentally friendly are available. In this way, the possibility of using the powerful filtration and contaminant accumulation abilities of the species in our favour has been studied in parallel. The potential of the clam as a bioremediation tool was evidenced in laboratorial experiments, supporting the suitability of taking profit from the species to offset its damages.

EF.19

***Pérez, Javier**; Sagarduy, Mikel; Martínez, Aingeru; Larrañaga, Aitor; Molinero, Jon; Basaguren, Ana; Pozo, Jesús*

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EFFECT OF THE WATER LEVEL FLUCTUATIONS ON LEAF-LITTER PROCESSING IN HEADWATER STREAMS

The effects of hydrological regime on the functioning of headwater streams have usually being assessed by means of structural indicators, but rarely using functional approaches. We study the leaf-litter decomposition, an ecosystem critical process which integrates the activity of different organisms, at different inundation levels in three streams during autumn (Nov.2012/Jan.2013) and spring (Apr.2013/Jun.2013). Alder leaf-litter [Alnus glutinosa (L.) Gaertn.] was incubated using fine (0.5 mm) and coarse (5 mm) mesh bags at 4 different levels (a: outside the flooding channel, b: close to the interface (‹10cm), c: intermediate (10-15cm) and d: deep riffles (20-25 cm) in each stream. The punctual location of each pair of bags was monitored every week during the study period. Additionally, continuous measures of temperature and discrete samples of water for nutrient analyses were taken. At the end of each experiment leaf mass loss rates, elemental (CNP) composition and associated detritivores were analyzed. In both seasons decomposition rate in coarse mesh bags clearly responded mainly to the presence/absence of water more than to the water depth, being microbial activity less affected, even in terms of leaf conditioning. The leaf-litter decomposition outside the channel appeared to be almost exclusively related with microbial activity, being there scarce signals of detritivore activity in both seasons. On the contrary, benthic detritivores were the main drivers of the in-stream processing, explaining the great inter-seasonal differences.

GC.3

***Pérez-Martínez, Carmen**[1]; Jiménez, Laura[1]; Rühland, Kathleen[2]; Michelutti, Neal[2]; Conde-Porcuna, José M.[1]; Smol, John P.[2]*

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DIATOM SHIFT AND CHLOROPHYLL INCREASE AS EVIDENCE FOR 20TH CENTURY CLIMATE WARMING IN SIX ALPINE LAKES FROM SIERRA NEVADA

Changes in diatom assemblage composition and Chlorophyll a content were examined from the sediments of six lakes in Sierra Nevada Mountains at elevations of roughly 2900-3050 m.a.s.l. The lakes were selected to represent the regional heterogeneity of the lakes. Sediment cores were sectioned at a high resolution and dated using gamma spectrometry techniques by measuring 210Pb and 137Cs activities. Our temporal study period was the last 150 years.

All six lakes reveal dramatic increases of inferred chlorophyll a concentrations within the last 50 years, following prolonged intervals of comparatively low values. The chlorophyll a increase occurs at the 60-70s and were correlated to the temperature values, obtained by long instrumental temperature series, in all lakes.

Diatom assemblages show conspicuous shifts around the 1970s in RS, BG, AV and MC Lakes. Declines of a variety of epiphytic and/or acidophilus taxa (Gomphonema spp, Pinnularia spp., Tabellaria flocculosa, Eunotia spp.) in the upper intervals of the cores were synchronous with the increase of alkaliphilous Staurosirella pinnata and other small taxa as Navicula spp. and Nitzschia spp. A further remarkable change is the decrease of the heavily silicified, tychoplanktonic Aulacoseira alpigena. These changes occur roughly synchronously between this four lakes and with the temperature increase recorded at the 70s by the instrumental temperature series. The main variation in diatom species assemblage was summarized by a principal components analysis (PCA). Both PCA 1 scores and Chlorophyll are correlated to temperature in all these four lakes.

In the two lakes without surrounding meadows, RSS and CD Lakes, the diatom changes occur earlier, at the turn of the XIX century, and are less significant than in the rest of the lakes. PCA 1 scores is not correlated to temperature in RSS Lake
Several possible mechanisms for these recent changes are examined, including direct anthropogenically derived changes, however we conclude that climatically induced limnological changes associated with a longer duration of ice free period can best explain the direction and magnitude of changes in our diatom and chlorophyll a record.

SS2.10

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EXTREME VARIABILITY IN PCO2 FROM A SUBTROPICAL FRESHWATER COASTAL LAKE (FLORIANOPOLIS, BRAZIL)

Temporal and spatial variation of partial pressure of CO2 and O2 in a subtropical freshwater coastal lake were examined to test the hypothesis that spatial variation in pCO2 occurs mainly due to DOC variation and depth; and temporal variation is influenced by temperature. Peri Lake was investigated monthly over six years in order to assess the amount of spatio-temporal variation of pCO2 and pO2 and, to determine its role in the regional and global carbon budgets. Peri Lake is spatially homogeneous according to most variables analyzed, but pCO2, DOC and chlorophyll-a showed difference among sampling points. Temporal variations in pCO2 was detected oscillating from below saturation (38 µatm) up to highly saturated (16,477 µatm) and the increase in pCO2 has been related to increase in chlorophyll-a and decrease in Secchi depth. Nearly 67% of the months sampled were supersaturated in CO2 and consequently functioned as source of CO2 to the atmosphere (pCO2 lake › pCO2 atmos). Annually, we observed predominance of net CO2 release; however, in 2009 lower pCO2 occurred in relation to the atmosphere, due the high pH values. The respiration index showed low values during all study period and in 20% of the months. pCO2 was strongly correlated with pH, weakly correlated with DOC and showed no correlation with temperature. Seasonally, multiple regression analysis showed several limnological and climatic variables that explained a statistically significant amount of variability in pCO2 in different ways, including chlorophyll-a concentration, precipitation and wind. These data provide a first large-scale overview of pCO2 in Peri Lake, its extreme variability and low respiration index, in which the environmental conditions in the lake favour respiration instead of primary production providing a predominantly supersaturated condition in CO2.

EF.1

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AUTOTROPHIC PICOCYANOBACTERIA DOMINANCE IN A MEROMICTIC KARSTIC LAKE. ECOLOGICAL SIGNIFICANCE.

Dominance of cyanobacteria in aquatic ecosystems has been extensively studied in both saltwater and freshwater ecosystems; freshwater ecosystems show significant gradients and diversity of environments and this dominance shifts between unicellular species in oligotrophic waters to filamentous species at higher trophic levels. Many mechanisms have been described which justify the dominance of cyanobacteria over the rest of eukaryotic phytoplankton in different ecosystems studied. In this work we discuss different mechanisms that explain dominance of autotrophic picocyanobacteria (APC) in Lake La Cruz and the ecological consequences of this dominance. Lake La Cruz is a small and deep meromictic lake with a seasonal strong thermal stratification and a permanent carbonate oversaturation with annual whiting events. Seasonally develops a sharp thermocline from April to October with the development of highly productive deep chlorophyll maximum (DCM). The main photosynthetic microorganisms were autotrophic picocyanobacteria, larger eukaryotic phytoplankton, and photosynthetic sulfur bacteria. Despite the diversity of photosynthetic microorganisms found in Lake La Cruz APC dominate in abundance, in biomass and in inorganic carbon assimilation. In abundance APC represents, in annual average, more than 97 % of the total abundance of photosynthetic microorganisms, although, the rest of photosynthetic microorganisms can be seasonally significant in terms of biomass. Oxygenic photosynthesis is the most important process of inorganic carbon assimilation accounting for 89.7% (164 g C m-2 yr-1) of total inorganic carbon assimilation, where APC is responsible of 80% of this assimilation. The classical mechanisms of dominance are relevant but not enough to justify the dominance of APC in lake La Cruz, different bioassays and experiments show a close relationship between this dominance and the phosphorus cycle in the lake. Whiting phenomena also seem to have an important role in these processes. Addition of phosphate triggers a very rapid response with a fast uptake and transformation of soluble phosphorus to intracellular polyphosphate granules reestablishing the limiting concentration of soluble phosphorus in the lake. APC and some populations of heterotrophic picoplankton are the responsible of this uptake and storage. This strategy becomes very significant to explain the dominance of APC in this kind of aquatic ecosystems with significant ecological consequences.

SS1.6

Primo, Ana L.[1]*; Marques, Sónia C.*[1]*; Azeiteiro, Ulisses M.*[2]*; Pardal, Miguel Â.*[1]

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ESTUARINE ICHTHYOPLANKTON AND EXTREME CLIMATIC EVENTS: COMMUNITY STRUCTURE, DYNAMICS, AND TROPHIC INTERACTIONS

Worldwide coastal ecosystems are strongly affected by variations in climate through alterations in freshwater input and increased temperature. Recent variations in the precipitation regime across southern Europe have led to changes in river fluxes and salinity gradients, affecting biological communities in most rivers and estuaries, such as planktonic assemblages. A long-term monitoring programme (2003-2010) on the ichthyoplankton communities of the Mondego estuary (Portugal) allowed a better knowledge of the functioning of estuarine larval communities, their links with adjacent coastal areas and responses to local climate variability, namely two recent drought events.
The ichthyoplankton community was dominated year round by the estuarine species Pomatoschistus spp., with seasonal importance of migrant marine species. Generally, the community showed a clear seasonal pattern with higher abundances and distinct community structure during spring and summer. However, there was no distinction between sampling sites. Drought events did not affect ichthyoplankton community structure: the main changes observed were related to a spatial displacement of salinity gradient within the estuary, echoed by marine species distributions. Results indicated that dry periods could influence trophic interactions, affecting primary productivity, zooplankton and potential predators such as fish larvae and juveniles, and jellyfish. Low freshwater inflow affected larval vertical distribution and migration patterns, influencing the transport of larvae to/from adjacent coastal areas and to the upper reaches, as well as the overall nursery function of the estuary.

AMWQ.3

Pujante, Ana M.[1]*; Barrios, Elena*[2]*; Puig, Alejandra*[2]*; Ruza, Javier*[2]

[1]*Laboratorios Tecnológicos de Levante S.L.;* [2]*MAGRAMA*

METODOLOGÍA PARA EL ESTABLECIMIENTO DE LAS CONDICIONES DE REFERENCIA Y LAS COMUNIDADES DE REFERENCIA EN LAS MASAS DE AGUA SUPERFICIALES DE LA CATEGORÍA RÍO

La Directiva 2000/60/CE establece cinco clases de estado ecológico, en función del grado de alteración de la masa de agua respecto a sus condiciones de referencia: muy buen estado, buen estado, estado moderado, estado deficiente y mal estado; siendo las condiciones de referencia aquellas que representan los valores de los indicadores de calidad ecológica de ese tipo de masa de agua en muy buen estado. En esta comunicación se presenta la metodología utilizada en el establecimiento de las condiciones de referencia y los límites de cambio de clase de estado ecológico para las 32 tipologías definidas dentro de la categoría ríos en España. El análisis se ha realizado con los datos procedentes de los programas de control de las diferentes Administraciones Hidráulicas: Confederaciones Hidrográficas, Agencias del Agua, etc., correspondientes a los años 2009-2011. Se han analizado los datos de 652 puntos de control ubicados en 410 masas de agua consideradas de referencia. Tras varios intercambios de información con las diferentes Administraciones se confirmó la existencia de 388 estaciones de referencia. Posteriormente se realizaron los análisis estadísticos descriptivos (mediana, percentiles, desviación estándar, intervalo de confianza, etc.), que permitieron establecer la propuesta de condición de referencia y de los límites de cambio de clase para las siguientes métricas: IBMWP, IPS, tasa de saturación de oxígeno, oxígeno disuelto, pH, nitratos, fosfatos y amonio. Para los tipos sin datos o con datos insuficientes, se realizó una propuesta interpolando los valores establecidos por criterio de experto con los valores obtenidos en los tipos con suficiente información. Se han analizado las comunidades biológicas, mediante técnicas multivariantes no paramétricas (ANOSIM, MDS, SIMPER, etc.) y se han establecido las comunidades de referencia para los invertebrados bentónicos y las diatomeas. Se han considerado taxones sensibles a los invertebrados con puntuaciones del IBMWP = 10, y a las diatomeas con un IPS = 5 y un IPV = 1. Finalmente, los agrupamientos obtenidos con los análisis CLUSTER de las comunidades de referencia de invertebrados y diatomeas señalaron una similitud entre ciertas tipologías.

RLWE.13

Quevedo, Luis; *Ibáñez, Carles; Caiola, Nuno; Trobajo, Rosa*

IRTA, Aquatic Ecosystems Program

STRUCTURE OF BENTHIC COMMUNITIES (MACROINVERTEBRATES AND DIATOMS) IN THE LOWER STRETCH OF A MEDITERRANEAN HIGHLY REGULATED LARGE RIVER

This study is the first work including a complete characterization of benthic communities developed through a methodology that cover all the lower Ebro river (Catalonia, Spain) morphological variability and the study area showed a characteristic pattern of anthropogenic alterations (flow regulation and water pollution) present in large Mediterranean rivers. In order to determine species composition, community structure and distribution patterns along spatial and temporal scales, seasonal benthic organism (macroinvertebrates and diatoms) surveys were conducted in five sampling sections. Non-metrical Multidimensional Scaling (MDS), Similarity Percentage Analysis (SIMPER) and 1-way Analysis of Similarities Test were performed to identify differences in community composition and Principal Components Analysis (PCA) was carried out in order to illustrate patterns of association among the main limnological variables and assemblages of benthic communities. River conditions showed a lower degree of eutrophication than levels found in the early nineties, due mainly to reduction in phosphorus levels and it was evidenced that the regulation system influences on the structure and composition of benthic communities. A total of 46 and 67 taxa of macroinvertebrates and diatoms species were identified respectively. The macroinvertebrate community was dominated by Oligochaeta in abundance and by Artropoda in species richness. Our results compared with previous studies allowed to identify the follow changes in the ecology of the river: the appearance and proliferation of black fly larvae (Simulium erythrocephalum), the decrease in abundance of the filter feeding mayfly larvae of Ephoron virgo and the presence of invasive species of bivalves (Dreissena polimorpha, Corbicula fluminea). Diatom assemblages showed temporal differences associated with seasonality. The community was dominated by Nitzschia and the genus with the highest number of taxa was Navicula. The most abundant species were Amphora pediculus, Nitzschia dissipata var. dissipata and Cocconeis placentula var. lineata. Opposed to our initial expectations, in all studied river sections, community structure showed no significant differences as a function of the hydromorphological variability, with one exception for macroinvertebrates at the uppermost sampling section (near Flix dam) which is attributable to the direct influence of the dams, the main anthropogenic factor exerting pressure on the lower Ebro River.

RLWE.17

Rasines-Ladero, Rubén[1]; *Iepure, Sanda*[1]; *Llorente-García, Rosa M.*[2]; *Chocrón-Niego, Ilan*[3]; *Ramos-Cobos, Iván*[3]

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INFLUENCE OF HABITATS HETEROGENEITY OF GROUNDWATER-FEED STREAMS ON HYPORHEIC CRUSTACEANS, IN A MEDITERANEAN RIVER BASIN, IBERIAN PENINSULA

The hyporheic zone of stream ecosystems located at the transition between surface channel and groundwater, exhibits a patchy discontinuum on longitudinal transect, inducing changes in structure and functioning on biotic communities. Crustacean communities' diversity and distributions were investigated in the fluvial hyporheic zone of two groundwater-fed streams (Henares and Tajuña Rivers) in central Spain. Both streams were characterized by a great habitat heterogeneity along the hyporheic flowpath reflected in lithology, geology (carbonates vs. siliceous rocks), water discharge, riverbed permeability, surface/groundwater exchanges and human-induced disturbances (dams, river channel strengthening). The surveys were conducted at two base flow hydroperiods in 2012. Individual measures of physico-chemical parameters (water, sediments organic matter as loss on ignition), water discharge and sediment size were measured at 20-40 cm depth in 20 hyporheic sites. Pearson correlations results indicate that total abundance of crustaceans are positively related to fine sands (Pearson, r=0.75, p< 0.05) and total susspended solids (r=0.69, p <0.05) and negatively with water quality as measured by simplified water quality index (SWQI, r=-0.52, p<0.05). The results also showed that Cyclopoida and Ostracoda were highly diverse (with 16 and 14 species, respectively), but only three are stygobites. Factors such as carbonate substratum, high permeable riverbeds and groundwater upwelling contribute in shapping a diverse Cyclopoida and Ostracoda assemblages (25 species) of mixed ecology (stygobites/stygophiles/stygoxenes). Conversely, low mineralized waters, siliceous riverbeds with reduced permeability and relatively less active surface/ground water exchanges are asociated with low diversity of both groups (11 species) and assemblages are composed exclusively from stygophiles/stygoxenes. The swift of riverbed from predominantly siliceous (Henares) and carbonates (Tajuña) to low permeable gympsum-evaporites substrates at the confluence with the Jarama River, cause a significant decrease of species diversity of both groups, up to species loss. The presence of groundwater endemics (Eucyclops graeteri) and especialy of Tertiary origine (Acanthocyclops sp. kieferi gr.) along the upper and mid-hyporheic flow paths, suggest active exchanges between the hyporheic zone and the shallow Tertiary aquifers. The results obtained highlight the significance of hyporheic crustaceans as proxy for the assessment of environmental conditions and provide forthcoming approaches to depict the surface–subsurface hydrological exchanges.

RLWE.2

Reche, Isabel[1]; *Batanero, Gema L.*[1]; *Mazuecos, Ignacio P.*[1]; *Suttle, Curtis*[2]; *Vittecoq, Marion*[3]; *Amat, Juan*[4]; *Green, Andrew J.*[4]

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LINKING BIOGEOCHEMISTRY AND PROKARYOTIC COMMUNITY IN SALINE WETLANDS

Saline wetlands, characterized by salinities higher than 1 g l-1, compose about a fifth of the total Earth´s lake surface and constitute globally about 45% of the total water volume of inland waters. About 75% of saline lakes are located in endorheic watersheds that retain water. Indeed, most saline lakes are hydrological terminals where nutrients, organic matter and salts largely remain within the basin resulting in high dissolved inorganic and organic carbon concentrations and high water residence times. Consequently, they are usually extremely productive systems. However, despite this global prevalence of saline wetlands, there are few studies linking their biogeochemical peculiarities with their predominant microbial communities.

In this study, we selected 142 saline systems belonging to 8 wetland areas located along the western Mediterranean coast from the Camargue in France to Odiel marshes in Huelva, Sardinia, and Tunisia. Here, we explored the relationships between biogeochemical conditions (water stable isotopes ($\delta^{18}O$, D), salinity, nitrogen, phosphorus and organic carbon, and their prokaryotic community (cyanobacteria, bacteria, arqueas and viruses), and the concentration of exopolymers (carbohydrate exudates from microorganisms). Salinity ranged from 3.3 to 307.6 g l-1. The concentration of dissolved organic carbon ranged more than one order of magnitude from 2.8 to 69.1 mg l-1 and the concentration of total phosphorus more than three orders of magnitude from 9 to 1500 µg l-1. Prokaryotic heterotrophic production (measured as 3H-leucine incorporation) oscillated from 222 to 4033 pmol l-1h-1 with an exponential decrease as salinity increase. Arqueal production (measured as 3H-leucine incorporation with a previous erythromycin bacterial inhibition) ranged from 28 y 2290 pmol l-1h-1 and showed just the opposite pattern, increasing exponentially with salinity. The abundance of virus ranged two orders of magnitude from 3.6 x107 to 3.1 x 109 particles ml-1 increasing also exponentially with salinity. In a preliminary exploration of the data set, we observed negative and significant relationships between bacterial production and virus abundance and exopolymer concentration. Unexpectedly, we observed a positive and significant relationship (r=0,76, p<0.001***) between the virus abundance and the exopolymer concentration. These results suggest a link among bacterial mortality under salinity stress; exopolymer production and virus abundance.

FW.1

Ribeiro, Lúcia[1]*; Ferreira, Nelson*[2]*; Motta-Marques, David*[1]

[1]*Universidade Federal do Rio Grande do Sul;* [2]*Pontifícia Universidade Católica do Rio Grande do Sul*

FISH COMMUNITY IN A LARGE COASTAL SUBTROPICAL LAKE: HOW AN ENVIRONMENTAL GRADIENT MAY AFFECT THE STRUCTURE OF TROPHIC GUILDS

Biological communities change in time and space following driving pressures from habitat structure, resource availability, interspecific competition, predation and others. Here, we analyze the dynamics of a fish community in a subtropical lake, focusing on the spatial and temporal patterns of species composition, distribution and biomass. Mangueira is a large shallow lake with a mean depth of 3 m, 90 km in length and covering about 820 km2 in Southern Brazil. Limnological and biological data were collected in two sampling sites located in the northern (N) and southern (S) extremes of the lake. Principal components analysis (PCA) showed temporal and spatial gradients in the Mangueira Lake, whereas analysis of similarity (ANOSIM) applied to environmental variables showed significant differences between the North and South. Secchi transparency, DOC and chlorophyll a were driving factors related to this spatial heterogeneity. Northern site presents more turbid water, muddy sediments and increased chlorophyll a concentration, while southern site was characterized by increased water transparency, less chlorophyll a concentration and more PVI (percent volume infested) of submerged macrophytes, demonstrating the strong spatial heterogeneity of ecosystem. Important differences in fish structure of were also identified. Invertebrate eaters were the dominant feeding guild in both the North and South. North/South frequencies of omnivorous fish were quite similar in the 19-21% range, while planktivorous fish presented low captured biomass in both sites. However, it is interesting to note that the dominant main invertebrate eaters were different in both extremes. In the northern sampling site Oligosarcus jenynsii (Characidae) was the dominant invertebrate eater, feeding mainly crustaceans (Aegla sp. and Palaemonetes argentinus). In contrast, the dominant invertebrate eater of the southern sampling site was Odontesthes humensis (Silversidae) consuming mainly mollusks (Heleobia sp. and Corbicula sp.). It was also observed an inversion related to frequencies of detritivorous and mainly fish eaters. Muddy sediments in the Northern site may explain the relative abundance of detritivorous, while sandy sediments and clear waters could be related to increased frequency of fish eaters in the South, supposing easier prey detection.

RLWE.9

Rico, Eugenio

Universidad Autónoma de Madrid. Departamento de Ecología

EVOLUCIÓN DE LAS CARACTERÍSTICAS LIMNOLÓGICAS DEL LAGO DE ARREO: 20 AÑOS DE HISTORIA.

El lago de Arreo (Alava, Norte de España) ha sido monitorizado de forma continua desde principio de la década de los años 1990s. Tras 20 años de datos se aporta una síntesis de la evolución de las principales características limnológicas.
El lago es un sistema mesotrófico que ha sufrido dos tipos de impactos; por un lado, la utilización de sus aguas para usos agrícolas, por otra, la introducción de especies exóticas de peces (Micropterus salmoides, Lepomis gibbosus, Cyprinus carpio) e invertebrados (Procambarus clarkii).

La extracción de agua unida a las características batimétricas de la cubeta ha provocado un cambio del funcionamiento del ciclo de mezcla-estratificación, pasando de ser un lago meromíctico, con acumulación de aguas más saladas en el fondo, a un lago de dinámica holomíctica monomíctica.

Desde al punto de vista biológico, ha existido durante años un buen estado de las comunidades de fitoplancton, macrófitos acuáticos e invertebrados (con presencia escasa de cangrejo rojo). La comunidad piscícola mantuvo un prolongado equilibrio entre las especies alóctonas y autóctonas de peces, favorecida por la existencia del refugio proporcionado por una cobertura total de macrófitos. En la última etapa, un desarrollo desmesurado de la población de cangrejo rojo ha roto el equilibrio, provocando una eliminación total de la cobertura de macrófitos y una alteración de la estructura etaria de la única especie autóctona existente (Tinca tinca). El estado ecológico del lago se ha visto seriamente comprometido, no cumpliendo los criterios de calidad marcados por la Directiva Marco del Agua.

SS2.1

Rochera, Carlos[1]*; Picazo, Antonio*[1]*; Castillo-Escrivà, Andreu*[1]*; Corrales, Maykoll*[1]*; Belenguer, Maria*[1]*; Santamans, Anna C.*[1]*; Benichou, Fatima Z.*[1]*; Valls, Luis*[1]*; Chicote, Alvaro*[2]*; Sánchez, Gema*[2]*; Armengol, Xavier*[1]*; Florín, Máximo*[2]*; Mesquita-Joanes, Francesc*[2]*; Camacho, Antonio*[1]

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ASSESSING PATTERNS OF CARBON METABOLISM IN SHALLOW LAKES FROM THE BIOSPHERE RESERVE OF LA MANCHA HÚMEDA (CENTRAL SPAIN) IN THE FRAMEWORK OF PROJECT ECOLAKE

This communication presents the main advances in the knowledge of the patterns of lake metabolism within the context of ECOLAKE project (CGL2012-38909, MINECO), which aims to test ecological hypotheses related to the flow of organisms, the structure and function of populations, and the transit of nutrients and biogeochemical cycles in shallow endorheic lakes, paying attention to the community as a whole. The project focuses on shallow lakes located at the Biosphere Reserve of La Mancha Húmeda (Central Spain), which entails some unique ecosystems in the European context, though they are suffering different levels of degradation. Large differences of salinity and trophic status occur among this set of lakes. Our surveys show hypersaline lakes characterized by high dissolved organic carbon (DOC) concentrations, as well as low oxygen concentrations and, frequently, a high alkalinity. Apart of catchment geology, this high accumulation of salts and DOC results both from a negative hydrologic balance from spring to summer and the catchment's flows convergence that is characteristic of these endorheic lakes. The community-level physiological profiles of samples from the lakes showed a lower functional diversity as salinity increases, which is probably related to the accumulation of recalcitrant DOC but also with a less diverse bacterioplankton community. We measured dissolved organic matter (DOM) excitation–emission matrices by fluorescence as a proxy of DOM origin and nature, which also captured most variation among lakes, likely related with the evapo-concentration and in-lake transformations of nutrients. With regard to lakes' metabolism, both planktonic primary production and respiration were seasonally regulated by nutrients, light and temperature and predominantly resulted in a net autotrophic dominance, except during cool season. Both planktonic primary production and planktonic respiration correlated only partially, suggesting also a role of benthic primary production sustaining plankton respiration. However, the noticeable eutrophic conditions in some of the lakes and the sediment re-suspension sometimes produced low transparency of water, which likely had also a negative impact on the benthic photosynthetic community. All these outcomes will be discussed in the framework of this paper.

AE.7

Rodrigues, Andreia C.M.[1]*; Quintaneiro, Carla*[1]*; Gravato, Carlos*[1]*; Barata, Carlos*[2]*; Soares, Amadeu M.V.M.*[1]*; Pestana, João L.T.*[1]

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EFFECTS OF CHLORANTRANILIPROLE AND ESFENVALERATE ON TWO AQUATIC INSECTS AT DIFFERENT LEVELS OF BIOLOGICAL ORGANIZATION

Benthic communities are often dominating by detritivores species in terms of biomass and number. Moreover, most detritivores in Iberian freshwaters are insects and consequently these communities are sensitive to insecticide contamination. Therefore, studies using aquatic insects are required for an accurate prediction of pesticide effects on the ecological integrity of freshwaters.

Our study focused on the effects of two recent and widely applied neurotoxic insecticides, the anthranilic diamide chlorantraniliprole, and the pyrethroid esfenvalerate. We used two aquatic detritivores species: the caddisfly Sericostoma vittatum and the midge Chironomus riparius. Both species are present in Iberian streams and play an important role on detritus processing.

Laboratory ecotoxicity tests were performed to evaluate the different sensitivities of both species to the selected insecticides at different levels of biological organization (survival, growth, development rate, feeding rate, biomarkers).

In environmental toxicology studies, the most used biomarkers are the cholinesterases due to their role in neurotransmission and the antioxidant defenses. In this study, we determined the acetylcholinesterase, antioxidant enzymes (catalase – CAT) and glutathione-S-transferase – GST) and the levels of lipid peroxidation (LPO). Cellular energy allocation (CEA) was also measured to evaluate effects on energy reserves (total lipid, protein and sugar content) and energy consumption (electron transport activity – ETS).

Esfenvalerate was the most toxic insecticide, causing feeding inhibition of S. vittatum at concentrations as low as 5 ng/L and impaired growth and emergence rate of C. riparius at 7 ng/L and 14 ng/L, respectively. Exposure to Chlorantraniliprole also caused feeding inhibition of S. vittatum (LOEC = 0.5 µg/L) and affected C. riparius' growth rate and emergence (LOEC = 5 µg/L). Chlorantraniliprole significantly reduced the activity of CAT and GST in C. riparius at concentrations similar to that tested for organismal endpoints, whereas esfenvalerate significantly affected CAT activity. Both insecticides significantly affected the cellular energy budget measured as increased ETS activity.

The results of this ecotoxicological evaluation are not only discussed in terms of the relative toxicity of these insecticides to both species but also considering the sensitivity and ecological relevance of the several endpoints measured.

BB.3

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FACTORS SHAPING GROUNDWATER OLIGOCHAETE BIODIVERSITY AT THE REGIONAL SCALE

Stygobiont oligochaete species in the Cantabrian region are diverse and exhibit a high degree of endemicity as well as marine phyletic affinities. We aim to identify the environmental factors that determine the stygobiont assemblages at the regional scale. We sampled a total of 58 sites in 7 hydrogeological units, and recorded 7,000 specimens which rises to 32 genera and at least 62 species (15 stygobiont) the richness of the region. Multivariate (n-MDS) analyses show that major determinants of occurrence and distribution of stygobiont oligochaetes are latitude, longitude and water conductivity and thus, we infer that historical events may provide a better explanation than environmental variables of the stygobionts distribution. In fact, we found a decreasing gradient in the number of stygobiont species towards the West, where the oldest karsts (Palaeozoic carbonate rocks) in the region are located. Stygobiont species are found within the range of 0 – 1000 m altitude, and species with marine phyletic affinities are present even at the highest altitude sites; Pleistocene glaciations were limited to the highest Cantabrian massifs, glaciers were relatively small, and in the majority of the Eastern karsts there was only periglacial influence, which favoured karstification and groundwater habitat formation. From the Middle Pleistocene (250 ky BP), successive glacial and interglacial periods produced a consecutive series of marine regression-transgression events, which could have influenced colonization of groundwater by marine ancestors. Marine regressions must have been a major determinant as indicated by the high number of thalassoid stygobionts (p.e. Phallodrilinae and Troglodrilus) found in the study area; however, current distance from the sea shore has only minor influence in the n-MDS ordination. Conductivity is also a major factor affecting the occurrence of the stygobiont oligochaete fauna, which is a surrogate of the presence of marine intrusion, or specific rock lithology. Dissolved oxygen, pH and sediment organic content have little influence in stygobionts occurrence, although they appear to be more relevant environmental factors to influence the total oligochaete community.

SS2.2

Rodríguez-Castillo, Tamara*; González, Alexia M.; Estévez, Edurne; Álvarez-Cabria, Mario; Peñas, Francisco J.; Silió-Calzada, Ana; Álvarez-Martínez, José M.; Lezcano, María; Barquín, José*

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LONG-TERM EVOLUTION OF ECOSYSTEM METABOLISM IN ATLANTIC RIVERS

Over the last few years, functional indicators (e.g. nutrient uptake, organic matter decomposition rates or secondary production) have been proposed as a valuable tool to assess ecosystem health. Ecosystem processes are controlled by a broad range of variables, integrating environmental conditions through time. These are the result of numerous interactions between different structural ecosystem components (i.e. physical, chemical and biological). In freshwater ecosystems, river metabolism (primary production and ecosystem respiration) constitutes the processes controlling nutrient cycling and organic matter processing and, thus, provides critical information defining the river ecosystem functioning rates. However, the relatively short duration of most studies estimating river metabolism limits our ability to identify important long-term controls and patterns. This study focuses on the long-term evolution of river metabolism, using 6 years of continuous recording in six Atlantic catchments. Flow, depth, water temperature, pH, conductivity, turbidity, dissolved oxygen concentration and ammonium were recorded at 5-min intervals from 1 January 2007 to 31 December 2012 at one monitoring station located on the lower course of the Sella, Deva, Pas, Besaya, Miera and Asón river catchments (Northern Spain). River metabolism was estimated from the water temperature and dissolved oxygen concentration measurements using the single station open-channel method and the night-time regression method was used to calculate the reaeration coefficient. Results showed interannual and seasonal patterns in the metabolism that had gone unnoticed in short-term studies. Gross primary productivity (GPP) and ecosystem respiration (ER) followed different annual patterns based on the intensity, frequency and duration of flow related disturbances, such as storms flows or droughts. Furthermore, similar disturbances originated different metabolic responses depending on the season. In general, the smaller rivers responded more clearly to the temporal variation of the structural variables and showed a greater tendency towards heterotrophy.

BG.4

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REACH-SCALE 15N TRACER ADDITION EXPERIMENT TO QUANTIFY NITROGEN DYNAMICS IN A STREAM INFLUENCED BY AGRICULTURE

Human activities have altered the nitrogen (N) cycle in streams through increased wastewater discharge, the over-use of fertilizers, overgrazing practices and atmospheric N deposition, so deeply knowledge of N processes and fates has become increasingly desired. In this study, we measured main N transformations in a small third order agricultural stream using a 15N tracer addition. Field experiment consisted of a 6-h addition of 10 atom % (15NH4)2SO4 and a conservative tracer (NaCl) in a reach of 180m. We determinate reach-averaged rates of N flux from isotopic analyses of 15N-NO3, 15N-NH4, 15N-N2, 15N-N2O- and we calculate total NH4 uptake rate (Ktot) and lenght (Sw). The in stream isotope tracer provided a sensitive reach-scale measurements of N rates in N saturated streams where other mass balances were not suitable because perturbation of in stream nutrient concentrations leads to little observable effects. Then, we were able to estimate the role of nitrification and denitrification and to quantify whole-stream NH4 uptake rate in an agriculture stream and compare these results with other types of streams.

RLWE.1

Ruiz-Verdú, Antonio[1]*; Tenjo, Carolina*[1]*; Delegido, Jesús*[1]*; Miracle, María R.*[2]*; Peña, Ramón*[1]*; Moreno, José F.*[1]

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MULTITEMPORAL ANALYSIS OF CHLOROPHYLL-A AND WATER TRANSPARENCY IN THE ALBUFERA OF VALENCIA USING IMAGES OF THE NEW LANDSAT-8 SATELLITE

Landsat is a satellite Earth Observation program of NASA, which has monitored land ecosystems for the last forty years, being a very valuable information source on the changes in inland water bodies, both in its area and in its water quality. In these four decades, a series of eight successive satellites were launched, assuring a continuity and coherence in the data while improving progressively their amount and quality. Landsat-8, launched in February 2013, is the most recent satellite of the Landsat program and is successfully in operation since April 2013. It acquires 185 km-wide images at 15 to 100 m of spatial resolution and with a maximum acquisition frequency of 16 days in cloudless conditions (8 days in the areas of lateral overlap between contiguous scenes). It has two imaging sensors, which measure radiance in 11 spectral bands located in the visible and infrared regions. Most have the high signal-to-noise ratio required for studying water bodies.

We have developed empirical models for obtaining maps of water transparency (Secchi Disk Depth; SD) and Chlorophyll-a concentration (Chl-a) in inland water bodies from Landsat-8 images. The models have been calibrated and validated with a database of biophysical and radiometric field measurements from Spanish lakes and reservoirs.

A one-year series of 25 cloud-free Landsat-8 images has been acquired between April 2013 and April 2014 over the Albufera de Valencia. The Albufera is a well-known hypertrophic coastal lagoon with a high anthropogenic nutrient load, whose natural hydrodynamic is heavily modified due to water diversions, rice cultivation and hunting activities. The model was applied to the images and the temporal trends for SD and Chl-a were obtained. The model performance was assessed using field data collected in the project MICINN FEDER I+D Ref: CGL2009-12229. Using this dataset, the correlation of the observed trends with some environmental factors was also analyzed.

The results confirm the usefulness of Landsat-8 images for the monitoring of some key inland water quality variables with an acceptable accuracy. The limitations for using the proposed models in different geographic areas and/or water types are also discussed.

SS3.7

Ruiz-Verdú, Antonio; *Tenjo, Carolina; Delegido, Jesús; Peña, Ramón; Moreno, José F.*

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ALGORITHMS FOR THE ESTIMATION OF CHLOROPHYLL-A CONCENTRATION IN INLAND WATERS USING IMAGES OF THE NEW SENTINEL EARTH OBSERVATION SATELLITES

Chlorophyll-a concentration (Chl-a), as an indicator of phytoplankton biomass, is a key variable in the estimation of the ecological status of inland water bodies, according to the European Water Framework Directive (WFD). Although not explicitly included in the WFD, Chl-a maps obtained from images of Earth Observation (EO) satellites, are increasingly being used for monitoring freshwater ecosystems, and as auxiliary data in the context of the WFD. Remote sensing maps offer the advantage of a continuous Chl-a estimation on water surfaces, covering wide areas at a time and with a high frequency (weekly to monthly, depending on the satellite and/or sensor used).

Algorithms for the remote sensing estimation of Chl-a and other biophysical variables in freshwaters, have evolved notably in the last decade. Moreover, new satellite missions with increased capabilities for water monitoring are on the way. In this respect, the European Union is promoting the Copernicus mission, which includes two satellites, called Sentinel-2 (S-2) and Sentinel-3 (S-3) that are especially suited for monitoring the ecological status of inland waters. S-3, with 300 m of spatial resolution and a revisit time of 2 days, has the high sensitivity required for water bodies and a set of spectral bands centred in the regions of phytoplankton pigment absorption. S-2, with a spatial resolution of 20 m and a revisit time of 5 days, has a band setting good enough for the monitoring of medium to small size water bodies. The combination of both satellites (once they start operating in 2015) could allow the continuous and accurate monitoring of Chl-a at a river-basin scale, with high spatial and temporal resolution, becoming a valuable management tool.

In this work, we present two new algorithms, developed for S-2 and S-3, for the estimation of Chl-a in inland water bodies. The models were calibrated and validated with an extensive database of biophysical and radiometric field data, from Spanish lakes and reservoirs. They were also applied to hyperspectral satellite images emulating the Sentinel's band settings. The precision and accuracy of the expected products is within the range required for most water monitoring programs.

EF.21

Salgado, Cristina[1]*; Encalada, Andrea*[2]*; Cássio, Fernanda*[3]*; Pascoal, Claudia*[3]*; Graça, Manuel*[1]

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MICROBIAL DECOMPOSITION ALONG AN ALTITUDINAL GRADIENT IN TROPICAL AND TEMPERATE STREAMS

Biological processes tend to increase with the temperature; therefore, higher metabolic rates are expected at lower latitudes and altitudes. We hypothesized that temperature regulates the microbial leaf litter decomposition along latitudinal and altitudinal gradients. This hypothesis was tested in two latitudes: Ecuador (tropical ecosystem at 0ºLat) and Colorado US (temperate ecosystem at 40ºN) and along altitudinal gradients from 1600 to 3800 m in the tropical zone and from 2000 to 3195 m in the temperate ecosystem. Fine mesh bags (0.5 mm) containing native alder leaves from tropical (Alnus acuminata Kunth) and temperate (Alnus incana (L.) Moench) streams were incubated in five locations along each altitudinal gradient for 28 days (Ecuador) and 60 days (Colorado). Contrary to our hypothesis, decomposition rates (k) were faster at higher latitudes (Colorado). However, in both zones, decomposition decreased with increased altitude. Even when temperature seems to play a pivotal role driving microbial decomposition (altitude), variables related to local geographical conditions (e.g. identity and biomass of decomposers and nutrient availability) are very important to understand the dynamic of litter decomposition.

AMWQ.11

Sámano, María L.*; Pérez, María L.; Claramunt, Íñigo; García, Andrés*

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WATER-SEDIMENT DIFFUSIVE PROCESSES IN ESTUARIES UNDER HEAVY INDUSTRIAL PRESSURE

The industrial pressure suffered by the Ría de San Martín de la Arena estuary (northern Spain) has been leaving a pollution record at its sediments for decades. Thus, high concentrations of many heavy metals (especially zinc) and some organic compounds are found at the surface sediments of this estuary. In this sense, the sediment acts as a continuous internal source of pollutants due to diffusive processes derived from the concentration gradient between the interstitial water at the solid particles of the sediment and the water column bottom. These diffusive processes are especially important for ecosystems as they may control the microorganisms absorption rates of the pollutants and, hence, their bioavailability. The aim of this work is to contribute to the water quality management strategies enhancement at these zones, going more deeply into the study of the diffusive processes which take place between the water and the sediment through a double approach: the experimental practice and the numerical simulation.

On the one hand, the experimental obtained results exhibited the buffering capacity of the system and allowed the determination of the required time for the mass transfer processes to reach an equilibrium state. Furthermore, the diffusion velocity of zinc within this system was approximately assessed. On the other hand, the modeled results demonstrated the strong influence of the background concentration of zinc at the sediment whereas a negligible influence of that background concentration of zinc at the water column was also revealed.

Although the benthic bed by itself has been identified as the most important and continuous source of contaminant substances to this estuary, a strict compliance with the industrial discharge authorizations' specifications must be observed in order to prevent the continuous accumulation of pollutants at the sediments. In this context, the most effective management actions will be those applicable directly to the benthic bed.

AEBC.6

Sánchez, Marta

Doñana Biological Station-CSIC

WHY JOIN GROUPS? LESSONS FROM PARASITE-MANIPULATED ARTEMIA

Grouping behaviours (e.g. schooling, shoaling and swarming) are commonly explicated through adaptivemhypotheses such as protection against predation, access to mates or improved foraging. However, the hypothesis that aggregation can result from manipulation by parasites to increase their transmission has never been demonstrated. We investigated this hypothesis using natural populations of two crustacean hosts (Artemia franciscana and Artemia parthenogenetica) infected with one cestode and two microsporidian parasites.

We found that swarming propensity increased in cestode-infected hosts and that red colour intensity was higher in swarming compared with non-swarming infected hosts. These effects likely result in increased cestode transmission to its final avian host. Furthermore, we found that microsporidian-infected hosts had both increased swarming propensity and surfacing behaviour. Finally, we demonstrated using experimental infections that these concurrent manipulations result in increased spore transmission to new hosts. Hence, this study suggests that parasites can play a prominent role in host grouping behaviours.

RLWE.16

Sánchez-Montoya, María del M.[1]*; Corti, Roland*[1]*; Datry, Thibault*[2]*; Monaghan, Michael T.*[1]*; Tockner, Klement*[1]

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INTERMITTENT RIVERS ARE PIVOTAL DISPERSAL AND MIGRATION CORRIDORS FOR AQUATIC AND TERRESTRIAL ORGANISMS

Dispersal links ecosystems in space and time and plays an important role in the maintenance of genetic and species diversity. Rivers are known to be effective corridors of dispersal for aquatic and terrestrial organisms and have been considered primarily as linear habitats facilitating the movement of water, sediments, and organisms driven by unidirectional, longitudinal, and continuous flow.

Intermittent rivers comprise about half of the global river network and are predicted to increase in proportion due to climate change and increased water extraction for human use. They accommodate unique and diverse aquatic, amphibious, and terrestrial biotic assemblages, and they can store, process, and transfer energy and material, depending on spatial locations and hydrological conditions. They are characterised by repeated onset and cessation of flow, and their complex hydrological dynamics result from alternating flowing, drying and dry conditions influence biotic communities, nutrients and organic matter processing. These cycles of expansion and contraction may also make intermittent rivers efficient dispersal corridors. For example, dry river beds act as migration corridors for biota thereby increasing terrestrial landscape connectivity.

In this study, we analyse intermittent rivers as efficient dispersal and migration corridors across the landscape, thereby linking upstream and downstream sections as well as aquatic and terrestrial systems. We consider intermittent rivers as a Boundary-Corridor Continuum, with boundaries and corridors representing opposite ends along a gradient of permeability to organisms, matter, and energy flow. We analyse the alternating landscape permeability under different hydrological conditions, such as base flow, drying, dry and first flush periods for various aquatic and terrestrial assemblages.

Study funded by CLITEMP Project (MC-IEF Intra-European Fellowships), IGB Fellowship in Freshwater Science Program and IRBAS (Intermittent River Biodiversity Analysis and Synthesis, a working group supported by the French Foundation for Research & Biodiversity and the French National Agency for Water & Aquatic Environments).

EF.7

Sanpera-Calbet, Isis[1]*; Marcé, Rafael*[2]*; Acuña, Vicenç*[2]*; Butturini, Andrea*[1]*; Muñoz, Isabel*[1]

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DYNAMICS OF ALLOCHTHONOUS ORGANIC MATTER IN A MEDITERRANEAN STREAM: HYDROLOGICAL, METEOROLOGICAL AND CLIMATIC DRIVERS

Forested headwater streams are highly influenced by allochthonous organic matter (OM) subsidies. The goal of this study was to assess the quantity and the quality of OM sources, to determine which local and global environmental factors control the dynamics of OM at reach scale. The study was performed over 10 years on a Mediterranean stream edged by a deciduous riparian forest. Riparian inputs, benthic and transported OM, and its carbon (C) and nitrogen (N) content were determined. The quantity of riparian inputs (912 g dry mass m-2 y-1) was comparable to temperate regions with deciduous riparian forests, but the Mediterranean climate determined the different dynamics of these inputs. Distribution of inputs throughout the year depended on the presence of a drought event that same year, with a bimodal annual cycle in the years when the stream had dried up in summer. On the other hand, the annual amount of inputs depended on previous drought events, successive droughts causing a progressive decrease in riparian inputs. El Niño Southern Oscillation highly explained the interannual variability in riparian inputs through changes in precipitation. Retained and transported OM were mainly determined by flood frequency. The quality of allochthonous OM (C : N ratio) increased from riparian inputs to the finer transported particles. Changes in the quantity and quality of OM are explained by both present and past local and global factors, and are potentially important to stream detrital food webs.

SS2.14

Santamans, Anna C.*; Benichou, Fatima Z.; Miralles, Javier; Picazo, Antonio; Rochera, Carlos; Camacho, Antonio*

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CARBON BALANCE AND METHANE EMISSIONS IN SALINE SHALLOW LAKES FROM CENTRAL SPAIN: ECOLOGICAL IMPLICATIONS

Processes of carbon fixation in wetlands and lakes and further storage in anaerobic wetland sediments provide unique conditions for long-term storage of carbon. The capacity for wetland's carbon sequestration is determined by the balance between methane and carbon dioxide emissions, which strongly contribute to the greenhouse effect, and the removal of CO2, mainly through primary production. The balance of greenhouse gases (GHG), somewhat determined by CH4 and CO2 exchange in water and sediments, is therefore an important factor to understand the role of wetlands in climate change mitigation. This work, supported by the project CARBONSINK ("Evaluación del potencial de los principales tipos de humedales españoles en la lucha frente al cambio climático"), funded by Fundación Biodiversidad, aims to make an assessment of the capacity of some of the main types of Iberian wetlands to act as a carbon sink and thereby contribute to the mitigation of climate change. Among others, some shallow endorheic lakes from "La Mancha Húmeda Biosphere Reserve" (Central Spain) have been studied, as representative of this kind of ecosystems widely distributed through the Iberian Peninsula. We have surveyed a variety of these types of wetlands showing a salinity gradient (from 5 to 700 mS cm-1). Some of them experience an annual desiccation process with the consequent variations of salinity through the hydrological cycle. Methanogenic processes in sediments are slowed by high salt concentrations; as those of some of the studied lakes, which would potentially provide them with a higher efficiency in climate change mitigation. However, our results show that carbon fixation and CO2 emission processes also vary along the salinity gradient, and the balance among all these exchange processes determine the capacity of each wetland type and under each condition (e.g. salinity, which varies through the hydrological cycle) to act as carbon sink and influence the atmospheric pool of GHG. In any case, our preliminary results show that endorheic saline shallow lakes might result favorable environments for long-term storage of carbon.

BB.5

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THE DOUBLE LIFE OF FRESHWATER FUNGI: EVOLUTIONARY RELATIONSHIPS OF AQUATIC AND ENDOPHYTIC FUNGI

Aquatic hyphomycetes or Ingoldian fungi are commonly found in running fresh waters. They play a key role in leaf litter decomposition and are mediators of nutrient flow in stream ecosystem. Aquatic hyphomycetes are anamorphs of Ascomycetes or Basidiomycetes. They produce spores of two dominant shapes, sigmoid or tetraradiate, as a result of convergent evolutionary strategies potentially driven by access to aquatic lifestyle. Molecular evidence have pointed that some aquatic hyphomycetes are also plant endophytes, however more evidences are needed for dual ecological abilities. To date very little information is available on the independent fungal lineages that might have been subjected to convergent evolution to adapt to the dual mode of life. In the current study we examined the phylogenetic relationship between aquatic hyphomycetes, endophytic aquatic hyphomycetes and fungal endophytes of riparian/terrestrial plants. To that end, ITS1-5.8S-ITS2 rRNA genes sequences of 505 endophytes and 68 aquatic hyphomycetes were retrieved from National Center for Biotechnology Information (NCBI) and evolutionary relationship of 573 fungal sequences of ITS1-5.8S-ITS2 rRNA genes was explored by constructing neighbor joining tree (NJ) using the Kimura 2-parameter distance. Out of the 505 endophytic sequences 7 are reported be endophytic aquatic hyphomycetes. The sequences of the endophytes employed for this study belonged to Ascomycota and Basidiomycetes and Zygomycetes, whereas aquatic hyphomycetes only to Ascomycota. This study shows that relatives of aquatic fungi can appear endophytically far from streamside. In addition, ITS1-5.8S-ITS2 rRNA genes sequences of aquatic and endophytic aquatic hyphomycetes showed very close affinity. This study indicates that we need to assign a vast ecological niche for aquatic fungi and further its ecological role has to be thoroughly explored.

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SS4.1

Siegloch, Ana E.[1]*; Suriano, Marcia*[2]*; Spies, Marcia*[3]*; Fonseca-Gessner, Alaíde*[2]

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EFFECT OF AGRICULTURAL LAND USE ON MAYFLY ASSEMBLAGE STRUCTURE IN NEOTROPICAL HEADWATER STREAMS

Human activity has changed the landscape in southeastern Brazil, mainly through conversion of native habitats for the exotic forest plantations and pasture in rural areas. The aim of this study was to analyze the effect of agricultural land use on structure of mayfly assemblages in headwater streams. Twenty-nine headwater streams were investigated in the state of São Paulo, Brazil, during the 2005 and 2006 dry seasons. We analyzed 15 streams in pristine areas (mixed tropical rainforest, semi-deciduous seasonal forest and dense tropical rainforest), and 14 streams covered with sugarcane, eucalyptus or pasture. Mayfly genera richness obtained by rarefaction curves was higher in pristine areas (21genera), especially in mixed and semi-deciduous forest, than on agricultural land (9 genera), where values were particularly low in sugarcane plantation areas (3 genera). The NMDS ordination showed a clear difference in mayfly assemblages between agricultural and pristine areas. Analysis of similarity (ANOSIM) pointed to significant differences between two groups (R=0.67, p=0.001). Using partial Redundancy Analysis (pRDA) to evaluate the possible effects of environmental variables on assemblage we found that land elevation, fine sediment stream substrate, water pH, and Riparian, Channel and Environmental Inventory (RCE) index score were the descriptors that best explained differences in assemblage structure. Our results suggest that agricultural land use has a strong negative effect on the mayfly assemblages in headwater streams. These results also support the use of mayflies as environmental indicators, as some genera were sensitive to changes in land use, while others responded to naturally changes in the study area.

RLWE.5

Silió-Calzada, Ana[1]*; Barquín, José*[1]*; Huszar, Vera*[2]*; Mazzeo, Nestor*[3]*; Álvarez-Martínez, José M.*[1]*; Peñas, Francisco J.*[1]*; Álvarez-Cabria, Mario*[1]*; González, Alexia M.*[1]*; Rodríguez-Castillo, Tamara*[1]*; Estévez, Edurne*[1]*; Lezcano, María*[1]

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ESTIMATING FLOOD-DROUGHT PULSES IN SHALLOW LAKES FROM SATELLITE DATA: SEASONAL AND INTERANNUAL VARIABILITY IN THE BRAZILIAN PANTANAL WETLAND.

Hydrological variability over seasonal and multi-annual time scales strongly shapes the ecological structure and functions of wetlands and this is particularly apparent in floodplains. Understanding how hydrological variation is related to ecological features in ecosystems subject to flooding requires information on seasonal and inter-annual variation in flood patterns. The magnitude, duration and frequency of flooding are of great ecological significance, affecting spatial and temporal variation in physical, chemical and biological properties. Considering that remote sensing has become an important source of information for detecting changes in different earth resources (and surface water in particular), the estimation of the magnitude of flooded areas and their temporal variability can be achieved by the use of such techniques. In this study, we propose a simple remote sensing methodology for mapping flooded areas, distinguishing between "open water" and wetland areas. This approach is based on the combined use of a newly developed normalized water index (NWI), the normalized difference vegetation index (NDVI) and Getis's G statistics. Inundation changes were mapped by applying the derived relationships to 210 Landsat-5 images. This methodology was applied to two inter-connected lakes (Chacorore and Sa Mariana) located in the Brazilian Pantanal of Mato Grosso to map wetland inundation between 1984 and 2011. The derived maps revealed large changes in wetland inundation among dry, average, and wet years.

The Pantanal is fed by the upper Paraguay River and its tributaries, and these promote an annual flood that varies both yearly and spatially. Therefore, another objective of this study was to find the possible correlation between each lake behavior and the climate variation indices. The correlation analysis was performed between the area data series, daily and monthly water flow records from the Barao in situ station and 15 climate indexes. The mapped flooding changes were found correlated with local drought conditions and stream flow, with the highly inundated areas having the highest correlations.

EF.11

Solagaistua, Libe; *Larrañaga, Aitor; Aristi, Ibon; Arroita, Maite; Flores, Lorea; Pereda, Olatz; Elosegi, Arturo*

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CHANGES IN STREAM DISCHARGE AFFECT MORE BENTHIC THAN HYPORHEIC BREAKDOWN

Streams and rivers across the world are affected by modified hydrology, but its impact on litter breakdown is still poorly understood. Changes in discharge affect the depth and velocity of stream water, which are known to affect breakdown. Drying tends to stop breakdown of organic matter on parafluvial areas, even when hyporheic zones maintain residual water. Therefore, changes in discharge might affect more benthic than hyporheic breakdown. To test this hypothesis, we carried out an experiment in Artikutza (N Iberian Peninsula). Alder leaf litter bags were incubated on the stream bed and in the hyporheos different water depths (from 0 to-20 cm), and thus, subject to different frequencies of drying events and velocity regimes. We measured microbial (100 µm mesh bag) and total (5 mm mesh bag) breakdown and analyzed benthic invertebrate assemblages. Bags on parafluvial areas broke down at significantly lower rates (-3.5·10-3 day-1) than bags permanently submerged (-9.2·10-3 day-1), but water depth did not affect breakdown rates in the later group. Hyporheic breakdown did not significantly differ between parafluvial and wetted areas. Both microbial and total breakdown showed a similar response to the factors considered. Our results suggest that water abstraction can increase the relative importance of hyporheic to benthic breakdown.

AMWQ.4

Solana, Joaquín; *Rincón, Gonzalo; Alonso, Carlos; García de Jalón, Diego*

Universidad Politécnica de Madrid

APPLICATION OF FUZZY COGNITIVE MAPS FOR AQUATIC ECOSYSTEM MANAGEMENT: A CASE STUDY OF THE ESLA RIVER BASIN, SPAIN

The management of river ecosystems is a major issue which is subject to controversy due to the large number of factors, environmental and human, involved in its development. Stakeholders´ participation is a fundamental aspect for modeling effective management. The application of Fuzzy Cognitive Maps (FCM) for developing a fluvial management model is presented in this research work. Based on the knowledge of seven experts in fluvial ecology a cognitive map about Esla river basin in Spain was developed. This map was composed of 13 variables with 114 connections reflecting a causal relationship network. The most central variable in the collective map was Cross barriers, dams and weirs. The main objective is to develop a methodology based on FCM as useful tool for decision making in river management, taking account the expert knowledge. We determined the steady state conditions of our system based on the centrality of each variable to generate a model of the behavior of Esla river basin. Using our FCM expert model we perform a number of simulations from different possible scenarios: reducing the number of cross barriers, increasing natural flow regime, improvement of riparian vegetation and bank conditions and finally a scenario without impact management. As a result, the expected responses of river concepts were obtained according to the feature and intensity of planned scenarios. Thus, FCM methodology enabled us not only to understand the perception of current fluvial ecosystems but also to generate realistic management scenarios based on knowledge of experts in this field.

SS3.5

Soria, Juan M.[1]*; Garbouch, Abdelhadi*[1]*; Soria, Javier*[2]*; Vicente, Eduardo*[2]*; Peña, Ramón*[3]*; Rodríguez, María J.*[4]*; Durán, Concha*[4]

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CALIDAD ACUÁTICA EN EMBALSES MEDIANTE TÉCNICAS DE TELEDETECCIÓN BASADAS EN LANDSAT 8

El presente trabajo tiene objeto evaluar la calidad de las aguas de embalses pertenecientes a la Demarcación Hidrográfica del Ebro, durante el verano de 2013, por medio del análisis de calidad de algunos embalses a partir de muestras de campo y analíticas de laboratorio y del procesado de imágenes de teledetección recogidas por el satélite Landsat 8, una nueva herramienta avanzada para los estudios por medio de sensores remotos, que entró en servicio en abril de 2013, como continuación de los servicios proporcionados desde 1972 casi ininterrumpidamente por la serie Landsat.

La determinación del estado ecológico de la totalidad de embalses necesita el mutualismo de los resultados de las muestras y el análisis de imágenes de los embalses considerados. Es decir, que los análisis de imágenes de satélite se basarán sobre las medidas del campo como medidas de estandarización para poder llegar a la determinación la calidad ecológica en los embalses, según lo establecido por la Legislación que desarrolla la Directiva Marco del Agua para España y su posible aplicación a embalses en los cuales no se haya recogido datos de campo. El estado trófico se estima con la medida de la transparencia del agua y la concentración en la zona fótica de la clorofila a usando las técnicas de teledetección. Se complementa también con las medidas de sólidos suspendidos. Las imágenes de Landsat 8 se procesan mediante el software ENVI 5 y el análisis de datos por regresión múltiple se realiza con la aplicación Excel.

Los resultados obtenidos han mostrado una correlación significativa entre los valores de campo y las medidas mediante sensores remotos, de tal manera que en la mayoría de los casos estudiados se puede aproximar el estado trófico obtenido por teledetección con el resultado obtenido con las medidas de campo y laboratorio.

IS.2

Srean, Pao; *Magellan, Kit; Merciai, Roberto; García-Berthou, Emili*

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WORLDWIDE DISTRIBUTION AND INTRODUCTION CORRELATES OF "THE MOST WIDELY DISTRIBUTED FISH IN THE WORLD"

Non-native species invasions are a serious problem in freshwater ecosystems and represent huge ecological and economic costs worldwide. The mosquitofishes, Gambusia affinis and G. holbrooki, native to parts of the USA and Mexico, have been introduced worldwide since the 1900s and have often been suggested to be "the most widely distributed fish in the world". We aimed to clarify the worldwide distribution of these two mosquitofishes; to establish their introduction history; and to provide preliminary estimates of the most important predictors mediating their probabilities of introduction, establishment, and invasion history. We obtained the introduction records of G. holbrooki and G. affinis from FishBase (*http://www.fishbase.org/*) and three other databases and revised the exact species involved based on the literature and the history of introduction. We found many clear errors in the four databases. We estimate that mosquitofishes have been collectively introduced to 113 countries and have established in all continents except Antarctica. We also analysed the most important factors for predicting the probability of countries acting as donors or recipients of mosquitofish introductions, the establishment success, and the date of first introduction using twelve socioeconomic and climatic predictors and random forests (a machine learning technique).

Frost-day frequency, mean temperature, latitude and longitude were the most important predictors of introduction probability and establishment success, whereas country area, gross domestic product per capita, and minimum temperature were better at predicting number of donations to other countries and date of introduction. Our findings suggest that the geographical distribution of fish is poorly known, that databases contain many errors, and that we do not yet know which is the most widely distributed fish species.

MSF.3

Suárez, María Luisa[1]***;*** *Sánchez-Montoya, María del M.*[2]*; Gómez, Rosa*[1]*; Arce, Maria I.*[1]*; del Campo, Rubén*[1]*; Vidal-Abarca, Maria del R.*[1]

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EFFECTS OF SALINITY AND FLOW INTERMITTENCY ON SPECIES RICHNESS, FUNCTIONAL RICHNESS AND FUNCTIONAL REDUNDANCY OF AQUATIC INVERTEBRATES COMMUNITIES

Currently, the importance of biodiversity for ecosystem functioning and services is receiving an increased attention. Many empirical evidences indicate that not necessarily species richness, but rather the functional diversity of the community is responsible for ecosystem services. So, from a functional perspective, some species could replace the functional role of others (i.e. functional redundancy). Experimental studies suggest that stressor factors (e.g. pollution, land use intensification, alien species) reduce ecosystem functions through the elimination of species, but we do not know how natural stressor factors affect to ecosystem functions. Both stream water salinity and flow intermittency are natural stressor, which lead to reduction of biodiversity in stream ecosystems. Thus, our main objective was to examine how salinity and flow intermittency influence the species richness, functional richness and functional redundancy of aquatic invertebrates of saline and intermittent streams in Southeast Spain. We collected a total of 241 taxa of aquatic invertebrates in 22 streams (including perennial, temporary and saline streams) in the Segura River Basin. We measured the species richness, functional richness and functional redundancy using information on the traits of feeding habits and food, and five traits (life cycle duration, potential number of reproduction cycles per year, reproduction, dissemination and resistance forms) related to the survivability of these taxa to natural stress conditions.

In general, a decrease in specific richness, functional richness and functional redundancy is observed with the increase in the number of stressful natural factors, which suggest that the aquatic invertebrate communities in temporary and saline streams are less resistant if compared with perennial streams.

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BB.14

Subirats, Jessica [1]***;*** *Fillol, Mireia*[4]*; Compte, Sergi*[1]*; Sánchez, Àlex*[1]*; Rivas, Pedro*[2]*; Cao, Min*[2]*; Rosell, Antoni*[3]*; Borrego, Carles*[4]

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DISTRIBUTION AND DIVERSITY OF MISCELLANEOUS CRENARCHAEOTIC GROUP ARCHAEA IN SEDIMENTS FROM FRESHWATER LAKES WITH CONTRASTING TROPHIC AND CLIMATIC CONDITIONS

Archaea of the Miscellaneous Crenarchaeotic Group (MCG) are predominant in anoxic water layers of karstic lakes and ubiquitous in marine subsurface sediments worldwide. This widespread distribution and the large phylogenetic intragroup diversity (17 subgroups known so far) suggest that they may have a significant role in global biogeochemical cycles. In this study, fourteen Spanish lakes selected according to their trophic status and distributed along a climatic gradient were sampled to investigate the abundance and diversity of MCG archaea in their sediments. Surface sediment samples from all lakes were collected and preserved "in situ" to avoid nucleic acids degradation. A 15-cm sediment core from lake Montcortés was also collected to study differences in abundance and diversity of archaea along the depth sediment profile. DNA extracts from all samples (surface and 1cm-depth layers) were analyzed by gene fingerprinting (DGGE) using specific MCG primers, quantitative PCR (qPCR) and massively parallel sequencing using universal primer for Archaea. The prokaryotic community in all analyzed sediments was dominated by Bacteria (average relative abundance of 94% to total 16S rRNA gene copies) whereas Archaea ranged from 2% to 14%. In Montcortés, copy numbers of archaeal 16s rRNA gene were lower at the sediment surface (2% of total prokaryotic 16S rRNA copies) but readily increase along depth, reaching its maximum at deep layers (27%). DGGE fingerprinting using specific primers identified MCG gene signatures in all sediments confirming its widespread distribution. Interestingly, all sequences recovered from DGGE fingerprints affiliated to subgroup MCG-6. To resolve whether or not MCG-6 was actually the unique subgroup present in freshwater sediments or its dominance was caused by a bias of the primer pair used, the phylogenetic richness of sedimentary archaeal communities was further analyzed by massively parallel sequencing. Results from these analysis corroborated that: i) archaeal communities in freshwater lake sediments are very diverse; ii) MCG archaea are widespread in these habitats; and iii) the abundance of MCG in sediments seems to be related to local physico-chemical conditions in the sediment (e.g. anoxia, sulfide and organic matter content).

AEBC.4

Teixeira, Amílcar[1]*; Varandas, Simone*[2]*; Sousa, Ronaldo*[3]*; Froufe, Elsa*[3]*; Lopes-Lima, Manuel*[3]

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ECOLOGY AND CONSERVATION OF FRESHWATER MUSSEL POPULATIONS (UNIO DELPHINUS, ANODONTA ANATINA AND POTOMIDA LITTORALIS) OF THE RIVER SABOR (DOURO BASIN, NE PORTUGAL)

Autochthonous freshwater mussel populations of the River Sabor, a tributary of the River Douro located in the northeastern Portugal, are severely threatened by habitat and biotic shifts that are occurring after the construction of a big dam (60 km reservoir extension) in the lower section. The objective of the present study was to investigate the ecological pattern and the potential impact of this dam on freshwater habitats and on species composition and distribution, namely on mussel populations, like Potomida littoralis, Unio delphinus and Anodonta anatina. From 2009 to 2013, several sampling sites were selected and abiotic (e.g. sediment, water quality and hydromorphological features) and biotic (e.g. algae, macroinvertebrate and fish communities) analyses made, following the European Water Framework Directive procedures. Habitat and microhabitat used by native naiads and the host fish species were evaluated. For host determination, glochidia were extracted from each mussel species and exposed, in laboratory experiments, to autochthonous and exotic fish species that co-occur in the River Sabor. The results showed a good ecological status of the most sampling sites, based on the abiotic and biotic information collected, and allowed to identify the spatial distribution of the unionid populations along the watercourse. Unionid mussels are naturally distributed along the middle and lower sections of the River Sabor, occupying fine sediment zones with high densities near banks and particularly in lateral arms of the main river. The results of host fish experiments showed that almost all effective hosts were native fish species (mainly endemic cyprinids). Conservation measures need to consider monitoring, legislation and translocation programs and the definition of priority zones for mussel populations.

SS3.2

Toja, Julia*; Hidalgo-Lara, Cristina; Leon, David; Peñalver, Patricio*

Departamento de Biología Vegetal y Ecología, Universidad de Sevilla, C/ Profesor García González s/n C.P. 42, Sevilla, España.

EMBALSE DE LA BREÑA (1973-2013): 40 AÑOS, DOS PRESAS Y UN INCREMENTO DE MÁS DE 60 METROS DE PROFUNDIDAD

Hace casi 40 años el equipo de Margalef realizó un estudio de 110 embalses (incluyendo al de La Breña), con objeto de su tipificación. En el ciclo 1987-88 el equipo de Joan Armengol repitió el estudio. Pero hasta 20 años no hubo m{as estudios hasta que en septiembre de 2007, nuestro grupo ha venido realizando su seguimiento limnológico con el objetivo estudiar los efectos de un notable recrecimiento de la presa y el posible bombeo de agua desde el río Guadalquivir como apoyo para la toma de medidas de gestión. Se presentan los resultados obtenidos desde septiembre de 2007 hasta noviembre de 2013, antes y después de la puesta en servicio de la nueva presa, en diciembre de 2009. Se hace una comparación con datos de fito y zooplancton obtenidos en las campañas de 1973-75 (en que el embalse se comportaba como mesotrófico) y 1987-88 (en que se clasificó como oligo-mesotrófico). Hay que tener en cuenta que este último periodo fue mucho más lluvioso que el anterior. El embalse, ha pasado de acumular 50,77 Hm3 en la antigua presa a llegar a los 770 Hm3 en noviembre de 2013, alcanzando en sus zonas más profundas una columna de agua de hasta 100 m de profundidad. La media de clorofila del epilimnion en el periodo anterior al cierre de la nueva presa fue de 6,46 µg/L (similar a los datos anteriores). Aunque se retiró la vegetación leñosa de las nuevas zonas inundadas, ha habido una mayor carga de entrada de nutrientes. Las condiciones lluviosas extraordinarias del periodo de puesta en servicio de la nueva presa han marcado la evolución del nuevo embalse que, por ahora, ha compensado con la mayor profundidad el aumento de la carga de nutrientes (4,56 µg/L de clorofila media). Por tanto se sigue comportando como oligo-mesotrófico. Pero, dada la situación geográfica del embalse, no hay vientos suficientes para mantener mezclado térmicamente por completo el embalse más allá de 15 días, por lo que no hay tiempo para que recarguen oxígeno las capas más profundas (por debajo de 70m de profundidad) que ya están prácticamente anóxicas.

EF.13

Tonin, Alan M.[1]*; Ubiratan, Luiz*[2]*; Gonçalves, José F. Jr*[1]

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RIPARIAN CANOPY COVER AND SPATIAL SCALE AFFECTS IN-STREAM LITTER DECOMPOSITION

The identification of the spatial patterns and factors that control key ecosystem process such as litter breakdown is crucial to understand the functioning of stream ecosystems at different spatial scales. We examined how riparian canopy cover and spatial scales can affect litter breakdown and associated communities in streams. For this, we assessed the variability of the litter breakdown rates and invertebrates (richness and abundance of shredders and scrapers) in closed and open canopy streams. Our sample design included a set of hierarchical scales in four watersheds, two streams in each watershed, two stream riffles in each stream and 18 litter bags per riffle. Litter breakdown was 1.4 to 5.5 times faster in closed canopy than in open canopy watersheds (mean ± SE of the two closed canopy watersheds, k total = 0.0174 ± 0.0015, k microbial = 0.0050 ± 0.0001, k invertebrates = 0.0034 ± 0.0003, open canopy watersheds, k total = 0.0052 ± 0.0005, k microbial = 0.0036 ± 0.0001, k invertebrates = 0.0006 ± 0.0002). However, the abundance and taxa richness of shredders and scrapers did not differ between riparian canopy cover, while the abundance of scrapers was ~ 6 times higher in open canopy watersheds. We also observed greater variability in breakdown rates among stream riffles (4 to 15% of total variability) and litter bags (15 to 18%) than in watershed and stream scale (<1 and <1 to 9%, respectively). Riffle scale was the largest source of variation in the abundance of shredders and scrapers (70 and 38% of total, respectively), while the largest variability in taxa richness of shredders and scrapers occurred among streams (43 and 27%) and litter bags (34 and 63%). Our results indicate that streams ecosystems can have structurally similar communities that function differently in response to riparian canopy cover. We also conclude that the variability in litter breakdown and associated communities decreases with increasing spatial scale within a geological and climatic region. We suggest that future experiments should abandon the traditional evaluation of litter breakdown in single riffle sites and place more emphasis on variability at multiple and broad spatial scales.

SS3.8

Toro, Manuel[1]*; Alonso, Ana M.*[1]*; Alonso, Covadonga*[1]*; Bueres, Alberto*[2]*; de Anta, Alberto*[2]*; de Hoyos, Caridad*[1]*; Domínguez, Almudena*[1]*; Fompedriña, Diego*[2]*; Pahissa, José*[1]*; Peg, María*[1]

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ENVIRONMENTAL FACTORS AFFECTING THE OCCURRENCE OF PLANKTOTHRIX RUBESCENS BLOOMS IN VILASOUTO RESERVOIR (LUGO, NW SPAIN)

In April 2011 an intense proliferation of the toxic cyanobacterium Planktothrix rubescens was observed for a first time in Vilasouto reservoir (Lugo). This phenomenon occurred again in the spring of 2013, when high microcystins concentrations were detected in the whole water body. Vilasouto is a monomictic reservoir, with a maximum depth of 45 m, a maximum surface area of 111, 21 ha. and a storage capacity of 20,45 Hm3.

In this work possible environmental factors and limnological processes affecting the appearance and intense development of this species are analyzed. The study of phosphorus dynamics and internal loading (from sediments) in the reservoir, water column stratification and low oxygen levels in the hypolimnion, hydrological regime and increased inflows following heavy rain periods, may explain the exceptional occurrence of this species in both years. High inflows running through the narrow tail end of the reservoir could cause resuspensión of sediment finest particles with high levels of adsorbed phosphorus, and mixing of deep layers of water column with phosphorus redissolved from the sediment under anoxic conditions. Other limnological, meteorological and hydrological variables are also described and analyzed. High concentrations of other elements as Fe or Al were detected in surface sediments and bottom waters during summer stratification. Measurements for reservoir management and exploitation are suggested to minimize this problem.

AMWQ.16

Usaquen, Olga Lucia[1]*; Gómez, Aina G.*[2]*; García-Alba, Javier*[2]*; García, Andrés*[2]

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METHODOLOGY OF TEMPORAL AND SPATIAL ASSESSMENT OF EUTROPHICATION SUSCEPTIBILITY AT COASTAL LAGOONS

A prompt and up to date methodology to assess temporal and spatial eutrophication susceptibility at coastal lagoons is developed and validated. Eutrophication is one the main environmental effects at coastal lagoons. This process is influenced by nutrient load from natural and anthropogenic sources and is related to natural changes in tidal forcing, constituent loading, return flows, and water depth, among others. Then, the flushing capacity of a domain has relevant impacts on eutrophication's processes. In this contribution, temporal and spatial susceptibility are calculated considering hypothetical tracer experiments by means of numerical models at the Albufera de Valencia. This RAMSAR protected coastal lagoon is intensively altered by agricultural practices (rice crops), and its hydrodynamics is artificially regulated by the lagoon-sea connection.

Temporal flushing capacity is defined as the daily capacity to flush a tracer from the domain (renewal potential). While, spatial flushing capacity is considered as the capacity to flush a tracer since the concentration in a water parcel flushes 99.9% of its concentration (recovery time). Daily renewal potential is calculated for a one year period considering hourly hydrodynamic currents. Recovery time, at each water parcel in the domain, is calculated considering annual average hydrodynamic conditions. A calibrated and validated 2D hydrodynamic model is used to accurately describe the hydraulics of this regulated coastal lagoon. A 2D transport numerical model is used to obtain the local variation of the tracer concentration in time, as a consequence of advection and diffusion.

The correspondence between flushing capacity (renewal potential and recovery time values) and environmental data (chlorophyll-a, temperature, soluble reactive phosphorus and Secchi depth) collected monthly during one year at seven sampling stations is studied. On one hand, regression analysis between renewal potential and temporal evolution of environmental data are presented. On the other hand, a Principal Component Analysis, considering annual averaged values for each sampling station and variable, is obtained to correlate them with spatial recovery time values. Both indicators present a significant relation to environmental data, being sensitive to different physical and hydrodynamic conditions.

BB.6

Valdecasas, Antonio G.*; García-Jiménez, Ricardo; Becerra, José M.*

Museo Nacional de Ciencias Naturales, CSIC

FIGMENTS OF THE IMAGINATION? WATER MITE SPECIATION IN MADEIRA

It is almost 80 years since Olov Lundblad was sampling the island of Madeira in the summer of 1935. Seven years later, he published a monograph on the water mite (Acari, Hydrachnidia) fauna of the island, documenting 25 species of whose 24 were new to Science.

An intriguing fact was that 10 species belonged to the genus Torrenticola and more intriguing that eight of those species could be found together in the same sampling point.

To the untrained eye, Torrenticola species look very similar. This fact, together with the popular suspicion that taxonomists erect new species 'out of the blue' using minimum differences, could raise the idea that those species were just 'figments of Lundblad's imagination'.

However, by 1942, Lundblad had had a long training in water mite taxonomy, and was studying, at the same time, material from Europe and South America, so we may assume that he had a good knowledge of taxon variability, before assigning a particular water mite variation to a new taxon. Looking retrospectively, Lundblad documented more than 700 new taxa during his career as a taxonomist, and since his death (1972) most of his named taxa remain valid.

Attracted by the idea that some biological interesting process has been taken place with these taxa in Madeira, we decided to carry out a research program on the following lines:

a) Study Lundblad's Madeira Torrenticola collection that is still available at the Stockholm Natural History Museum.
b) Sampling the original locations to get fresh material. This material would be further studied
   b1) morphologically, and
   b2) by molecular markers.

Our communication reviews our present results, aimed to answer the following questions:

1.- Are Madeira Lundblad's Torrenticola real species?
2.- If so, which main phenotypic character allows their coexistence?
3.- Are them the product of individual dispersion or are the product of 'dispersal plus speciation' events in Madeira's waters?

AEBC.3

Varandas, Simone[1]*; Teixeira, Amílcar*[2]*; Froufe, Elsa*[3]*; Sousa, Ronaldo*[3]*; Cortes, Rui*[1]*; Hughes, Samantha J.*[1]*; Crespí, António*[1]*; Santos, Cátia*[4]*; Jesus, Joaquim*[4]*; Magalhães, Marco*[5]*; Pereira, Vitor*[4]*; Lopes, Marisa*[4]*; Assunção, Tiago*[6]*; Lopes-Lima, Manuel*[3]

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ECOLOGICAL AND CONSERVATION STATUS OF NATIVE FRESHWATER BIVALVES IN COASTAL LAGOONS OF PORTUGAL

The Coastal lagoons of Barrinha de Mira, Mira, Vela and Braças (Portugal) are highly productive and environmental sensitive natural wetlands, being part of the Natura 2000 Network. The ecological integrity of these lagoons is intrinsically related to both natural and anthropogenic pressures from adjacent terrestrial areas. The PAELORIS project aims to determine the resilience of these lagoons and develop plans and measures to rehabilitate and/or preserve these ecosystems using freshwater bivalves as surrogate species. Indeed, freshwater bivalve species are highly recognised by their functional and ecological importance although being also recognised as one of the most threatened group of organisms' wordwide.

Of the four lagoons surveyed only two (Barrinha de Mira and Mira) present native freshwater mussels: Anodonta cygnea and Unio delphinus. A special attention should be given to Anodonta cygnea since this species is possibly restricted to only three sites (these two lagoons plus Pateira de Fermentelos) in the Iberian Peninsula. The main threats to these native bivalve species in both lagoons are: water eutrophication, presence of invasive species (e.g. Corbicula fluminea, Eichhornia crassipes, Ameiurus melas, Carassius auratus), lack of native hosts, dredging's, overfishing, etc... Eutrophication poses perhaps the greatest long-term threat to the ecological integrity of these Lagoons characterized by restricted water circulation, poor flushing, shallow depths, and heavily populated surroundings. This situation is usually intensified by the overgrowth of Eichhornia crassipes that needs constant control.

Finally, in order to increase environmental awareness, the PAEORIS project produced information on the preservation of the lagoons in the form of a guide, leaflets and informative panels, providing knowledge to the public on the intrinsic natural values of the lagoons, promote the importance of the invasive species control, and the conservation of freshwater bivalves, their habitats and their hosts.

Keywords: Anodonta cygnea, coastal lagoons, freshwater bivalves, exotic species, environmental awareness.

GC.5

Venâncio, Cátia; *Anselmo, Eduardo; Soares, Amadeu; Lopes, Isabel*

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SALINISATION OF FRESHWATER ECOSYSTEMS MAY INFLUENCE INTERSPECIFIC ECOLOGICAL RELATIONSHIPS

Impacts of global climate changes comprise, among others, awareness regarding sea level rise. The International Panel for Climate Change states that global mean of sea level will continue to rise during the 21st century. Also, highlights that such sea level rise will very likely exceed that observed from 1971 to 2010 due to increase in ocean warming and melting of glaciers and ice sheets. Within this scenario, it is expected that low-lying coastal freshwater ecosystems will have to face seawater intrusion and therefore increased salinity. Increased salinity may provoke adverse effects to freshwater species, affecting their life histories and fitness and influencing community composition by disrupting competitive relationships. However, species may be capable of acclimating to low salinity levels, which may influence the resilience of ecosystems, as organisms are capable of evolving strategies allowing their persistence in disturbed environment. Accordingly, this study intended to understand the influence of low levels of salinity on (i) the capacity of freshwater microalgae to acclimate to this chemical and (ii) on the competitive outcome of two species of freshwater microalgae (Chlorella vulgaris - Raphidocelis subcapitata). For this, the two species were exposed, solely and in competition for 96 h, to the respective EC25 of salinity for growth, both before and after acclimation to low salinity levels. Increased salinity scenarios were created by adding NaCl to the media and by diluting seawater, so to evaluate if NaCl may be used as a surrogate to assess salinisation effects. At the end,, growth rate of the two species was computed. Results indicated NaCl as more toxic than natural seawater. Raphidocelis subcapitata exhibit higher growth rates when exposed solely, while when in competition, where C. vulgaris surpassed growth rates of R. subacapitata. Exposures after acclimation, showed that C. vulgaris coped better with salinity.. This highlight the susceptibility of ecosystems equilibrium since shifts or competitive outcome in the algae community can be caused by saline stress in short periods of time. These implications cannot be neglected since algae are the basis of the trophic chain, influencing all levels above as they are the resource food for many organisms.

RLWE.6

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PHYTOPLANKTON COMMUNITIES IN A HIGH MOUNTAIN LAKE: HAVE THEY CHANGED AFTER 14 YEARS?

Iberian high mountain lakes are young ecosystems due to their origin in the last glacial period. Their particular location determines the environmental conditions. Usually, these lakes are oligotrophic environments, where radiation (either extremely high or very low) is an important factor. The development and duration of the ice cover affect the dynamic of these lakes and the phytoplankton community structure. Peñalara Lake (2019 m.a.s.l.) is located in the Guadarrama Mountains (Central Range, Iberian Peninsula). It is a permanent lake with a maximum depth of 4.8 m. The lake is oligotrophic and monomictic, with an inverse stratification during ice cover period.
Depth integrated monthly samples of phytoplankton collected during a two years period (2010–2011) were analized and results were compared with a previous study period that was carried out 14 years before (95-96). Samplig was accomplished following a monitoring program of the restoration of this high mountain lake, since in earlies '90 the lake was affected by tourist impact.

A decrease of 1 order of magnitude in total algal density and biovolume was found after 14 years. Seasonal dynamics of total density showed similar patterns in both compared periods, contrasting with the distinct ones for total biovolume. We observed interannual differences in seasonal taxonomic composition between both studies. Taxonomic richness remained stable for Chlorophyta-non Desmidiaceae, Chrysophyceae, Cryptophyta and Dinophyta, and decreased for Desmidiaceae, Bacillariophyceae, Cyanophyta and Euglenophyta.

We discuss how well-known environmental changes could be the responsible of these changes, in particular: 1) introduced fish eradication; 2) recent warming; 3) lake shore restoration.

AMWQ.14

Vicente, Eduardo[1]*; Miracle, María R.*[1]*; Soria, Javier*[1]*; Peña, Ramón*[2]*; Soria, Juan M.*[3]

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LOS SENSORES HIPERESPECTRALES COMO HERRAMIENTAS EN EL ESTUDIO DE LA CALIDAD DEL AGUA DE LA ALBUFERA DE VALENCIA Y EL PAPEL DEL FLUJO HÍDRICO EN SU PROCESO DE OLIGOTROFIZACIÓN

En el marco del proyecto CGL2009-12229/BOS (MICINN) - Universidad de Valencia, para el estudio de la influencia de los flujos hídricos en el proceso de oligotrofización de los lagos hipertróficos, se ha utilizado la Albufera como un caso de estudio.

Se ha recurrido al empleo de imágenes de teledetección para establecer la heterogeneidad espacial del lago y las corrientes de circulación de los flujos hídricos, pues dada la complejidad espacial del sistema y la muy diferente calidad de las aportaciones influentes por sus más de sesenta tributarios, sólo es posible abordar este estudio a partir de imágenes que cubran simultáneamente la totalidad del lago.

Los sensores utilizados han sido el espectrómetro HICO instalado en la Estación Espacial Internacional (ISS), el hiperespectral CHRIS del satélite Proba y el sensor térmico del Landsat 8. Se han seleccionado varias imágenes digitales de cada sensor, a las que se han aplicado algoritmos para la corrección atmosférica y la estimación de las variables ambientales relacionadas con las propiedades ópticas del agua (clorofila a, ficocianina, transparencia, temperatura del agua superficial, sólidos en suspensión, presencia de grupos algales dominantes, etc.). Las escenas han sido intercalibradas con datos reales tomados en diferentes puntos del lago en sincronía con la obtención de estas imágenes.

Se presentan los resultados obtenidos a partir de la aplicación de diferentes algoritmos y los mapas temáticos del lago, destacando las corrientes de circulación del agua influente.
En las imágenes puede reconocerse la diferente calidad de los flujos hídricos mediante los valores de su concentración en clorofila a, que se aprecian en su ruta de circulación aunque, en los casos de aguas ricas en nutrientes, su pluma de entrada queda enmascarada por el crecimiento algal que la homogeniza con las aguas circundantes del lago.

En este trabajo se pone de manifiesto la necesidad de que los flujos influentes sean de óptima calidad para alcanzar el objetivo de oligotrofización de la Albufera.

AMWQ.1

Vidal-Abarca Gutiérrez, María Rosario; *Suárez, Maria L.; Santos-Martín, Fernando; Martín-López, Berta; Benayas, Javier; Montes del Olmo, Carlos*

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UNDERSTANDING COMPLEX LINKS BETWEEN FLUVIAL ECOSYSTEMS AND SOCIAL INDICATORS IN SPAIN: AN ECOSYSTEM SERVICES APPROACH

Nowadays, fluvial ecosystems are considered from a holistic perspective (i.e., as providers of ecosystem services) because it helps understand how their deterioration affects human well-being. At least in Spain, there are no studies linking the ecological and social components of fluvial ecosystems that consider its current state and capacity to supply services, the direct and indirect causes responsible for its state, and the policy response options carried out. We used the Driver-Pressure-State-Impact-Response (DPSIR) framework to explore the relationships between fluvial ecosystems and social systems in Spain from an integrative perspective. We selected 58 national scale indicators that provide long-term information on each DPSIR framework component. We prepared aggregated indices, which allowed us to explore the trends and relationships among them. Trend indicators showed overall progressive aquatic biodiversity loss, significant loss of regulating services, but a major increase in cultural services, deterioration of the nonmaterial dimensions of human well-being (e.g. health, security, social relationships), but the goods and materials relating to human welfare increased, as well as a constant growing linear trend of direct (e.g. land use change, pollution, invasive alien species) or indirect (e.g. demographic, economic) drivers of change, and of institutional responses to correct their negative impacts. Spearman correlation test showed that most DPSIR components were strongly related. Biodiversity loss related negatively with the supply of provisioning services, and regulating services associated negatively with direct drivers of change (pressures) and institutional responses, indicating that current water management policies do not deal with the loss of regulating services. These results suggest that the Water Framework Directive (WFD), interpreted as the most important current institutional response to maintain the sustainability of European aquatic ecosystems, does not suffice to ensure aquatic biodiversity conservation and the supply of ecosystem services delivered by fluvial ecosystems to human well-being.

SS4.3

Vieira, Cristiana*; Portela, Ana; Hespanhol, Helena; Honrado, João; Marcos, Bruno*

FCUP

ASSESSING THE IMPACT OF RIVERSCAPES FRAGMENTATION IMPACT OF ENERGY AND COMMUNICATION ELEMENTS ON THE REPRESENTATIVENESS AND STRUCTURE OF BRYOPHYTE COMMUNITIES AT A REGIONAL LEVEL (NORTH PORTUGAL)

The objective was to conduct a regional assessment of impacts caused by fragmentation elements (dams, small hydropower schemes, wind farms, roads and railway) on the riverscapes, identifying simple or cumulative impact zones and potential zones of ecological protection, particularly, of fluvial bryophyte communities.

We used a compilation of databases including information on fluvial bryophytic communities (2000-2013), from 257 locations in the North of Portugal. Floristic composition was classified and typified and ecological parameters of sites statistically modelled trough BIOMOD to obtain the regional communities types and establish species-environment relations. Spatial information analyses were performed in GIS program (ArcMap 10.1). Bryophytic communities were spatialized in the watersheds, as well as buffers of impact for each fragmentation element and the loss of potential occurrence of communities was analyzed. We obtained 4 types of bryophytic communities characterized by 1 to 6 core taxa and found indicator pseudo-species concordant with many of the taxa responsible for the cohesion of the groups. Communities were spatialized according to their flow accumulation, summer precipitation, annual average temperature, local slope, altitude and hillshade. Areas of occurrence were calculated for each community. The impacts are mainly due to dams and small hydropower schemes and the areas of loss and potential preservation of each community type were calculated and presented in a detailed map that allows regional and local conservation planning.

Bryophytic communities are spatially restricted in the context of Portuguese, Iberian and European biodiversity, where communities show high species richness and diversity and many taxa of Atlantic distribution. Especially in mountain areas, these communities are vulnerable because of fragmentation caused by small hydropower schemes and wind dams implementation.

These results allowed us to analyze the impact of energy and communication elements on the assessment of cumulative impacts and identify areas of cumulative impact and conservation.

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BG.2

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"ENVHYDREM" A NUMERICAL MODEL FOR EUTROPHICATION ANALYSIS IN COASTAL LAGOONS: APPLICATION TO ATLANTIC AND MEDITERRANEAN LAGOONS

Eutrophication in coastal lagoons is one of the environmental problems that have attracted more interest in the scientific community in recent years. Eutrophication models that exist in the current state of the art have been developed to be applied to various types of water bodies, but in the case of coastal lagoons they exhibit deficiencies due to the simplification of some important processes such as silica or iron limitation of phytoplankton growth. The EnvHydrEM model has been developed in order to respond to these deficiencies. The model takes into account a total of nineteen state variables including phytoplankton, carbon (total inorganic carbon and sediment carbon), phosphorus (organic phosphorus and phosphate), nitrogen (organic nitrogen, ammonia and nitrate), silica (available dissolved silica and particulate biogenic silica), dissolved oxygen, carbonaceous organic matter, zooplankton, bacterioplankton, detritus, iron (total iron and ferrous iron) and manganese (total manganese and manganous ion). The model also describes all possible interactions between the considered variables showing biological and physicochemical processes that can occur in coastal lagoons. These are usually characterized by a series of peculiar aspects which result mainly from the complex interaction between inland and marine waters, as well as from a low hydrodynamic renewal rate. EnvHydrEM is able to reflect all considered processes in the other existing models and also a series of reactions for this type of water bodies. To validate this model, it has been applied to two coastal lagoons of different nature: Victoria Marsh in the North of Spain and Albufera of Valencia in the Mediterranean Costs, and has shown to be able to reproduce the trends of the chlorophyll-a and other substances concentrations in both media.

Posters

AMWQ.P26

Echavarria, Monika C.; *Lemus, Jenny M.*

Universidad Manuela Beltrán

DISEÑO DE ESTRATEGIAS DE REHABILITACIÓN ECOLÓGICA EN LA MICROCUENCA DE LA QUEBRADA LA CULEBRERA, MUNICIPIO DE COTA

El agua es vital para la vida humana y para el bienestar económico de las comunidades (Timothy et al., 2008), sin embargo en el caso de la Quebrada La Culebrera este recurso se está viendo afectado por las actividades antrópicas, las cuales generan impactos negativos y la pérdida de su calidad. El objetivo del proyecto es proponer estrategias de rehabilitación ecológica con participación de la comunidad en las áreas deterioradas y en aquellas con riesgo de ser afectadas.

Es así, como por medio de la caracterización realizada a la zona de estudio, se evidencia un caudal sujeto al periodo de lluvias en zonas de montaña y piedemonte (Monsalve, 1999), mientras que en la parte baja se evidencian constantes inundaciones debido a la baja pendiente, al tipo de relieve (llanura de desborde) y a la falta de cobertura vegetal protectora (SECS, 2003). Así mismo, la caracterización fisicoquímica y biológica realizada determinó la presencia de contaminación en sus partes media y baja, mientras que la parte alta aún se conserva; lo anterior se concluyó a partir de los resultados arrojados después de la aplicación del índice BMWP, si bien este indicó que la calidad del agua en la parte alta de la quebrada era la peor, esto podría estar asociado al bajo caudal existente en esta parte de la quebrada (Milán et al., 2011), hecho que afecta la cantidad de macroinvertebrados presentes.

Según las zonas identificadas se proponen estrategias como: la disminución de pendientes laterales del cauce (Zeballos & Rivas, 2002), plantaciones protectoras de márgenes hídricas (MAVDT, 2003), recuperación del suelo (Vargas, 2007), implementación de sistemas silvopastoriles, agroturismo, barreras cortavientos (Barrera et al., 2007), entre otras. Cabe señalar que antes de emprender acciones de rehabilitación se deben suprimir los disturbios presentes en el ecosistema (Escobar et al., 2010); ahora bien, las autoridades ambientales locales y regionales deben tomar medidas de control ya que los mayores problemas están relacionados con la incorrecta disposición de los residuos sólidos y líquidos. La participación de la comunidad es de gran importancia en el desarrollo de las propuestas planteadas y así hacer posible la sostenibilidad del proyecto.

AE.P5

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SENSITIVITY OF EUROPEAN GROUNDWATER ISOPODS TO METALS

Understanding the impact of contaminants in groundwater species is important for setting groundwater environmental quality and soil use at surface.

We have investigated the acute toxicity (copper sulphate; potassium dichromate) responses of two endemic stygobiont species of the circum-Mediterranean genus Proasellus from two caves in isolated karst massifs of central Portugal. Groundwater from both sites was analysed to depict possible responses resulting from the long-term exposition of organisms to contaminants. Stygobiont Proasellus spp. toxicity was compared with bibliographic values for other stygobiont species and with the epigean model species of Daphnia magna.

The less groundwater-adapted P. assaforensis, revealed to be more tolerant to acute exposure to both toxics, suggesting that the degree of adaptation to groundwater life can influence the acute response of Proasellus spp. to pollutants. On the other hand, the tolerance to wide environmental conditions could be a key factor in groundwater colonization. The use of the genus Proasellus as model for groundwater ecotoxicology is discussed.

This study points out the urgent need to use endemic specimens to infer the effects of pollution in each groundwater system. Highlighting the importance of defining specific environmental quality thresholds for groundwater ecosystems that will certainly contribute for the protection of this sensible and neglected compartment.

AMWQ.P36

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INFLUENCE OF HYDROPEAKING ON MACROINVERTEBRATE COMMUNITY IN A PYRINEAN RIVER

The Unarre-Esterri hydroelectric power plant on the upper reaches of Noguera Pallaresa River (NE Spain) is managed by hydropeaking and generates significant and frequent daily fluctuations in flow downstream. Observations at this site aimed to determinate the effect of these fluctuations on the macroinvertebrates community (composition, distribution and structure). Four site were studied, one upstream of the plant (reference), and three more downstream to recognize the hydropeaking effects. A total of 7 sampling campaigns were carried out to analyze results and their signification by different statistical tests. It is found that factors governing the organization of the physicochemical parameters are seasonality and situations of high flow. Changes are observed in density and variety of the families of the macroinvertebrate community at points immediately downstream of the plant, recovering to normal in the end point at 1800 m from the plant. It has been detected also, in the sections subjected to hydropeakings, changes in the biological cycles of some macroinvertebrates, favoring the presence of some families in front of others.

AMWQ.P15

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Universidade Estadual Paulista - UNESP

RESPONSE OF FUNCTIONAL MACROPHYTE GROUPS TO ENVIRONMENTAL DETERMINANTS IN THE AQUATIC HABITATS OF A SUBTROPICAL SOUTHEAST WATERSHED IN BRAZIL

Quantifying the relative role of environmental and spatial factors to understand patterns in community composition allow us to make better management decisions and predict the direction of ecological change. We assessed the relative influence of limnological variables together with environmental characteristics in driving variation in aquatic macrophyte community composition in 112 points in a southeast watershed of Brazil. We studied different growth forms (i.e. emergent, submersed and free-floating species) and these were used as a surrogate of functional groups. Partial redundancy analysis (pRDA) was employed to quantify the relative role of limnological variables and environmental variation in explaining the occurrence of functional macrophyte groups, in other words, a pRDA allows the total variation to be decomposed into fractions that indicate the importance of pure limnological variables, environmentally structured limnological variation (shared fraction), pure environmental variables and unexplained variation. Emergent vegetation was the dominant growth form, followed by free-floating plants and the response of macrophyte growth form was significant. The analysis revealed that limnological variables and environmental factors explained 43,5% of total adjusted variation in aquatic macrophyte composition across the landscape. The limnological component explained a higher proportion of variance in the assemblage composition than the environmental component. However, the shared component between environmental and limnological variables contributed with 27% of the explained variation in the macrophyte assemblage. Our results demonstrate that macrophyte functional groups are dominantly affected by the fraction environmentally structured limnological variation.

RLWE.P1

Alcorlo, Paloma[1]; *Casas, J. Jesús*[2]; *Fenoy, Encarnación*[2]; *Moyano, Francisco J.*[2]; *Gessner, Mark O.*[3]

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HOW MUCH DOES THE δ13C AND δ15N ISOTOPIC SIGNATURE OF A LEAF CHANGE AFTER IT FALLS INTO A STREAM?

The power of stable isotope analyses to unravel pathways of carbon and nitrogen flows in stream ecosystems hinges upon a quantitative mechanistic understanding of the factors affecting the isotopic signature of decomposing organic matter. The present study aimed to determine the relative role of leaf-litter quality and environmental conditions on such isotopic changes during leaf-litter decomposition. Since leaf litter is chemically heterogeneous, its decomposition can be viewed as the sequential use of carbon compounds differing in recalcitrance. This can entail shifts in the relative abundance of different carbon isotopes in decomposing litter. Similarly, the exchange of nitrogen between litter and the environment can alter the relative abundance of nitrogen isotopes in the litter. Thus, we hypothesized that the magnitude of change in the isotopic signatures of leaf litter during decomposition is correlated with the rate of decomposition, which in turn depends on the initial leaf-litter quality and on the activity of microbial decomposers and detritivores. To test this hypothesis, we determined the temporal dynamics of β13C and β15N in leaf litter of two common riparian plant species differing widely in quality (Alnus glutinosa and Phragmites australis). Leaf litter of both species was incubated in a total of six streams, three in near-pristine mountain streams of the Sierra Nevada and three in the semiarid lowlands of Almería. The two sets of streams experience naturally contrasting environmental conditions, including climate, and varying human influences. The isotopic signature of both C and N was analyzed in green leaves collected from riparian plants before senescence, in freshly fallen leaf litter, and in decomposing leaf litter after 2, 15, 50 and 70 days of submergence in the streams.

FW.P2

Almela, Pablo[1]; *Velazquez, David*[1]; *Rico, Eugenio*[2]; *Justel, Ana*[3]; *Quesada, Antonio*[1]

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TROPHIC RELATIONSHIP IN ANTARCTIC MICROBIAL MATS.

Cold environments constitute ~85% of the biosphere, with most of the aquatic life being microbes. In ice-free areas from polar regions in summer, shallow low productive lakes and meltwater streams are locally abundant in maritime Antarctica. However, smaller inland water bodies freeze solid or dry up for an extended period every year, thus providing rather unfavourable conditions for the biota. Aquatic communities are dominated by microscopic organisms, and microbial mats, mainly dominated by cyanobacterial, diatoms and green algae, that play a major role in the biological input of energy and matter.

Here we present the trophic relationships of a microbial mat by measuring of C and N stable isotopic shifts. Natural abundance of the different groups of organisms established the baseline for re-capturing experiments in controlled environments. These in situ incubations were feeding by labelled inorganic C and N compounds to track them both through the food web at different time points.

The result showed that primary phototrophs, mainly diatoms and cyanobacteria, assimilated the inorganic labelled compounds during the first hour and then the natural abundance ratio were coherent in the upper trophic levels within the next 24 hours. However, after eleven days of incubations, natural abundance shifts were measured through the whole trophic web. Consistently with samples´ microscopic surveys, consumers (rotifers, tardigrades, nematodes) displayed different trophic profiles by some feeding on primary consumers or preying other heterotrophic organisms. Here the transfer ratios will be presented in different sorts of communities and discussed in a latitudinal context.

AMWQ.P11

Amaral, Atanásio A.[1]*; Martins, Mariane*[2]*; Silva, Nathan*[2]*; de Fátima, Alessandra*[3]*; Santos, Alexandre C.*[3]*; Vidal, Adilson*[2]*; Tebaldi de Queiroz, Vagner*[3]*; Fontes, Patrícia*[2]

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COLIFORMS INDEX IN THREE LOTIC WATER BODIES OF ALEGRE CITY, BRAZIL

Taking into account the consumption of water, the microbiological quality of it is of utmost importance, because disease-causing microorganisms may be present due to contamination of water resources. The aim of this study was to evaluate the microbiological quality of water from three water bodies of the municipality of Alegre, in areas of coffee cultivation and pasture, based on counts of total and thermotolerant coliforms. Water samples were collected on water bodies that cross the Café and Celina Districts and on Rio Alegre, in the rainy and dry seasons. Analyzes were performed by the multiple tubes technique. In the presumptive test were used 1 mL, 0.1 mL and 0.01 mL of the water samples, respectively, in triplicate. These volumes were inoculated in broth sodium lauryl sulfate, containing Duhran tubes, and incubated at 35 °C for 48 h. The tubes in which there was gas formation and turbidity lauryl broth were considered positive. Samples scope of the positive tubes were inoculated in tubes with brilliant green broth, incubated at 35 ºC for 48 h, for confirmation of total coliforms, and in tubes with selective broth for Escherichia coli (EC broth), incubated at 44.5 °C for 24 h, for confirmation of thermotolerant coliforms. The count values (MPN/100ml) of total and thermotolerant coliforms were, respectively, in the rainy and dry seasons: Café District, upstream: 2,100 and 1,653; Café District, downstream: 2,300 and 1,170; Celina District, upstream: 1,500 and 1,000; Celina District, downstream: 2,300 and 1,170; Alegre City, upstream: 1,100 and 220; Alegre City, downstream: 1,500 and 200. The high levels of total and thermotolerant coliforms can be explained by the presence of feces in the pastures. The mountainous terrain makes these stools are transported to the riverbeds by rainwater, as the number of coliforms is greater in this period. This fact further increases the contamination of river water in the rainy season. Values found in sampling sites cause the water to be classified in Class 3, which indicates a low quality standard. So, the use for public supply or bathing without prior treatment is not recommended.

AMWQ.P12

Amaral, Atanásio A.[1]*; Scaramussa, Milena*[2]*; Guio, Diego P.*[2]*; Paz, Rômulo L.* [2]*; Oliveira, Giovanni*[2]*; Avelino, Roberto*[2]*; Sárah, Sidney*[2]

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WATER QUALITY INDEX OF TWO WATER SOURCES OF THE MUNICIPALITY OF ALEGRE, ESPÍRITO SANTO, BRAZIL

The Water Quality Index (WQI) was created in 1970, by National Sanitation Foundation of the United States (NSF-WQI), to facilitate communication with the public. In 1975, this index has been used in Brazil by Environmental Company of the State of São Paulo (Cetesb) with some adjustments (Cetesb-WQI). Currently, the WQI is the most widely used index in Brazil. The states Rio de Janeiro, Minas Gerais and Mato Grosso adopt the NSF-WQI, however, other states, as the Espírito Santo, São Paulo and Mato Grosso do Sul adopt the Cetesb-WQI. The aim of this work was to compare the classification of water from two sources located in the municipality of Alegre, ES, using the NSF-WQI and Cetesb-WQI. Samples of water was collected at each source and performed the analysis of the 9 parameters required by the index: dissolved oxygen (DO) and temperature (portable oximeter), turbidity (turbidity bench); pH (pot bench); total nitrogen and total phosphorus (multiparameter probe), biochemical oxygen demand (iodometric titration) and fecal coliform (technique of multiple tubes). The results were used to calculate the WQI at NSF-WQI and Cetesb-WQI. It was found that the two calculation systems provide different amounts WQI. By NSF-WQI, the two sources were classified as “Poor”, with equal to 31.84 (source 1) and 30.63 (source 2). At the Cetesb-WQI, they were classified as “Good”, with WQI equal to 57.35 (source 1) and 52.47 (source 2). Analyzing the parameters individually and confronting with the law, it is observed that in both sources, 7 of them are within the limits established for Class 2 waters, intended for public supply after conventional treatment. The dissolved oxygen parameter was below the minimum threshold recommended for Class 2 waters and the number of fecal coliform was above the allowed for this class of waters. Through the above, the classification obtained by the Cetesb system was more representative for the sources studied.

AMWQ.P13

Amaral, Atanásio A.[1]*; Martins, Mariane*[2]*; Vieira Moura, Ludmila*[2]*; Thuller de Lima, Meire*[3]*; de Fátima, Alessandra*[3]*; Rodrigues, Jaqueline*[3]*; Fontes, Patrícia*[2]*; Vidal, Adilson*[2]*; Tebaldi de Queiroz, Vagner*[3]

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WATER QUALITY IN THREE WATER BODIES OF THE RIVER ALEGRE BASIN, ALEGRE CITY, BRAZIL

This study aimed to assess the quality of water from three water bodies of the River Alegre Basin, in the rainy and dry seasons in areas of coffee cultivation. Water samples were collected upstream and downstream of the Alegre City and Celina and Café District. The analyzed variables were: temperature (digital thermometer, °C), pH (potentiometer), turbidity (turbidimeter, NTU), dissolved oxygen (DO) and biochemical oxygen demand (BOD) (iodometric titration, mg/L), total ammoniacal nitrogen and total phosphorus (spectrophotometer, mg/L). The mean values found in the rainy and dry seasons, respectively, were: Celina District, upstream: temperature 22.9 and 24.4, pH 7.5 and 7.4, turbidity 84.8 and 75.1, DO 7.25 and 8.25, BOD 10.8 and 14.8, nitrogen 0.094 and 0.000, phosphorus 0.0038 and 0.0095; Celina District, downstream: temperature 22.9 and 23.9, pH 7.0 and 7.1, turbidity 42.3 and 39.9, DO 6.25 and 7.77, BOD 17.1 and 2.2, nitrogen 0.065 and 0.000, phosphorus 0.043 and 0.020; Café District, upstream: temperature 24.1 and 24.2, pH: 7.7 to 7.5, turbidity 39.6 and 41.5, DO 7.45 and 7.55, BOD 21.1 and 15.6, nitrogen 0.056 and 0.024, phosphorus 0.0053 and 0.0083; Café District, downstream temperature 24.2 and 23.8, pH 7.6 and 7.8, turbidity 54.7 and 60.3, DO 8.2 and 8.7, BOD 16.3 and 9.5, nitrogen 0.066 and 0.058, phosphorus 0.0052 and 0.0078. Alegre City, upstream: temperature 25.0 and 24.6, pH 7.7 to 7.6, turbidity 71.0 and 700.1, DO 8.00 and 7.93, BOD: 13.7 and 6.6, nitrogen: 0.068 and 0.039, phosphorus 0.0027 and 0.022; Alegre City, downstream: temperature 25.4 and 24.7, pH 8.0 and 7.7, turbidity 227.1 and 235.1, DO 8.45 and 7.63, BOD 17.4 and 16.8, nitrogen 0.062 and 0.057, phosphorus 0.0030 and 0.0050. The values found at the three water bodies are very similar, indicating the same pattern of water quality in both periods. The water parameters were not affected by the rains and the differences in the amounts of nitrogen and phosphorus between the two periods can be due to the volume of water, which decreases considerably in the dry period.

AMWQ.P39

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EFFECT OF THE WATER RESIDENCE TIME IN THE REDUCING OF COLIFORMS AND AEROMONAS IN AN OXIDATION POND

The efficiency of an oxidation pond in reducing coliforms and Aeromonas spp. was evaluated. This pond receives pig farming waste of the Ifes - Campus of Alegre. The pond analyzed has area 1,475 m ‹SUP›2‹/SUP› and depth 1.5 m, with a volume 2,213 m ‹SUP›3‹/SUP›, being the average water residence time 21 days. Water samples were collected in the supply of the stalls, near the entrance of the pond and near outlet of the pond, one collection per month for five months. For isolation of Aeromonas, water samples were inoculated on Petri dishes with agar and ampicillin-dextrin Aeromonas M-agar. Colonies Gram negative, oxidase and catalase positive, and resistant to O/129 vibriostatic agent were identified as Aeromonas. For coliforms analysis, was used the technique of multiple tubes. During the study there was variation in the number of bacteria in water samples analyzed. Increasing the number of bacteria in the rainy season was observed. The results for the dry and rainy seasons, respectively, were: water supply total coliforms 360 and 110000 NMP 100 mL ‹SUP›-1‹/SUP›, thermotolerant coliforms 3.0 and 7500 NMP 100 mL ‹SUP›-1‹/SUP›, Aeromonas spp. 2000 and 100000 UFC 100 mL‹SUP›-1‹/SUP›; for the water collected near the entrance of the pond, the results were total coliforms › 1,000 7.3 x 105 and NMP 100 mL ‹SUP›-1‹/SUP›, thermotolerant coliforms 730000 and 7300000 NMP 100 mL ‹SUP›-1‹/SUP›, Aeromonas spp. 41000 and 1800000 UFC 100 mL ‹SUP›-1‹/SUP›; for the water collected near the outlet of the pond, the results were total coliforms 75000 and 450000 NMP 100 mL ‹SUP›-1‹/SUP›, thermotolerant coliforms 35000 and 450000 NMP 100 mL‹SUP›-1‹/SUP›, Aeromonas spp. 44000 and 480000 UFC 100 mL‹SUP›-1‹/SUP›. The residence time promoted a reduction of the number of bacteria, but not enough for quality water to be considered good. It is recommended to increase the residence time, so that the number of bacteria is reduced to acceptable levels by law.

IS.P2

Anadón, Antonia[1]*; Lanao, Munia*[1]*; Touya, Vincent*[2]*; Durán, Concha*[2]

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INFORMACIÓN: LA HERRAMIENTA FUNDAMENTAL PARA LA LUCHA CONTRA LAS ESPECIES EXÓTICAS INVASORAS

La presión que ejercen las especies exóticas invasoras (EEI) sobre los ecosistemas de aguas continentales es cada vez mayor puesto que se está observando un notable aumento de introducciones en la península. Desde los Organismos de cuenca se está manifestando cada vez más, una mayor preocupación por esta problemática y se están buscando vías de actuación, dentro de sus competencias, para evitar nuevas introducciones y reducir el riesgo de expansión de aquellas especies que ya se han establecido. Facilitar la información dentro de las propias administraciones para que en cada actuación se conozca la presencia o no de EEI es fundamental para evitar una expansión involuntaria mediante maquinaria, equipos o actuaciones de cualquier tipo en cauce. Por otra parte, informar a los usuarios y a la ciudadanía ha resultado ser, durante años de experiencia en la gestión de la plaga del mejillón cebra en la cuenca del Ebro, la herramienta fundamental que puede conseguir frenar esta expansión; recordemos que estas introducciones en la mayoría de los casos suelen estar ligadas a la intervención humana. En este marco, la Confederación Hidrográfica del Ebro ha desarrollado medidas y herramientas adaptadas a las nuevas tecnologías, como los visores geográficos y las plataformas on-line, para conseguir que la información fluya tanto dentro de la Administración como entre los usuarios náuticos de las aguas continentales. La puesta en marcha de estas acciones acopladas a las vías tradicionales de información constituye un ambicioso programa de divulgación que está informando a la sociedad sobre cómo evitar esta amenaza ecológica y socio-económica alarmantemente creciente.

EH.P8

Andrade, Fernando[1]*; Marques, Marcelo*[2]*; Okawa, Cristhiane M. P.*[2]*; Vital, Elaine*[2]*; Pereira, Osni*[2]

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THE CONCEPT OF FETCH FIELD APPLIED TO THE FURNAS RESERVOIR IN BRAZIL

The choice of the method for determining the fetch depends on the nature of the water body, which may be oceanic or continental. In oceanic waters the fetch is limited by the large bounds of the meteorological disturbances. In inland waters the fetch is limited by the surrounding land. In that case, the limits of the margins and the effects of the water body width are considered in the calculation. Because of the dendritic characteristic of most inland water bodies, the effective fetch is determined by numerous geometrical operations. With these specific aspects in mind, this work presents the improvement of a classical method of fetch calculation, suitable for inland waters, by developing a model based on automated processing. The model is named ONDACAD and allows the automated computation of the fetch as a two-dimensional field. The reservoir of Furnas, located in the southeast region of Brazil, was adopted as a case of study. The model allowed the determination of the fetch field associated to sixteen wind directions, as well as the magnitude and location of the highest fetches in the reservoir. The spatial distribution of the fetch may allow future studies of correlation with the development of species in two-dimensional space.

SS1.P2

Antunes, Sara C.[1]*; Oliveira, Laira*[1]*; Gonçalves, Fernando*[1]*; Rocha, Odete*[2]*; Nunes, Bruno*[1]

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TOXICITY EVALUATION OF FOUR PHARMACEUTICALS DRUGS: ASSESSMENT OF ACUTE AND CHRONIC EFFECTS ON DAPHNIA MAGNA

The occurrence of pharmaceutical compounds in the aquatic environment has received increasing attention in recent years, as concerns have risen about their biological activity, low biodegradability and environmental persistence, representing a significant adverse health risk to humans and aquatic organisms. These substances have been found in natural waters, ground water, drinking water and effluents from sewage treatment plants (STPs) in concentrations ranging from ng L-1 to µg L-1. Considering the magnitude of concentrations and their often-specific modes of action, the assessment of physiological responses of exposed aquatic biota may provide significant information regarding the potential ecological consequences of exposure to these pollutants. In this study, the acute and chronic toxicity of four pharmaceuticals: acetaminophen (analgesic), chlorpromazine (antipsychotic), diclofenac (anti-inflammatory) and propranolol (antihypertensive) were evaluated in the cladoceran species Daphnia magna. Parameters such as immobility and subsequent life-history (total number of offspring and rate of population increase) were assessed. According to results obtained for acute bioassays, it was possible to establish a ranking of toxicity: chlorpromazine (EC50= 1.805 mg L-1) › acetaminophen (EC50= 2.831 mg L-1) › propranolol (EC50= 5.531 mg L-1) › diclofenac (EC50= 123.3 mg L-1). Concerning the chronic toxicity data, the pharmaceuticals chlorpromazine and propranolol caused a significant decrease in fecundity, with a reproductive EC50 of 0.285 mg L-1 (chlorpromazine), and 0.132 mg L-1 (propranolol). The rate of population increase parameter had a significant increase for chlorpromazine in a concentration of 0.33 mg L-1 and for propranolol in a level of 0.128 mg L-1 onwards, respectively, while for acetaminophen no modifications were observed. Differently, no significant reproductive impairment was observed in the remaining concentrations for sodium diclofenac and no reproductive EC50 could be calculated. However and despite the occurrence of important impacts on survival and reproduction on D. magna, it must be emphasized that the here-studied levels of pharmaceutical drugs required to elicit such effects are considerably higher than those already documented in the aquatic compartment. However the extensive use of pharmaceuticals and their loadings to the environment can result in potential long term ecological risks to aquatic biota.

SS1.P3

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LINKING PLANKTON COMMUNITY METRICS AND BIOASSAYS IN THE ASSESSMENT OF WATER QUALITY IN AN URBAN RESERVOIR

Crestuma-Lever is an urban reservoir located near Oporto city, in the north of Portugal. This reservoir has currently many uses, including hydropower, human water supply, irrigation, fishing, and recreation. Among the problems related to construction of dams in rivers – leading to the formation of reservoirs – are the extensive alterations and pressures observed in these ecosystems: hydrological fluctuations, variation of riverbed, excessive nutrient input, increase of turbidity, reduction in oxygen concentration, and transition from lotic to lentic ecosystem. Overall, these changes lead to alterations in communities and, usually, a significant decrease in water quality.

The Water Framework Directive (WFD) began a new regime in the European management of water quality, extending protection to all natural waters, in order to achieve its good condition and conservation until 2015. Quality indicators are defined in the WFD and include biological quality elements, hydromorphological elements, as well as chemical and physicochemical elements. However, the WFD assessment scheme lacks the quantification of functional measures and endpoints, thus precluding a perspective on ecosystem functioning and associated services of the waterbody. In this sense, bioassays are particularly suited to evaluate functional endpoints and also allow establishing cause-effect relationships between environmental factors and community structure. Using Crestuma reservoir as a study case, the aim of this study was to link responses from a set of bioassays (survival, reproduction, feeding) conducted with Daphnia with several plankton community metrics, including some indicators proposed in the WFD.

Physical and chemical parameters revealed that Crestuma did not achieve a good ecological potential throughout 12 months in two sampling sites. Zooplankton community structure revealed low diversity and low abundance of large-bodied filter-feeders, being mostly comprised by copepods and small cladocerans. One of the sites was slightly more subjected to anthropogenic pressures, which was confirmed by the bioassays. However, in general we found no strong negative impacts of reservoir water in the grazing and growth potential of cladocerans. These results suggest that the Crestuma-Lever reservoir should continue being a target for monitoring actions, to further clarify the causes of its less-than-good ecological condition.

AMWQ.P1

Argudo, Celso

Dirección de Turismo del Municipio de Ibarra, Proyecto PROMETEO SENESCYT

ENVIRONMENTAL STATUS OF AQUATIC ECOSYSTEMS AFFECTED BY TOURISM DEVELOPMENT IN THE MOST IMPORTANT AREA OF ECUADOR LAKESIDE “THE BLUE PROVINCE”

“The blue province**”** (Imbabura), located in the northern part of the Republic of Ecuador is considered one of the most beautiful natural reserved and scenic thanks to all lakes and lagoons around it. These 27 high altitude ecosystems that help regulate the climate and surface water flow and maintain the natural balance support accelerated development of tourism especially in The San Pablo Lake, Yahuarcocha Lagoon, Cuicocha Lagoon, Mojanda lakeside system consists of a set of three lakes (nested in the tourism inventory of the country), environmental processes that cause environmental damages to be receivers and accumulators of pollutants from various sources; currently several projects for recovery and protection of ecological balance purposes and tourism promotion are made.

They are located at different altitudes: Cuicocha Lagoon to 3060 masl, with an area of 425 hectares. (including its islets); San Pablo Lake to 2660 masl and a water mirror of 583 hectares. Yahuarcocha Lake to 2200 masl and a water mirror of 270 hectares. In each of them using the various factors that allow us to define the diagnosis of environmental reality, establishing lines of research on the characteristics of the lake and watershed, water quality, water balances, degree of contamination, sediment study; watershed management, erosion risk and environmental management programs and tourism development with the various indicators closely to established zones of protection.

Keywords: natural heritage , lakeside reserve, tourism, ecological balance

EF.P11

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EFECTO DE LA SEQUÍA EN LOS HIFOMICETOS FLUVIALES

El cambio climático global y la detracción de agua acentúan los periodos de sequía, aumentando así la proporción de hojarasca acumulada en pozas aisladas y zonas parafluviales secas. Tanto el aislamiento en pozas como la sequía afectan la estructura y el funcionamiento de los hongos acuáticos, lo que podría acarrear consecuencias importantes para la descomposición de la materia orgánica en los ecosistemas fluviales. En este trabajo se evalúa el efecto de la sequía en los hifomicetos descomponedores. Para ello, discos (12 mm) de aliso precondicionados en el río fueron sometidos a 10 tratamientos en mesocosmos de laboratorio, combinando la duración y la cadencia de periodos con aireación (caudal normal), sin aireación (pozas aisladas), y sin agua (zonas parafluviales secas). Cada 2 semanas durante 2 meses se midieron la concentración de ergosterol, las tasas de esporulación y respiración de los hongos, y la tasa de descomposición de los discos. Considerando el experimento en su totalidad, la producción total de esporas fue similar en todos los tratamientos. Sin embargo, los patrones de las tasas de esporulación durante el tiempo difirieron significativamente, dependiendo de la condición inicial y del momento de la sequía. La concentración de ergosterol y las tasas de respiración de los hongos mostraron tendencias semejantes a la esporulación. No obstante, la descomposición de los discos no varió entre tratamientos. Los resultados mostraron que los procesos de sequía, principalmente su cadencia, afectó a la dinámica temporal de los hifomicetos, aunque sorprendentemente, estos cambios en la actividad fúngica no influyeron en la descomposición de la materia orgánica.

BG.P3

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Universidad de Málaga

IMPORTANCE OF CARBONATES INTERFERENCE IN THE SEDIMENTARY C/N RATIO AND δ13C MEASURES. AN ALTERNATIVE TO THE PRE-ANALYSIS ACIDIC TREATMENT.

C/N ratio, δ13C and δ15N have been used as markers to determine the origin of organic matter (OM) in ocean, littoral, lake, estuarine sediments. In measuring these sediment variables interfere the inorganic carbon (Ci) of the mineral inorganic carbon fraction, this problem has traditionally been solved by pre-analysis acidic treatment. However it has been shown that this technique, which uses acid to remove inorganic carbon interference, introduces a new source of error (in addition to those resulting from the diagenesis, lack of full homogenization and sample sizes, etc.). In this study the effect of carbonates is quantified in C/N and δ13C measurements of OM into the sediment. A method to avoid the interference, without introducing a new source of variability, has been developed for both variables, C/N ratio and δ13C in order to eliminate the error source introduced by acidic treatment of the samples. This new method has been applied to Palmones River sediment (river section and estuary) (Southern Iberian Peninsula) in order to check its consistence.

RLWE.P7

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INFLUENCE OF DISSOLVED OXYGEN AVAILABILITY ON THE FORMATION OF HUMIC COMPOUNDS FROM THE DECOMPOSITION OF AQUATIC VASCULAR PLANTS

Macrophytes can be a considerable part of biomass of aquatic environments and their decomposition is an important detritus source. The availability of dissolved oxygen influences the decomposition kinetics and the quality of resulting products, like humic substances. Humic compounds are polymeric products formed by decomposition and condensation of organic molecules. This study aimed to determine the influence of dissolved oxygen availability on humic substances formation from the decomposition of four aquatic macrophytes species (Oxycaryum cubense, Salvinia molesta, Eichhornia azurea and Egeria najas). The macrophytes and water were sampled from a tropical lagoon (21º36´S and 47º49´N). Incubations were performed during 120 days under aerobic and anaerobic conditions. On sampling days were quantified particulate organic carbon (POC) and dissolved organic carbon (DOC). The fulvic acids (FA) and humic acids (HA) were extracted from the dissolved fraction, then separated and quantified. The comparisons of treatments were performed using repeated measures ANOVA. For all species the highest POC decay was under aerobic conditions. The percentage of labile and soluble fraction of each specie ranged from 7,3 to10,48 % for O. cubense, 8,3 to 9,1 % for S. molesta, 14,7 to 19,5 % for E. azurea and 32,1 to 32,2 % for E. najas. The aerobic condition supported the yield of HA from O. cubense, S. molesta and E. azurea decompositions, but for E. najas both treatments were not different. Furthermore, the proportion of HA in COD were higher under aerobic conditions for all species. The anaerobic condition favored the yield of FA from E. azurea and from E. najas decomposition, while O. cubense and S. molesta decomposition showed similar concentrations under both conditions. The yields of total humic compounds were higher under aerobic conditions for all species, except E. najas. Even though the humification process could be favored in reducing environments, and, despite the mineralization and humification are concurrent events, the aerobic condition favored these two cases. This may occurs due to the faster metabolism under aerobic conditions accelerating the mass decay and providing larger quantity of molecules that are humic substances precursor supporting the formation of more aromatic molecules, such as humic acids.

MSF.P2

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EFFECTS OF CLIMATIC EXTREMES (DRY AND RAIN) ON DYNAMIC AND CO-OCCURRENCE OF EGERIA DENSA PLANCHON E CHARA BRAUNII GMEL IN RESERVOIR IN SEMIARID REGION

Annual changes in water level are the main regulatory source of ecological processes in the semiarid region reservoirs. Submerged macrophyte communities influence many aspects of lake structure and function. The aim of this study was analyze the effects of climatic extremes in the temporal and spatial variation of E. densa and C. braunii populations and the relationship with limnological variables, answering the questions (i) how climatic extrems of dry and rain affect the biomass of E. densa and C. braunii? (ii) What is the predictor variables of biomass of E. densa and C. braunii (iii) there is competition by space between E. densa and C. braunii? (iv) What is the best competitor? Abiotic variables and submerged macrophytes were sampiling monthly from January to December of 2011 in twelve transections in Camalau reservoir (7°53'33.94" S 36°50'39.16" W) in braziliam semiarid region. The percent volume infestation (PVI) of submerged macrophytes ranged from 9.31 to 63.88 % of the reservoir coverage , the highest rate of infestation was C. braunii. Biomass and size of species decline during rainy season consequent of increase in the volume of the reservoir, returning to initial values in sequential dry period . C. braunii showed higher biomass in the region inflow of the main tributary and E. densa in the region near the dam. In the middle portion of the reservoir, the species showed co-dominance . The variables, biomass of C. braunii , volume , depth , pH and electrical conductivity , biomass of E. densa , temperature and total nitrogen comprised the prediction models of the variation of macrophytes biomass. Negative relationship was observed between E. dense and C. braunii biomass, suggesting competitive relationship. The species present competition for space. Individuals of C. braunii occupied more efficiently the more shallow and E. densa, the deepest places in reservoir. E. densa showed greater persistence, maintained under unfavorable conditions, however, C. braunii showed greater regeneration capacity. The results show that the hydrological cycle influenced the dynamics of colonization and biomass of submerged macrophytes and the volume of the reservoirs was the main predictor of this dynamic.

RLWE.P2

Bernabeu, Marc[1]*; Dohet, Alain*[2]*; Wetzel, Carlos E.*[2]*; L'Hoste, Lionel*[2]*; Cleiton, Anderson*[1]*; Martínez, Aína*[1]*; Gomà, Joan*[1]*; Novais, María H.*[2]*; Hoffmann, Lucien*[2]*; Ector, Luc*[2]*; Bonada, Núria*[1]

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INTERANNUAL VARIABILITY IN MEDITERRANEAN AND TEMPERATE STREAMS: FORESTED AND IMPACTED RIVER BASINS

Mediterranean rivers (med-rivers) are characterised by predictable and seasonal floods and droughts. These natural disturbances have resulted in high diverse communities with a myriad of species adapted to survive floods and droughts or to recover from them. In contrast, in temperate climate rivers (temp-rivers), droughts are rare and floods can occur throughout the year. Seasonal differences are thus supposed to be higher in med-rivers. The few existing studies carried out separately in med- and temp-rivers suggest that interannual variability is another important driver to explain taxonomic composition. Med-rivers are also expected to have a higher interannual variability with significant differences between riverine communities of wet and dry years. However, there are no comparative studies that evaluate the relative effect of seasonal and interannual variability of riverine communities. On the other hand, med- and temp-rivers are both subjected to many types of human disturbances. This has led to the homogenization and simplification of riverine communities, with the consequent potential loss of the uniqueness of both river types. Our main aim is to analyse seasonal and interannual variability in taxonomic composition in med- and temp-rivers subjected to a contrasting level of impairment. Two natural forested and two agricultural river basins were sampled in both med- and temp-regions. In each basin, macroinvertebrate quantitative and qualitative samples were collected in 5 sites with different stream order. Samples were taken in spring and autumn over 3 years.

In temperate rivers, the analyses of taxonomic composition by means of Correspondence Analyses revealed that both, seasonal and interannual variability was low, explaining only 2% and 7.5% of the total inertia, respectively. Main taxonomic differences were found when comparing forested with agricultural river basins and longitudinal zonation. Our study has implications in how Mediterranean and temperate rivers should manage to maintain their seasonal and interannual uniqueness under the current global change.

MSF.P4

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COMBINED EFFECTS OF FOOD QUALITY AND PREDATION RISK ON CHIRONOMUS RIPARIUS

Low-order streams with established riparian vegetation depend on the contribution of allochthonous material for their ecological processes. Detritus, particularly leaf litter, can be a major energy source in many freshwater ecosystems, serving as a food resource and providing shelter to benthic communities. Changing the resource identity, for instance by the introduction of an alien riparian tree species, can cause bottom-up effects. Leaf quality can have considerable impact on detritivore species' performance and is an important mediator of trophic relations namely predator-prey interactions. Predation is considered a powerful selection force shaping prey morphology, abundance, physiology and behavior. Predators' presence may lead to a variation of foraging activity reflecting in a metabolic cost to the prey with consequences to their growth and development rates, as well as mortality risk. It is therefore important to assess the combined effects of different natural stressors such as predation and diverse food resources in detritivore macroinvertebrates. In this study we used a simplified aquatic trophic chain composed by Alnus glutinosa leaves, a dipteran collector species, the midge Chironomus riparius and a predator, the native planarian Dugesia sp. As invasive species we selected Eucalyptus globulus, an exotic tree species that is now widespread in Iberian riparian corridors. By changing leaf species, laboratory tests combined effects of predation and native vs. invasive food resources. C. riparius larvae were allowed to feed on alder or eucalyptus leaves (leaf discs and macerated leaves). Three predation levels were tested adding 0, 1 or 5 planarians in each replicate container with Chironomids.

E. globulus leaves characteristics in terms of texture and toxic compounds revealed a deleterious effect on C. riparius emergence. Moreover, larvae size was also found to be smaller in these treatments. Regarding predation, adult weight was influenced by the level of predation pressure, decreasing in the highest treatment. Results are discussed in terms of the combined effects of these two natural stressors (food quality and predation risk) on the growth, emergence and feeding behavior of C. riparius. This study highlights the importance of testing how changing resource quality can affect predator –prey interactions in freshwater systems.

EF.P13

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DOES THE TROPHIC STATUS INFLUENCE THE MACROPHYTE DECOMPOSITION AND FORMATION OF LIGNOCELLULOSIC-DERIVED DOC?

Senescent aquatic macrophytes are important detritus source in aquatic ecosystems. Particulate organic carbon (POC) encompasses ca. 70% of macrophyte dry biomass and biotic and abiotic conditions influence its decomposition. Considering nutrients availability, different trophic status has effects on decomposition rates. We hypothesized that high concentrations of nutrients allow the high mass loss. This study compared the mass loss of POC of two macrophyte species (Paspalum repens and Pistia stratiotes) in four trophic conditions (oligotrophic to hipereutrophic) and the pathway of the recalcitrant carbon. Samples of aquatic macrophytes and water were collected in Barra Bonita Reservoir (São Paulo State, Brazil). The protoplasmatic fraction from plant material was removed by aqueous extraction. Anaerobic incubations with POC were prepared with the same N:P ratio, inoculums and water simulating different trophic status (oligotrophic to hipereutrophic). Periodically during 120 days the particulate and dissolved carbon were measured. A kinetic model was adopted to describe and compare the POC decay and dissolved organic carbon (DOC) formation. Non-parametric tests were used to compare the POC decay and DOC formation among four trophic status and between the plants. The results showed biphasic decay for both macrophytes: the initial phase generated DOC derived from microbial activity on recalcitrant material. The presence of proteins, waxes, lipids and other non-hydrolysable compounds may support the arising of DOC. However the pathway of the dissolved fraction was different for both plants: for P. repens there was the formation of high molecular weight compounds; for P. stratiotes the mineralization was the main pathway of the DOC. The last phase was related to the slow decay of the structural compounds. Nutrients condition presented minor importance for the mass loss or DOC formation ($p > 0.05$); the intrinsic characteristics of the plants have more influence on mass breakdown ($p < 0.01$) and on the DOC quality. The main fate of the high molecular weight compounds is the accumulation in the aquatic systems contributing to diagenetic process; the mineralized fraction contributes to the carbon flow in ecosystems.

EF.P8

Bullejos, Francisco J.[1]*; Carrillo, Presentación*[2]*; Gorokhova, Elena*[3]*; Medina-Sánchez, Juan M.*[1]*; Villar, Manuel*[1]

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NUCLEIC ACID CONTENT IN CRUSTACEAN ZOOPLANKTON: BRIDGING METABOLIC AND STOICHIOMETRIC PREDICTIONS

Metabolic and stoichiometric theories of ecology have provided broad complementary principles to understand ecosystem processes across different levels of biological organization. We tested several of their cornerstone hypotheses by measuring the nucleic acid (NA) and phosphorus (P) content of crustacean zooplankton species in 22 high mountain lakes (Sierra Nevada and the Pyrenees mountains, Spain). The P-allocation hypothesis (PAH) proposes that the genome size is smaller in cladocerans than in copepods as a result of selection for fast growth towards P-allocation from DNA to RNA under P limitation. Consistent with the PAH, the RNA:DNA ratio was ›8-fold higher in cladocerans than in copepods, although 'fast-growth' cladocerans did not always exhibit higher RNA and lower DNA contents in comparison to 'slow-growth' copepods. We also showed strong associations among growth rate, RNA, and total P content supporting the growth rate hypothesis, which predicts that fast-growing organisms have high P content because of the preferential allocation to P-rich ribosomal RNA. In addition, we found that ontogenetic variability in NA content of the copepod Mixodiaptomus laciniatus (intra- and interstage variability) was comparable to the interspecific variability across other zooplankton species. Further, according to the metabolic theory of ecology, temperature should enhance growth rate and hence RNA demands. RNA content in zooplankton was correlated with temperature, but the relationships were nutrient-dependent, with a positive correlation in nutrient-rich ecosystems and a negative one in those with scarce nutrients. Overall our results illustrate the mechanistic connections among organismal NA content, growth rate, nutrients and temperature, contributing to the conceptual unification of metabolic and stoichiometric theories.

AMWQ.P14

Burfeid-Castellanos, Andrea[1]*; Flor-Arnau, Núria*[1]*; Navarro-Barquero, Patricia*[2]*; Cambra-Sánchez, Jaume*[1]*; Durán, Concha*[2]

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WATER QUALITY OF THE EBRO RIVER BASIN IN THE YEAR 2013 USING DIATOMS (BACILLARIOPHYTA) AS BIOINDICATORS

The Directive 2000/60/CE of the European Union (Water Framework Directive, WFD) pursuits the water quality assessment of the ecological communities in European Rivers using biological, physical-chemical and hydromorphological tools. The Ebro River Basin Authority (Confederación Hidrográfica del Ebro, CHE) has established a water quality control network that includes, among other quality elements, the epilithic diatom communities since 2002. This network allows not only quality control, but a biomonitoring opportunity for this basin.

This study is based on the summer survey of 2013, in which 194 sites have been sampled using European standardized testing norms (CEN 2003, CEN 2004) and epilithic diatom sampling protocols of the CHE. A total of 366 taxa have been identified, 92.2% at species level. These identifications have been used to obtain three pollution diatom indices: IPS, IBD and CEE.

Following the habitat typification of the CHE, the Mediterranean calcareous mountain rivers (Type 112), Rivers of wet calcareous mountains (Type 126) and High mountain rivers (Type 127) excelled in their water quality in having most of their locations accredited with High quality indices, whilst Main axes in mediterranean environment (Type 117) and Continental and mediterranean slightly mineralized axes (Type 115) trailed with worse outcomes.

Comparing this year's results to the reports made for the 2011 and 2012 diatom data, the trend of relative water quality deterioration seems to remain, since only 72.5% of the studied sites have High to Good water quality. The draught of 2012 may have worsened the results.

MSF.P1

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VULNERABILITY OF HIGH-MOUNTAIN LAKES OF SIERRA NEVADA TO MULTIPLE STRESSORS

Current global change is altering ecosystems and producing changes whose magnitude is not completely predictable in single-factor studies due to the interaction among multiple stressors. Our objective was to quantify the responses of primary producer communities, with different light histories and acclimation to solar radiation to: (i) double-ambient CO2 concentration, increased in nutrient inputs, fluctuating light regimes and different light qualities on a short-term scale. We carried out a multifactorial experiment during the highest UVR fluxes (mid ice-free period) with natural communities collected from six high-mountain lakes [Río Seco Grande (RS), Río Seco Superior (RSS), La Caldera (LC), Aguas Verdes (AV), Las Yeguas (LY) and Lagunillos de La Virgen (LV)] of Sierra Nevada National Park across UVR-transparency gradient. The experimental design consisted of two radiation treatments [ultraviolet radiation (PAB) versus photosynthetically active radiation(PAR)] , two nutrient enrichment [non-enriched (Nutambient) versus enriched conditions (Nutadded)], two CO2 concentrations [ambient (390 ppm) versus enriched (750 ppm)] and two fluctuating regime [static versus mixed (one rotation from surface to 3 m depth (speed 1m 4 min-1, total 10 cycles).

We evaluated the impact of these stressors on primary production (PP) and on excreted organic carbon (EOC) as percentage. A significant single inhibitory UVR effect on PP was found in all lakes. Besides, the combined impact of PABxNutxCO2xMixing on PP produced a synergistic effect, increasing %UVR inhibition on AV and LY, whereas it was antagonistic for RS, RSS, LC and LV, as a result of increase in nutrients, CO2 and a fluctuating regime. Likewise, EOC percentage exhibited a similar response pattern to PP, but with highest values showed in LV, an intermediate UVR-transparency lake, and the lowest in LC, the most transparent lake. These results represent a differential vulnerability of these ecosystems due to their different nutrient concentrations, variations in species composition and UVR-protection levels related with the DOM concentrations.

EF.P3

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PHOTOSYNTHETIC COMMUNITY STRUCTURE BASED ON PIGMENT ANALYSIS (HPLC) IN SHALLOW LAKES FROM CENTRAL SPAIN. TEMPORAL VARIABILITY AND FUNCTIONAL IMPLICATIONS IN A TROPHIC AND SALINITY GRADIENT

The study of the community composition of photosynthetic organisms is essential for understanding the structure and dynamics of lenitic ecosystems and a reference tool for the evaluation of the trophic level of water bodies. In this work, supported by the projects ECOLAKE (CGL2012-38909, MINECO) and CARBONSINK (Fundación Biodiversidad), 18 shallow lakes located at the "La Mancha Húmeda Biosphere Reserve (Central Spain)" were studied and a chemotaxonomic approach to study the photosynthetic community was used. The monitored water bodies exhibited highly diverse conditions; most of them are temporal systems, with a high salinity gradient from fresh- to hypersaline waters, and a trophic gradient from oligotrophic to hypereutrophic status. Pigment chemotaxonomy was performed through high-performance liquid chromatographic (HPLC) for the main algal groups and photosynthetic bacteria inhabiting the lakes, this is cyanobacteria, bacillariophytes, euglenophytes, dinophytes, chrysophytes, cryptophytes and chlorophytes. More than 30 pigments and degradation forms were identified and quantified. These pigment markers can reveal a variety of taxonomic composition, physiological status and grazing effects, the pigment characterisation by HPLC is widely used to study the properties of phytoplankton. Results show how photosynthetic pigments and the different ratios used for determining the phytoplankton features change significantly under the environmental gradients studied. The composition of the community of photosynthetic organisms (chemotaxomony) shows strong differences between lakes, mainly related with gradients of salinity modulated with the trophic status, and the annual lake dynamics, related to the hydrologic stress associated with the annual desiccation process. We also determined the senescence of the populations as the function of the pheophytin/chlorophyll ratio. Carotenoid pigment ratios are used for understanding the productivity patterns of various water bodies. We also explored the relationship between chlorophyll and trophic status in this gradient of salinity, the amount of chlorophyll in highly saline "lagunas" does not seem to be strongly correlated with the rate of external nutrient inputs, implications of this bias are evaluated.

AE.P8

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BIOCHEMICAL AND LIFE-HISTORY RESPONSES OF CHRIRONOMUS RIPARIUS EXPOSED TO UV FILTERS

Stream ecosystems face ever-increasing pressures by some emerging pollutants such as personal care products. Ultraviolet filters are present in a wide variety of sunscreens and cosmetics that are applied in skin and hair and are used for protection of materials. These compounds enter in aquatic ecosystem indirectly by discharges of sewage and swimming pool waters or directly by wash-off from skin and clothes during water recreational activities. Their potentially toxic effects on biota, particularly in aquatic organisms, are of considerable concern since many of these compounds are being increasingly detected in freshwaters. There is an urgent need of ecotoxicological evaluation of these compounds especially on sub-lethal effects on freshwater benthic species that live in close contact with sediments where these compounds accumulate.

The aim of this work was to assess effects of environmental relevant concentrations of selected UV-filters on survival, growth, emergence, and biochemical responses such as acetylcholinesterase and phenoloxidase activity, antioxidant defences and oxidative damage of the freshwater benthic midge Chironomus riparius. C. riparius larvae were exposed to a gradient of concentrations of Benzophenone-3, Octocrylene and 4-MBC according to the OCDE guidelines to assess effects on mortality and life-history. Effects on biochemical responses were evaluated over 24 hour exposures.

Results will be discussed comparing deleterious effects of environmental relevant concentrations of the different UV filters tested on C. riparius and comparing the sensitivity and ecological relevance of the different ecotoxicological endpoints.

EF.P7

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FACTORES DETERMINANTES DE LA ACTIVIDAD DE LA COMUNIDAD PLANCTÓNICA DE LA LAGUNA DE MANJAVACAS

La laguna de Manjavacas está situada a unos 670 m.s.n.m, se ubica en el término municipal de Mota del Cuervo, a unos 8 Km hacia el sur de dicha localidad, y cuenta con una superficie máxima de inundación que raramente supera los 1,6 Km2. Está incluida en la cuenca alta del río Záncara perteneciendo a su vez a la cuenca del alto Guadiana. De manera natural sería una laguna estacional, debiéndose en la actualidad su recarga principalmente a los aportes de agua superficiales que incluyen principalmente el vertido de las aguas residuales de Mota del Cuervo a través de la Acequia Madre, y los aportes pluviales.

A lo largo de un ciclo hidrológico se han llevado a cabo muestreos quincenales de la laguna, obteniéndose muestras de agua, plancton y bentos, y determinándose parámetros funcionales como las tasas de producción primaria y de respiración de la comunidad planctónica y bentónica. Tanto la actividad fotosintética como la respiración presentaron un patrón moderado entre el otoño y el invierno, acentuándose durante la primavera y el verano. La producción primaria bruta presentó tasas muy altas durante el año, desencadenadas por el masivo crecimiento fitoplanctónico, consecuencia de la eutrofización causada por la entrada de aguas residuales del vertido de Mota del Cuervo. En las tasas de respiración se vio reflejado principalmente el efecto de la temperatura y de la carga orgánica de origen autóctono y alóctono registrada en la laguna. Las altas tasas productivas consecuencia del masivo efecto eutrofizante del vertido hacen inviable la consecución de un buen estado ecológico de la laguna, con una alteración de sus patrones funcionales tanto por lo que se refiere a su hidrología como a los ciclos biogeoquímicos. Este trabajo ha sido financiado por el proyecto ECOLAKE (CGL2012-38909).

AE.P9

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CIIMAR

GLUTATHIONE TRANSFERASES EXPRESSION PROFILING IN RUDITAPES PHILLIPINARUM EXPOSED TO MICROCYSTIN-LR

Cyanobacterial blooms often produce toxic metabolites, including the cyclic hepatotoxins microcystins (MC). MC-LR is one of the most toxic and commonly detected MC congeners in natural blooms. Bivalves, as sessile filter-feeding animals, are a group of aquatic organisms threatened by the presence of such toxins. Being included in the dietary plan, the contamination and persistence of MCs in bivalves can pose a serious threat to public health and damage to the fishing industry. Tolerance to MCs is not yet studied in these animals and might be related with a higher efficiency of the detoxification process, namely in terms of different glutathione transferase (GST) enzymes.

In this study we used a proteomic approach in the clam Ruditapes philippinarum for a quantitative study of changes in GST isoforms expression induced by purified MC-LR. Additionally, biochemical responses were also analysed to support GST expression responses. Clams were exposed for 24 h to 10, 50 and 100 µg/L of dissolved MC-LR. Enzyme activity in the ¬¬cytosolic fractions of gills and hepatopancreas were determined for total GST, Phosphatase (PPP2) and Superoxide Dismutase. GSTs were purified by glutathione–agarose affinity chromatography and analysed by two-dimensional (2D) electrophoresis.

Results support the important role of GST enzymes in the detoxification of MCs in R. philippinarum. The evidence resulting from this study suggests that each organ has particular GST isoforms that are responsible for different processes in the presence of this stressor. This study points to the importance of further characterization for the bivalve's GST isoforms to better understand the key mechanisms involved in these organisms defence against MC exposure.

GC.P1

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¿SON LOS FACTORES CLIMÁTICOS Y EDÁFICOS BUENOS PREDICTORES DE GRUPOS FUNCIONALES VEGETALES EN RIBERAS DE RÍOS DE CABECERA?

La materia orgánica vegetal de origen terrestre es alimento principal de la red trófica de cabeceras fluviales en cuencas forestales. Su cantidad y calidad condicionan su aprovechamiento por la red trófica fluvial, siendo muy dependientes de las formas de crecimiento vegetal y fenología foliar de las especies dominantes. En ecosistemas terrestres, las condiciones climáticas y edáficas suelen ser buenas predictoras de la distribución de grupos funcionales vegetales y por ende de su calidad foliar. Sin embargo, escasea la información de los efectos de tales factores sobre la vegetación de arroyos permanentes, donde la disponibilidad hídrica, el lavado del suelo y la periódica perturbación demográfica podrían diluir los efectos de clima y suelo sobre la vegetación. Pretendemos determinar el valor de algunos factores climáticos y edáficos como determinantes de cambios funcionales en la vegetación y su calidad foliar. Para ello, estudiamos 30 ríos de cabecera andaluces, distribuidos sobre un gradiente de aridez (PPA media entre 290-1400 mm) y sobre distinta litología. En cada ribera se midió la cobertura de 5 grupos funcionales vegetales, que en orden de calidad foliar decreciente fueron: árboles y arbustos, caducifolios y perennifolios, y graminoides gigantes. También se tomaron muestras de suelo y datos climáticos, mediante SIG, de la última serie climática completa (1971-2000). Usando modelos de regresión de Mínimos Cuadrados Parciales determinamos los mejores predictores, climáticos y/o edáficos. Las dos matrices de variables ambientales mostraron efectos de similar magnitud sobre la cobertura vegetal; cada una explicó el 40% de la variabilidad. Graminoides gigantes, arbustos y árboles caducifolios fueron los grupos mejor explicados por ambos tipos de variables. La cobertura de las primeras se relacionó significativamente con las variables de más peso en el componente 1 de cada modelo: positivamente con la aridez y negativamente con la ratio C:N del suelo. El "número de días con lluvia al año" y la PPA media fueron los mejores predictores de la cobertura de caducifolios. CE (negativamente), % C orgánico y ratio C:N (positivamente) mostraron también gran peso sobre los caducifolios, aunque las dos últimas deberían considerarse más consecuencia que causa.

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AE.P1

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NEUROTOXICITY AND OXIDATIVE STRESS INDUCED BY COPPER OXIDE NANOPARTICLES AND IONIC COPPER IN FRESHWATER INVERTEBRATE SHREDDERS

Increasing commercial applications of nanometal oxides have raised a global concern about their release into natural waters, ultimately putting aquatic biota at risk. In streams, invertebrate shredders play a key role in organic matter turnover and energy transfer from plant litter to higher trophic levels. We estimated the acute lethal effects of nanoCuO and Cu2+ on the freshwater invertebrate shredder Allogamus ligonifer via aqueous exposure. The LC50 (96 h) of nanoCuO was 5.5 times higher than that of Cu2+. Biomarkers of oxidative stress and neurotoxicity were assessed at six concentrations of nanoCuO and Cu2+ (3 levels ‹ LC10 and 3 levels between LC10 and LC30). Both copper forms showed a similar response pattern at similar effect concentrations. The activities of superoxide dismutase (SOD), glutathione peroxidase (GPx) and glutathione reductase (GR) increased at the lower concentrations (‹ LC10) of nanoCuO and Cu2+, but the enzymatic activities gradually decreased with increasing concentrations (LC10 - LC30). GR activity remained higher than in control at all concentrations of both copper forms. The activity of glutathione S-transferase (GST) increased whereas the activities of catalase (CAT) and cholinesterases (ChEs) decreased in a dose-dependent manner. The response patterns suggest that the activity of antioxidant enzymes can prevent oxidative stress and neurotoxicity induced by nanoCuO and Cu2+ contributing to the survival of A. ligonifer.

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BB.P4

Castillo-Escrivà, Andreu[1]*; Valls, Luis*[1]*; Rochera, Carlos*[1]*; Gil-Delgado, José A.*[1]*; Gosálvez, Rafael U.*[2]*; Velasco, Ángel*[3]*; Camacho, Antonio*[1]*; Mesquita-Joanes, Francesc*[1]*; Armengol, Xavier*[1]

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HUMAN-MEDIATED DISPERSAL OF AQUATIC INVERTEBRATES: IBERIAN SHALLOW LAKES AS A MODEL SYSTEM.

Human-mediated dispersal is often overlooked in continental water bodies. Understanding the role of these vectors in metacommunity dynamics is essential for their conservation. The subject of the present study is to evaluate the potential effect on aquatic communities of human dispersal during sampling Mud was collected from boots used in 13 shallow lakes in Castilla-La Mancha (Central Spain) between December 2012 and January 2013. These samples were cultured with 1 liter of water in aquaria for 24 days. Each one was divided in 3 subsamples and these, together with other 3 control aquaria without mud, were cultured at a constant temperature of 20 ºC and photoperiod 10L:14D. A total of 197 individuals belonging to different taxonomic groups hatched. Ostracods, cladocerans and anostracans were the taxa appearing earliest and showing the highest abundances in the aquaria. Juveniles were cultured appart to grow them to adulthood for a correct identification. Heterocypris barbara, Pleuroxus letourneuxi, Alona salina and Daphnia magna were the predominant species observed. Zooplankton movements by human vectors among lakes can influence the gene flow dynamics and disturb pristine communities. So, introduction of new species from near lakes can affect communities and cause extinction of some species through predation or competition. Given the high density of invertebrates dispersed, conservation measures to avoid these effects should be taken whenever possible. This work was supported by the project ECOLAKE (CGL2012-38909).

IS.P8

Castro, Bruno B.[1]*; Pinho, Sónia*[1]*; Ré, Ana* [1]*; Costa, Patrícia A.*[1]*; Costa, Raquel*[2]*; Gonçalves, Fernando*[1]*; Pereira, Joana L.*[3]

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BIOLOGICAL CONTROL OF THE INVASIVE ASIAN CLAM CORBICULA FLUMINEA: CAN PREDATORS RULE THE PEST OUT OF THE GAME?

The invasive clam Corbicula fluminea is the cause of severe impacts, both environmental and economic, in invaded sites (e.g., water-dependent industries). Chemical and physical control methods are generally expensive and hazardous to the environment. The biological control of invasive species has the potential of being an effective, safe, and low-cost tool. Within this scope, we evaluated the potential of using vertebrate and invertebrate predators as biological control tools, using direct (clam consumption) and indirect approaches (avoidance behavior). Our aim was to establish a proof of principle regarding the suitability of the application of such control strategies in sensitive areas of water-dependent infrastructures.

In the field, we confirmed the presence of clam fragments in stomachs of Barbus bocagei, albeit having reduced importance. However, a review of the existing literature suggested other predators. Therefore, one invertebrate and two vertebrate predator models were selected: Procambarus clarkii (Louisiana crayfish), Lepomis gibbosus (pumpkinseed sunfish) and B. bocagei (common barbel).

In feeding experiments, the interest shown by both fish species in C. fluminea in predation experiments was extremely low, even with small-sized clams. Clam consumption by crayfish was also negligible, except in the smallest size class (clams ‹ 1 cm). Additional experiments suggested that the reduced utilization of C. fluminea as a prey was due to the protective role of its shell. In practical terms, the potential of these fish species as C. fluminea predators is limited, precluding the possibility of using them as direct control tools, although crayfish can be important predators of very small clams.

In a second set of experiments, we evaluated the indirect effects of the presence of predators on the avoidance behavior of C. fluminea. Clams responded to the presence of the predator in dual-choice aquaria, by actively moving; however, the amplitude and direction of this dislocation depended on the presence of a refuge to the prey, the fish’s diet and light conditions.

Biological control is an environmentally-friendly tool for mitigating the impacts of nuisance species in water-dependent facilities. However, our results are not promising enough to sustain predator-based methods for preventing C. fluminea infestations.

AMWQ.P29

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STUDY OF THE ECOLOGICAL STATUS OF THE RIVER TURIA AND ITS RELATIONSHIP WITH PHYSICO-CHEMICAL PARAMETERS AND MICROBIOLOGICAL INDICATORS OF WATER POLLUTION

For the development of this work the ecological status of the River Turia was studied, from its headwaters in Universal Montes, to its mouth, in the capital of Valencia. For this, 18 sampling points were selected basing on criteria such as proximity of a stock or the existence of a damming that could interrupt the normal course of the river.

To assess the ecological status were taken into account:

- The macroinvertebrates as indicators of biological quality index using the IBMWP index.
- QBR index and IHF that determined both the riverbed and the riparian zone.
- Physic-chemical indicators measured "in situ" such as temperature, dissolved oxygen concentration (mg / l), conductivity (mS / cm), pH and river flow (m3/seg).

In addition, a water intake was performed with the intention of measuring physical, chemical and microbiological parameters in the laboratory such as total ammonium (mg/l), total organic carbon (mg/l) , total coliforms (NMP/100ml) BOD5 (mg/l), Enterococci (NMP/100 ml), Escherichia coli (NMP/100 ml), nitrates (mg /l) and suspended solids (mg/l).
The main objective of the work presented at this conference was to study the possible relationship between the ecological status of a river and some physico-chemical and microbiological parameters related to the control of water quality. For this, statistical analysis of all the results obtained by using the STATISTICA © 8.0 statistical program is performed.

Among the obtained conclusions are deduced that:

- The ecological status of the River Turia varied from very good, at his headwater, to acceptable in its mouth.
- A highly significant relationship between the ecological status of the river and some parameters were obtained, such as ammonium, dissolved calcium flow, chloride, conductivity, TOC, E. coli, nitrate, and dissolved oxygen.

These findings served to GAMASER laboratory, along with the other members of Aguas de Valencia Group, to continue its work in daily checks of ammonium upstream of the water intake of the station water treatment La Presa (Manises , Valencia, Spain), which supplies water to the city of Valencia and its metropolitan area, where 1560 inhabitants live.

EH.P2

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FISH HABITAT RESPONSE IN A HYDRO-PEAKED STREAM IN A PYRENEAN RIVER

The river Noguera Pallaresa, as it passes through Esterri d'Àneu, undergoes an alteration of the flow regime due to hydro-peaks generated by hydropower plants (HPP). The aim of this study is to observe the effects that hydro-peaks can cause to the features and availability of the physical habitat for fish, especially the brown trout (Salmo trutta).

A spacial analysis of mesohabitats distribution has been carried out by means of cartography obtained from field research during natural regime and hydro-peak regime situations, using GIS tools (ArcMAP 9.3). Besides, habitat availability for the brown trout has been assessed, using the simulation software Rhyhabsim 5.0, which covers a wide range of flows (natural and hydro-peaked). Sampling points are located in various stretches. One point is not affected by hydro-peaks, but it is regulated by a dam (P1); another point is located immediately after the water exit of the HPP (P2), with hydro-peaks strongly affecting it; and finally, two more points are located downstream (P3 and P4), in which hydro-peaks are cushioned by the distance and the contributions of a small tributary.

In all sampling stretches downstream of the HPP, in a maximum hydro-peak position (17 m3/s), the river is almost homogenized into a mesohabitat controlled by deep and fast water (fast channel) so that curves of physical habitat availability of the brown trout (function of the speed, water depth and substrate type) which decreases the weighted usable area (WUA) in all states of development (spawn, fry, juveniles and adults). Nevertheless, in intermediate hydro-peak flows, the WUA increases noticeably for juveniles and adults, and in a spectacular way for spawn conditions. The global balance is put forward in terms of physical habitat availability for the brown trout, in the stretch subdued to hydro-peaks in relation to the stretch model, from flow duration curves in 1 m3/s intervals and their own WUA. It is observed that the WUA depends on the hydro-peak flow's magnitude and the frequency with which it is produced.

BB.P3

Conde-Porcuna, José M.*; Moreno, Emilio J.; Pérez-Martínez, Carmen; Ramos-Rodríguez, Eloísa*

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RELEVANCE OF ZOOPLANKTON DORMANT PROPAGULES DISPERSAL BY WIND AND RAIN IN SEVERAL AQUATIC SYSTEMS.

The zooplankton dispersal capability may regulate the population dynamics and aquatic community structure and play a key role in the colonization of new water bodies. Zooplankton is potentially dispersed overland by abiotic vectors like wind, rain and water flow, or by organisms like waterfowls or insects. Although many studies have studied the dispersal vectors, quantitative measures of zooplankton dispersal have been rare and mainly focused on waterfowls. Unfortunately, little is known about dispersal rates by wind or rain due to the difficult to measure it. In this study we quantify the zooplankton propagules dispersal by wind and rain using two atmospheric deposition collectors, which permit to collect samples from dry atmosphere deposition and wet atmosphere deposition. Two of these collectors were placed beside the lakes Dulce and Santa Olalla, eutrophic lakes in Doñana Natural Park, and a third one was located close to the lakes Tinaja and Cueva Morenilla, oligotrophic lakes in the Ruidera Natural Park. As the collectors located in Doñana gathered more quantity of zooplankton propagules, we built two nylon wind socks beside these collectors for measuring the particulates blowing in the wind. The results shown differences in the number and the species propagules collected between the lakes of different location. The higher abundance of dormant propagules was registered in the wind socks, but the presence of them in both collectors suggested the importance of the aerial dispersal. Our results suggest the relative importance of wind and rain as dispersal mechanisms of the zooplankton dormant propagules and their impact on the biodiversity of aquatic systems.

SS1.P4

Cotrim, Sónia[1]*; Primo, Ana L.*[1]*; Falcão, Joana*[1]*; Martinho, Filipe*[1]*; Azeiteiro, Ulisses*[2]*; Pardal, Miguel*[1]

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AN ESTUARINE ZOOPLANKTON'S PERSPECTIVE OF WEATHER EXTREMES: A COMPARISON BETWEEN DROUGHT AND REGULAR YEARS

Presently, abrupt and dramatic changes in coastal and estuarine ecosystems occur in response to often subtle climate or anthropogenic pressures, which are already reflected in changes on zooplankton communities. In particular, coastal and estuarine systems are highly sensitive to climate extremes and changing precipitation patterns, and thus offer invaluable scenarios for the evaluation of climate variability. The ongoing work aimed to be the first step for a monitoring program, and integrates and synthesizes information about the structure of the zooplankton community in a highly dynamic coastal ecosystem, the Mondego estuary (Portugal). Zooplankton assemblages and hydroclimate variables were monitored for 8 yr. The main objective was to assess the impact of climate variability, particularly of the 2 most recent drought events, with emphasis on how stochastic extrinsic perturbation might influence these populations. Principal component analysis revealed dramatic environmental changes, which were reflected in the seasonal and inter-annual patterns in the zooplankton, indicating that hydroclimate forcing is critical in defining zooplankton dynamics. Lower precipitation and higher salinities were the main drivers for the observed patterns, i.e. a major penetration of seawater led to a higher prevalence of marine species. Results also revealed a conspicuous increase in warm water taxa since 2006, which was significantly related to pronounced changes in water temperature. This synchronous variability between water temperature and zooplankton abundance, which had not been evaluated and discriminated in previous studies, suggests the potential impact of warming on zooplankton assemblages. Hence, this study demonstrates the crucial role of zooplankton as valuable indicators of hydrological changes associated with climate factors in estuarine ecosystems.

GC.P5

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TOXICITY OF TWO FUNGICIDES IN TWO DAPHNIA GENOTYPES: IS IT ALWAYS TEMPERATURE-DEPENDENT?

Climate change scenarios, particularly involving increasing temperatures, have been the focus of recent studies, as they may affect aquatic communities. These communities can also be affected by nearby agricultural diffuse pollution, due to pesticide application, which may ultimately reach aquatic systems. The interaction between increasing temperature and pollution is therefore important to understand and predict, mostly because their joint effect on organisms is frequently more noxious when compared to their individual effects. Despite this, one must also take into account the organisms ability to adapt to new conditions (namely increasing temperatures), as this is a determinant aspect in their success. Bearing this in mind, our goal was to determine the sensitivity of a model organism to contaminants with increasing temperatures, allowing prior acclimation of the organisms to the different temperatures. To do so, prior to exposure, two Daphnia genotypes (belonging to the D. longispina species complex) were acclimated to three temperatures (17, 20 and 23˚C) for at least five generations. Afterwards, a crossed design was established using the different temperatures and a range of concentrations of two frequently used fungicides (tebuconazole and copper). These contaminants have been regularly recorded in an aquatic system surrounding a vineyard (project VITAQUA, PTDC/AAC-AM/112438/2009-FCOMP-01-0124FEDER013912). Daphnia life history parameters were analyzed in each temperature × toxicant combination for 21 d. Temperature was the most influencing factor: both Daphnia genotypes reproduced later and had lower fecundity at 17˚C than at 20˚C and 23˚C. As expected, both copper and tebuconazole also significantly reduced the fecundity and survival of Daphnia at environmentally-relevant concentrations. No temperature-dependence was found for copper toxicity profiles, whilst for tebuconazole the pattern was genotype-dependent. Unlike most literature on the subject, our results do not support the theory that increasing temperatures foment increasing toxicity. The absence of a clear temperature-dependent toxicity pattern may result from the previous acclimation to the temperature regime. These results show that researchers must consider the organisms' ability to adapt to new conditions in order to avoid misleading conclusions for climate change scenarios.

EF.P12

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RESPONSE OF MICROBIAL ACTIVITY IN THE HYPORHEIC AND BENTHIC RIVER SEDIMENTS TO GRADIENT OF ENVIRONMENTAL VARIABLES ACROSS LANDSCAPE

River sediments are pivotal environment for microbial metabolism in riverine ecosystems, thus the estimation of sediment metabolic activity can be good indicator of river condition. In this study, the linkage between respiratory potential of biofilm in surface and hyporheic sediments as well as the response of respiratory potential to different land uses was investigated. Twenty four sampling sites were selected, distributed along 5 rivers in central Slovenia differing in prevailing land use type (forest, agriculture and urban). The sampling was carried out during two seasons (summer and winter). Physical and chemical analyses of water, amount of fine sediments, and particulate organic matter was measured on the surface of the river bed and in hyporheic zone (depth 20-40 cm). Microbial activity was assessed by measuring respiratory electron transport system (ETS) activity. Comparison of ETS activity showed that significantly different values were observed between hyporheic and benthic sediments and between seasons (Mann Whitney U-test, $p<0.05$). Results of principal component analysis (PCA) performed on environmental variables and microbial activity explained 58 % of total variance by the two first components in surface sediment layer and 38 % of total variance in the hyporheic zone. Dissolved organic carbon, temperature and ETS activity correlated the most with the first PCA component and the amount of fine sediments and particulate organic matter correlated the most with the second component in both environments. Preliminary results indicate that forest land use had the lowest respiratory potential (0.503 +/- 0.269 µL O2 gWW-1h-1 in benthic sediments and 0.385+/-0.349 µL O2 gWW-1h-1 in hyporheic sediments; mean+/-SD), particularly in surface sediments. This pattern was stronger in summer in comparison to winter sampling occasion that gave less straightforward results.

RLWE.P14

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STRUCTURE OF MICROBIAL COMMUNITIES FROM BACTERIA AND ARCHAEA DOMAIN FROM ITUPARARANGA RESERVOIR, SÃO PAULO - BRAZIL

Microbial communities have been widely studied throughout history due to its importance for both its medical medicinal effects and environmental roles. However, the archaeal group presence is poorly studied in many environmental, as into the water column from subtropical reservoirs. This work quantified the archaeal and bacterial communities in two sites, dam and entrance, of the water column from the Itupararanga reservoir, Brazil by real time PCR and evaluated the richness of both domain by denaturing gradient gel electrophoresis (DGGE). Environmental parameters as dissolved oxygen, water temperature and nutrients concentrations were determined using an YSI multiparameter probe. Our results suggest that Bacterial and Archaeal communities were widely distributed on the water column. This profile is common to the first one but not to Archaea domain, since this group has anaerobic metabolism and in this work it was meeting on the top of the reservoir where the oxygen concentration was high (99% and 96% Dam and entrance, respectively). The bacteria quantity (media 4.19x107 copies. L-1 and 5.60 x107 copies. L-1 entrance and Dam, respectively) was greater than archaea quantity (media 4.29 x. 102 copies. L-1 and e 2.60 x. 102 copies. L-1 entrance and Dam, respectively). It seems possible that these results are due to the higher costs of metabolic processes carried out by archaea since diversity and abundance is directly limited by energetic costs of maintaining populations in extreme environments. Canonical Correspondence Analysis (CCA) enables the grouping of the environmental with biological parameters. The first grouping was between profundity and microbial quantity, mainly to Archaeal communities, probably due to the thermal and chemical stratification of water column. The second one was between bacteria quantity and environmental conditions, like pH, temperature and nutrients concentration, showing that these parameters have control in the bacterial communities. The last grouping was between nutrients concentration and the structure of the communities, indicating that the microbial richness is influenced by these parameters. Thus, although the differences between the communities and their particularities, both are distributed all over the water column.

BB.P10

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CONTRASTING PATTERNS IN FUNCTIONAL AND TAXONOMIC BETA DIVERSITY: INSIGHTS TO PERIPHYTIC ALGAE IN FLOODPLAIN

Due to the lack of taxonomic and functional patterns of beta diversity for periphytic algae in floodplain lakes, this study aimed to answer what the contribution of each component partitioned of functional and taxonomic beta diversity for periphytic algae in floodplain lakes; what is the relationship between the functional and taxonomic beta diversity and their respective components; which is the relationship between environmental and spacial dissimilarity of lakes and functional and taxonomic beta diversity, and whether functional beta diversity were significantly different from null-expectation given the observed patterns of taxonomic beta diversity. The study was conducted in nine lakes during 2011 in two hydrological periods. The species functional matrix was composed for four functional traits. Functional dendrograms were used to estimate the beta functional diversity, and species composition matrix to estimate the beta taxonomic diversity. We evaluated the turnover and nestedness-resultant, and the correlations between functional and taxonomy beta diversity, and its components, and between these dissimilarities with environmental and spacial dissimilarity of lakes. Species turnover did not provide the functional traits turnover, and this showed a functional redundancy between species. The species loss (nestedness-resultant) led to a loss of functional traits, which may indicate that species belonging to a community represent only a small set of functional traits present in the other community with higher species richness. Increasing the distance between the lakes provided higher turnover of species and environmental dissimilarity, and these communities showed strong distance-decay relationship for the species composition mainly related to dispersal and environmental dissimilarity. The null models demonstrated that in high water the replacement of functional traits between the lakes is greater than expect given the taxonomic beta diversity, and wherefore this period was configured for redundant species for the functional traits evaluated. We noted that it is essential to determine the periphytic algae patterns of taxonomic and functional beta diversity periphyton, and the proportion represented by its components to a better understanding of the dynamics and structure of these communities. We infer the importance of the selection of functional traits and that it represent the niche of the species.

AMWQ.P23

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INTERANNUAL VARIATION OF MACROPHYTE RICHNESS AND DIFFERENCES BETWEEN ANALYSTS IN REFERENCE SITES OF THE EBRO BASIN

When establishing reference conditions for riverine ecotypes for any biological indicator, it is necessary to have a reliable set of data (sampling and taxonomic determinations performed by qualified experienced staff) and a sufficient number of years to record the interannual variability naturally occurring. To do this, the variation of the number of taxa of macrophytes collected in the reference sites of the Ebro Basin during the period 2007-2013 was analyzed. So,firstly, differences in taxa richness collected at the same sites by different analysts were assessed, and secondly, the interannual variation in sites sampled by the same analyst with qualified experience in sampling macrophytes was evaluated (therefore, attributable to natural variation). Significant differences between analysts were obtained, while the interannual variability of natural origin was found to be 16 % on average. Then, taxa and probable environmental factors responsible for this variation were identified. Finally, the importance of such studies in determining reference conditions for the community of river macrophytes is emphasized.

IS.P3

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¿ESPECIES EXÓTICAS INVASORAS Y BUEN ESTADO ECOLÓGICO? UNA INCONGRUENCIA PENDIENTE DE SOLVENTAR

El estado de una masa de agua, en el contexto de la Directiva Marco del Agua (DMA), se define como el grado de alteración que presenta respecto a sus condiciones naturales y viene determinado por el peor valor de su estado químico y ecológico. El estado ecológico refleja la calidad y funcionamiento de los ecosistemas acuáticos asociados a las aguas superficiales y se evalúa según una serie de indicadores biológicos, físico-químicos e hidromorfológicos y en relación con las condiciones naturales en ausencia de presiones. La DMA establece que cada demarcación hidrográfica debe efectuar un estudio de las repercusiones de la actividad humana en el estado de las aguas superficiales (evaluación del riesgo, IMPRESS). Entre esas presiones se reconocen fuentes de emisión de contaminantes, extracciones de aguas significativas, obras de regulación, usos del suelo,...y en la cuenca del Ebro, se consideraron en su día también como presiones, las especies exóticas invasoras (EEI) Tras casi 15 años desde la publicación de la DMA, se han desarrollado abundantes herramientas para su buena aplicación. Sin embargo, la evaluación del estado ecológico, determinada a través de índices bióticos de diatomeas, macroinvertebrados, macrófitos y peces, no tiene en cuenta en España, ni en otros países de la Unión Europea, la presencia de EEI. De este modo, masas de agua con presencia comprobada de EEI, pueden estar dando resultados de estado ecológico bueno o incluso muy bueno sin que ninguno de los índices bióticos utilizados refleje este hecho. Un nuevo reto para la limnología ibérica.

AMWQ.P26

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DETERMINACIÓN DE LA CALIDAD DEL AGUA MEDIANTE INDICADORES BIOLÓGICOS Y PARÁMETROS FISICOQUÍMICOS DE LA MICROCUENCA DE LA QUEBRADA MORACI EN LA LOCALIDAD DE CHAPINERO

Es importante conocer y cuidar el agua ya que es un recurso natural muy valioso para el hombre, pues con el transcurrir del tiempo se ha visto afectada en el planeta sin tener conciencia de ello. Es por esto que los sistemas hídricos de la ciudad cobran importancia, ya que hacen parte fundamental del ambiente y nos brindan una inmensa riqueza natural además de servicios ecosistémicos.

La cuenca de la quebrada Morací está ubicada en la parte alta de Chapinero sobre los cerros orientales de la ciudad de Bogotá los cuales cuentan con una gran diversidad ecosistemas, fuentes hídricas, paisajes, presencia de bosques, fauna y flora nativos que persisten en este lugar. (Alcaldía Mayor De Bogotá 2010). Dicha quebrada se ha visto afectada por las actividades antrópicas generadas por procesos de urbanización en su ronda, labores domésticas o consumo humano, descarga de aguas residuales agropecuarias uso industrial y comercial, entre otras.

Por tal motivo en este trabajo se pretende obtener datos fisicoquímicos y microbiológicos que evidencien el estado actual de la calidad del agua de la Quebrada la cual suministra agua a la comunidad formando parte del acueducto veredal.

Es así como a través de parámetros como el pH, Temperatura, Oxígeno Disuelto y Conductividad (Barrenechea, 2002, Harris, 2007), bioindicadores como los macroinvertebrados (Pennak, 2001; Alvarez 2012) y la implementación del índice BMWP/Col (Roldan 1996) se determina la calidad del cuerpo de agua en cuestión.

Los resultados ponen de manifiesto que las características físico-químicas en especial la conductividad evidencian una baja calidad de las aguas. Así mismo los macroinvertebrados de las familias Chironomidae y Tubificidae a lo largo de la cuenca ratifican dicha calidad.
Es por esto que se requiere un plan de manejo y restauración encaminado a la recuperación de este cuerpo de agua donde se incluye la plantación en la margen hídrica (MAVDT, 2003; Barrera y Valdés, 2007), además de acondicionamiento de zonas erodadas en la cuenca alta a través de banquetas, biomantos y cerramientos (Zeballos y Rivas, 2002). Es importante integrar a la comunidad en el proceso si se desea obtener eficiencia en las medidas tomadas.

AMWQ.P27

Echavarria, Monika C.; *Jiménez, Daniel H.*

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DETERMINACIÓN DE LA CALIDAD DEL AGUA DE LA QUEBRADA CHICÚ, UTILIZANDO MACROINVERTEBRADOS ACUÁTICOS COMO BIOINDICADORES

El crecimiento poblacional en todo el mundo ha hecho que se requieran más recursos para satisfacer las necesidades generando una cantidad proporcional de residuos, los cuales no presentan una disposición final adecuada, contaminando los ecosistemas acuáticos a nivel mundial.

El río Chicú nace en Tabio, con el aporte de las aguas de las quebradas Chicú y Hoya Montosa, quebradas; y desemboca en el río Bogotá en Colombia (EOT Tabio, 2007). La subcuenca del río Chicú en la parte alta, recibe aportes orgánicos de la zona urbana del municipio de Tabio. Durante la época de verano, se presenta escasez generalizada del recurso y los caudales descienden considerablemente. En época de invierno se presenta el efecto contrario, y sus tributarios aumentan sus caudales, presentándose en algunas zonas represamientos (Diagnostico Primera Infancia y Adolescencia, 2012). Debido a la escasez de información en estos ecosistemas acuáticos colombianos y al uso que se hace de ellos, impera la necesidad de conocer la calidad de las aguas del rio Chicú tanto a nivel físico químico como microbiológico con la ayuda del método BMWP/Col y así convertirse en una herramienta útil para la toma de decisiones por parte de las autoridades ambientales.

A través del uso de macroinvertebrados acuáticos como indicadores biológicos (Figueroa, 2003) se evaluó la calidad del cuerpo de agua en mención. Cabe resaltar que los registros de estas especies están centradas en países europeos (Fossati et al., 2008) de forma tal que para nuestro país hay poca información al respecto, y la existente continua fragmentada. Así mismo se utilizó el método BMWP/Col. (Roldán 2003, 2008; Oyaga 2012) y el análisis de los parámetros fisicoquímicos, en tres diferentes puntos de la quebrada a lo largo del municipio los cuales evidenciaron una contaminación moderada en casi toda la quebrada, con una gran contaminación luego de que la quebrada atraviesa por un costado las Lagunas de Oxidación (PTAR) y recibiera los aportes de aguas negras sin tratamiento alguno, provenientes de la Quebrada Guandoque.

AMWQ.P37

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CORRESPONDENCIA ENTRE LAS ESTIMAS DE DENSIDAD Y BIOMASA DE PECES OBTENIDAS MEDIANTE ARTES DE PESCA Y MEDIANTE TÉCNICAS HIDROACÚSTICAS EN EMBALSES

Los embalses son ecosistemas acuáticos complejos, por lo que su funcionamiento es a veces difícil de modelar con vistas a una mejor gestión y conservación de los mismos. Limnólogos, ictiólogos y ecólogos en general siguen trabajando para conocer mejor el entramado de factores implicados en la estructura y función de estos ecosistemas y de sus comunidades biológicas. En el caso de la gestión piscícola de los embalses ésta pasa irremediablemente por la evaluación de sus poblaciones de peces: su abundancia y biomasa, pero la precisión de éstas está íntimamente ligada al muestreo del cual se extrae dicha información. El muestreo de las asociaciones ícticas en los embalses y en general en los ecosistemas acuáticos epicontinentales incluidos dentro de la DMA en el conjunto de las aguas no vadeables, es un tema siempre controvertido, y la información de las poblaciones de peces obtenidas en un muestreo depende en gran medida de la elección de la metodología de muestreo y de las técnicas y artes empleadas en el mismo.

En este estudio se han comparado la abundancia y biomasa de peces estimada a partir de las capturas con artes de pesca y la estimada a partir de prospecciones hidroacústicas en 25 embalses españoles con diferentes características morfométricas, limnológicas y de estados tróficos. Igualmente se analizó el efecto que puede tener la estratificación de la columna de agua en dichas estimas.

EF.P10

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CARACTERIZACIÓN DE LA ACTIVIDAD CELULOLÍTICA DE LA MICROBIOTA DESCOMPONEDORA DE HOJARASCA EN RÍOS DE DIFERENTES REGIONES BIOCLIMÁTICAS

Los aportes de hojarasca de la vegetación circundante suelen ser una fuente principal de carbono y de energía para los ecosistemas fluviales de cabecera. La degradación microbiana de estos materiales está mediada por enzimas extracelulares, que resultan de particular interés por poder hidrolizar los componentes principales de la fibra vegetal (hemicelulosa, celulosa y lignina) para su asimilación por los microorganismos descomponedores y por los detritívoros. Su especificidad hace de la caracterización funcional de los equipos enzimáticos y la cuantificación de sus actividades, en concreto las del complejo celulasa por la gran abundancia de este compuesto, una herramienta útil para detectar diferencias en el proceso de descomposición de hojarasca entre distintos ecosistemas. Las determinaciones de actividad celulolítica se realizaron sobre extractos procedentes de dos especies (Alnus glutinosa y Phragmites australis), muy diferentes en su calidad, que fueron incubadas durante 50 días en ríos de dos regiones con amplio contraste biogeoclimático: Sierra Nevada y levante semiárido de Almería, y por tanto con características físico-químicas del agua notablemente diferentes. La caracterización funcional en cuanto a pH y temperatura mostró máximos de actividad a pH 7.5 para todos los extractos, independientemente de la especie y del río. Por el contrario la actividad máxima se detectó a temperaturas notablemente diferentes en función del sustrato y el emplazamiento. Adicionalmente se realizaron zimogramas y se estimaron los parámetros cinéticos aparentes para algunas de las muestras confirmándose las diferencias funcionales apuntadas. Esto sugiere que el equipo enzimático de la comunidad microbiana presente en el material incubado en ríos de diferentes regiones muestra diferencias en la capacidad para la degradación de la hojarasca en función del entorno.

Este estudio ha sido financiado por el MINECO, proyecto RIBARID (CGL2012-39635).

EF.P9

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MODELIZACIÓN IN VITRO DE LA DESCOMPOSICIÓN MICROBIANA DE HOJARASCA MEDIANTE BIRREACTORES DE MEMBRANA

Se ensayó la aplicación de biorreactores de membrana con el objetivo de modelizar el efecto de diferentes variables ambientales (temperatura y concentración de sales del agua) sobre las tasas de hidrólisis de celulosa por parte de los equipos enzimáticos microbianos extraídos de material vegetal en descomposición. Se utilizaron extractos enzimáticos de dos especies de hojarasca con amplio contraste cualitativo, Alnus glutinosa (Ag) y Phragmites australis (Pa), incubados durante 50 días en un río del Parque Natural de Cabo de Gata (Almería). Los resultados mostraron que el proceso de hidrólisis de celulosa fue más dependiente del tipo de material foliar que de los factores ambientales ensayados. Además, la tasa de hidrólisis medida con los extractos de la hojarasca de baja calidad (Pa) fue relativamente insensible a la temperatura, en comparación con los extractos de la hojarasca de alta calidad (Ag). La tasa de hidrólisis de celulosa por parte de los extractos de ambas especies no se mostró sensible a la concentración de sales del agua. El modelo mostró una gran utilidad potencial para evaluar de forma sencilla el efecto de distintos factores que pueden afectar a la hidrólisis de la celulosa en material vegetal sumergido.

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RLWE.P5

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A CASE OF USING TRADITIONAL AND MOLECULAR APPROACHES TO ASSESS THE EFFECTS OF SEASON AND EUTROPHICATION ON FUNGAL COMMUNITIES ON PLANT LITTER DECOMPOSING IN STREAMS

Aquatic fungi, namely aquatic hyphomycetes, play a pivotal role in plant-litter decomposition in freshwaters. Traditionally, aquatic hyphomycete communities have been characterized by the microscopic identification of conidia released from colonized plant-litter. However, absence of conidia may be due to the absence of species or to the presence of non-sporulating mycelium. Molecular approaches based on nucleic acids such as Denaturing Gradient Gel Electrophoresis (DGGE), have been used successfully to assess fungal diversity, circumventing the hurdles associated with the microscopy-based techniques. However, DGGE community fingerprints only give an estimate of species richness but no information of species identity. High-throughput sequencing techniques allow the identification of species within communities through direct extraction of DNA sequences from environmental samples, and comparison with reference sequences on genetic databases. In this work, we assessed fungal diversity on Quercus robur leaves decomposing in 5 streams differing in trophic status (NW Portugal), in Autumn 2012 and Spring 2013, through microscopy-based techniques (identification of conidia), and by molecular techniques (DGGE and 454-pyrosequencing) of the transcribed spacer 2 region (ITS2) of rDNA. Higher fungal diversity was observed in Spring and in moderately eutrophic streams based on sporulating species. Contrarily, fungal diversity based on the DGGE fingerprints was higher in Autumn for most streams. From the total nº of aquatic hyphomycete species found through conidium identification and pyrosequencing, ca. 50% were detected by both techniques, while ca. 30% were exclusively accessed using conidia identification and ca. 20% by using pyrosequencing. In Autumn, pyrosequencing reveled higher fungal diversity than that assessed based on conidium identification, but the opposite was observed in Spring. This happened because most of the species which were only identified by spores occurred in Spring, and are not connected yet to any ITS barcode on genetic databases. Overall, this suggests that pyrosequencing is a powerful tool for revealing fungal diversity on decomposing-plant litter in streams and strongly encourages researchers to continue the effort in barcoding fungal species.

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AMWQ.P35

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PROPOSAL OF A TYPOLOGY OF MOUNTAIN LAKES AND PONDS USING THE COMPOSITION OF FUNCTIONAL GRUOPS OF MACROPHYTES

Before establishing the ecological status of lakes, WFD requires the availability of a classification of water bodies in types. Usually, the development of a typology has been based on abiotic variables. However, its validity should be derived from the corroboration with the biological communities present in the water bodies. For the macrophytes, several factors affecting their presence in aquatic ecosystems could be used to define types of lakes. In this study, the natural variability of macrophyte communities in mountain lakes and ponds is evaluated, in order to develop a biologically relevant typology. It also evaluates the validity of using functional groups as an alternative to taxonomical approach. 31 reference lakes and ponds located in the Cantabrian Mountains and Cabrera, Segundera, Gredos and Picos de Urbión mountain chains were included in the study. Functional groups of macrophytes were established taking into account the inorganic carbon source used in photosynthesis. Presence and abundance of macrophytes were strongly influenced by pH, alkalinity and conductivity. The typology developed from the functional groups was more conclusive than that derived from the taxonomic data. Four types of lakes were identified and they were characterized by a) submerged hydrophytes (charophytes and elodeids), b) bryophytes, c) isoetids and d) floating-leaved hydrophytes. The variability in functional composition of macrophytes among the different types of lakes was basically due to pH and orthophosphate concentration related to decomposition of macrophytes. Submerged macrophytes dominated in the lakes with low orthophosphate concentration and the highest values of alkalinity. In lakes with lower pH, floating-leaved macrophytes were the dominating plants when the phosphorus concentration was higher, whereas at intermediate concentrations of it, bryophytes and isoetids were more abundant. The differentiation of these latter two lakes was the higher acidity of lakes dominated by bryophytes.

AEBC.P5

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SEED BANK RESILIENCE ACCORDING TO HYDROPERIOD VARIATIONS IN A TEMPORARY POND NETWORK

We carried out an experiment in climatic chambers to asses differences in aquatic plants composition under three different flooding conditions. We simulated autumn, winter and spring pond flooding (respectively with 32, 19 and 10 weeks of hydroperiod) under photoperiod and temperature conditions similar to variations recorded in natural ponds. Every week we recorded the number of emergent plants and phenology. Plant biomass was recorded at the end of the experiment.

Under autumn and winter flooding, plants began to emerge after 4 week; while under spring flooding, plant emergence began in the second week. In the autumn flooding treatment, we also detected a second germination peak in spring.

We recorded the largest plant biomass in the winter flooding treatment. However, higher number of species flowered and fructified under autumn flooding. In this treatment, flower and fruit periods were also longer than in the other treatments. In contrast, under spring flooding, fruits were only recorded in 28.6 % of aquaria and fruit production was considerably lower than in in the other two treatments.

Our results reveal that communities of aquatic macrophytes show wide interannual variations in relation to the characteristic fluctuations of Mediterranean ecosystems.

EF.P14

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A META-ANALYSIS OF THE EFFECTS OF FOREST CHANGE ON LITTER DECOMPOSITION IN STREAMS

Native forests worldwide are being replaced by tree plantations or invaded by exotic woody species. Here we present a meta-analysis of 22 studies published between 1993 and 2013 that reported the effects of replacement of native forests by tree plantations or invasion of riparian areas by exotic woody species on litter decomposition in streams. When considering the entire database (n=150 native forest – altered forest pairs), forest change inhibited litter decomposition rate by ca. 16%. The magnitude of the forest change effect on litter decomposition depended on the type of change: the replacement of native forests by deciduous plantations (n=21) inhibited litter decomposition by 27% and the replacement by eucalypt (Eucalyptus globulus) plantations (n=88) inhibited litter decomposition by 20%; no significant effect was found for the replacement by conifer plantations (n=27) or the invasion by exotic species (n=15). The replacement of native forests by eucalypt plantations contributed the largest number of cases to this meta-analysis (59%), but most studies were performed in the Iberian Peninsula (9 out of 10), while 12 countries have more than 500.000 ha of eucalypt plantations. This limits the geographic generalization of our results. Nevertheless, the replacement of native deciduous forests by eucalypt plantations the catchment and riparian level had stronger effects on litter decomposition (– 26%) than when eucalyptus were present only in the catchment (– 9%) or only in the riparian area (– 2%). The eucalypt effect was stronger for the decomposition of high quality leaves (low C:N; up to – 51%) and when invertebrates were allowed access to the litter (– 46%), but not for the decomposition of wood, low quality leaves (e.g. E. globulus), or microbially-driven decomposition. This indicates that eucalypt plantations inhibit litter decomposition when invertebrate decomposers play an important role in the process, suggesting that the effect of eucalypt plantations on litter decomposition is mediated by changes in invertebrate communities, while microbial communities may be more resilient. The replacement of native forests by eucalypt plantations may thus have more negative effects in streams that receive natural high quality litter and where invertebrate detritivores play an important role on ecosystem functioning.

AMWQ.P10

Formigo, Nuno*; Ferreira, Stéphanie; Ribeiro, Sérgio; Maia, Mónica;*

FCUP

GEOGRAPHICALLY BASED DECISION SUPPORT SYSTEM (DSS) FOR A PORTUGUESE HYDROGRAPHIC REGION

As required by the Water Framework Directive (WFD), Portugal has prepared Hydrographic Basin Management Plans (HBMP) for its 8 hydrographic regions. In these plans, a lot of information, concerning physicochemical and biological indicators of water quality status was gathered. Nevertheless, the integration of this information was done almost exclusively through tables and statistical modelling. The considerable number of maps produced represents only particular types of information, rarely allowing for an integrated view of the situation.

In the present work, we tried to develop a method to synthetize as much information as possible in a geographical representation (map), thus allowing for a much easier assessment of the quality status of each water body, by someone at the national or regional water agencies, using all the information available.

Hydrographic region 4 (corresponding to the basins of rivers Vouga, Mondego and Lis), in the central region of Portugal, was chosen as a study-case.

The resulting maps present, in the same image, the geographical limits of the water bodies; the altimetry of the basin (thus indicating the direction of the flow and which water bodies affect/are affected by which); and the value of the selected physicochemical indicators (BOD5, COD, N and P) according to the respective types of origin (Urban, Industrial, Agricultural and Livestock farming) as tables, for each water body, with a colour code concerning the fulfilment of legal standards.

As a Decision Support System (DSS), this methodology allows for a rapid and accurate assessment, not only of each water body quality status, but also of the most critical indicators and how far they are from fulfilling the legal standards, as well as their main source. Finally, it allows for an upstream-downstream analysis of the evolution of the water quality, thus enabling a more realistic and basin wide management decisions.

RLWE.P8

Fraile, Henar

ANBIOTEK, S.L.

PHYTOPLANKTON BIODIVERSITY AND WATER FRAMEWORK DIRECTIVE IN THE AÑARBE RESERVOIR

The Añarbe reservoir is a water body identified as heavily modified corresponding to “lake” 1 Type: warm monomictic resevoir from wet areas, with mean annual temperature lower than 15ºC, in head waters and highlands.

In this work we used different metrics of the biological quality indicator Phytoplankton to calculate the Ecological Potential in the Añarbe reservoir (according to the MAGRAMA protocols and the Hydrological Plan of the Eastern Cantabrian River Basin), and we present the results of the last five years.

One hundred and eighteen different algal species have been found in the Añarbe reservoir, and Chlorophyta, with 52 taxa, is the most abundant phytoplankton group. The richness in each campaign is between 15 and 30 taxa, and H diversity between 1.2 and 4 bits.

The maximum total algal abundance found in the period from 2009 to 2013 is lower than 3500 cell ml-1 and the maximum biovolume lower than 2500 mm3 m-3, which indicates mesothrophic state in same cases. The most abundant taxons in the five years´period are Volvox aureus (2943 cell ml-1 in autumn 2013) and Chlorella cf vulgaris (1812 cell ml-1 in summer 2009). However, the total biovolume was low, in oligotrophic range. Both species of Chlorophyta are frequent in nutrient rich waters. The Cyanophyta Aphanocapsa sp. was the most abundant species in the spring of 2010 (1634 cell ml-1), but its biovolume was very low. In autumn 2012 the Cyanophyta Woronichinia naegeliana -potentially toxic species- was detected (19.18 cell ml-1 and 0.57 mm3 m-3). The Cryptophyta and Myzozoa groups are mayor contributors to the total biovolume. The main species are Cryptomonas erosa and Gymnodinium uberrimum (common in waters with low pH and alkalinity). The Bacillariophyta group is seasonal, being more frequent in autumn and winter.

The Ecological Quality Ratio (EQR) of the ecological potential for phytoplankton is higher than 0.6 in all cases. The Añarbe reservoir shows a good ecological potential according to the phytoplankton indicator and could be considered as a reference within its group.

AMWQ.P9

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ANNUAL CYANOBACTERIA FLUCTUATION AND THE INFLUENCE OF ENVIRONMENTAL PARAMETERS IN BILLINGS RESERVOIR (DIADEMA, SÃO PAULO STATE, BRAZIL)

The Billings complex is a strategic reservoir to São Paulo city and surrounding regions because its waters are used for some purposes including water supply for the population. The prokaryotic Cyanobacteria have shown outstanding dominance in some Brazilians Reservoirs, and their blooms can cause some environmental and economic damage to these ecosystems. The aim of this study was to evaluate the richness and abundance of Cyanobacteria during an annual cycle and its correlation with environmental parameters. One sampling site was fixed close to a Monitoring Real Time station localized in Billings Reservoir (Diadema, São Paulo State, Brazil). Samples were collected monthly from December/2012 to December/2013 in three different depths. The Cyanobacteria dominance was observed in the majority of monthly samples analyzed. Planktotrix sp dominated the majority of samples followed by Microcystis aeruginosa. The cyanobacteria composition of three depths sampled was similar and the surface presented the highest density showing the average value of 6,229 cells/mL. The statistic correlation applied to cyanobacterial density demonstrated moderate influence of environmental parameters Dissolved Oxygen and Electric Conductivity. No seasonal influence was clearly observed. The eutrophic state of Billings Reservoir studied area has been confirmed in this study by Cyanobacteria predominance over the year and the clearly observed waterblooms during the majority of the sampling months.

RLWE.P11

***Freitas-Teixeira, Lacina M.**[1]; Bohnenberger, Juliana B.[2]; Rodrigues, Lúcia H.R.[2]; Motta-Marques, David[2]; Schulz, Uwe H.[1]; Crossetti, Luciane C.[2]*

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DISSIMILAR PATTERNS OF THE SPATIAL ARRANGEMENT OF PHYTOPLANKTON STRUCTURE IN A HIGHLY HYDRODYNAMIC LARGE SHALLOW SUBTROPICAL LAKE (SOUTHERN BRAZIL)

Spatial heterogeneity has often been implicated as being crucial in the ecology of many organisms, acting mainly on species richness and diversity. The main objective of this study was to understand the influence of the spatial heterogeneity on the structure of phytoplankton in a large shallow lake. The study was carried out in Lake Mangueira, (southern Brazil), which is a continuous warm polymictic, large (90 km long and 3-10 km wide), oligo-mestrophic shallow lake (Zmax = 6 m), under direct influence of wetland area at north and has its margins densely inhabited by aquatic macrophytes, especially in the south. Samples were taken in the subsurface of the water, quarterly, for two years, in 19 sampling points, comprising the littoral and pelagic zones and the southern, central and northern regions of the lake, for abiotic and biological analyzes. The phytoplankton community was accessed through measures of chlorophyll - a, biomass, species richness and diversity. A total of 117 species were recorded. Cyanobacteria (e.g. Chroococcus limneticus, Aphanocapsa conferta, Aphanothece smithii, Planktolyngbya contorta) was the the most representative group regardless the region (southern, central or northern) or zones (litoral or pelagic). There was a clear spatial pattern heading south to north, which showed increasing gradient in the values of total biomass and chlorophyll - a. Although species richness did not show clear spatial pattern, diversity was markedly lower in the north of Lake Mangueira. This pattern was explained by exploratory analyzes (canonical coefficient analysis) for abiotic variables and descriptors species, which demonstrated that the dissimilar distribution of resources along the lake, especially the increased availability of nutrients and low light at the north, are the drivers of phytoplankton structure in this ecosystem.

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EH.P9

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MORPHOMETRIC PARAMETERS OF LAKE PARAÍSO, SOUTH AMAZONAS STATE

Lakes are formed in a variety of ways, depending on their geographic location. Lake Paraíso is an oxbow formed by the abandoned meander loop of the Madeira River channel, located in Humaitá, south Amazonas State, Brazil. The goal of this study was to realize the first morphometric study that will be utilized as reference in future works about the lake. Data were took in the transition period rainy - dry, maximum level of conexion with Madeira River. Hypsographic curves (area x depth and volume x depth) were constructed for to evaluate the ability of the Lake Paraíso in to dilute incoming materials and its potential water mixing. The volume (total amount of water in a lake) calculated was 90.6 x106 m3. The surface area, one of the most important morphometric parameters of a lake because it not only describes the size of a lake, but also plays a major role was 19.6x106 m2. The Lake Paraiso perimeter was 32x103m and the maximum length (distance, in a straight line, between the two farthest points on a lake without intersecting a land mass) was 6.3 x103m.

AER.P2

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USING MAGNETIC PARTICLES FOR IMPROVING WATER QUALITY AND LAKE RESTORATION

It is well known that both anthropic eutrophication and contamination by metals of aquatic ecosystems can pose a threat for biodiversity as well as for human health. The general aim of this work was to assess the convenience of using magnetic particles for Manganese (Mn) and Phosphorous (P) uptake and their subsequent removal from solution by applying a magnetic separation gradient. A set of batch experiments were performed to find out optimum conditions for Mn and P removal by investigating the effect of factors such us pH, type of adsorbent, adsorbent concentration, contact time, or surface coating of magnetic particles. Once established the best adsorption conditions in batch mode, we aimed to test the possibility of removing P from aqueous solution in continuous flow conditions by applying a High Gradient Magnetic Separation (HGMS) and later, identifying the best working conditions under flow conditions. Results in batch mode showed a high Mn removal efficiency (›98 %) for bare magnetic particles when pH › 9 whereas this efficiency was lower when reducing pH since Mn remains as soluble cation. However, Mn removal efficiency was enhanced by increasing adsorbent doses and by covering magnetic particles surface with Mn oxides (MnOx). In the case of P, magnetite and iron magnetic particles were tested as adsorbents. Iron magnetic particles are considered good adsorbents since the uptake efficiency was › 80 % whatever pH although magnetite showed a higher adsorption capacity due to its larger specific surface area. Surface covering of iron magnetic particles with aminosilane groups (APTS) promoted a remarkable increase in P adsorption capacity due to a reduction of the aggregation process and an enhancement of the affinity between adsorbate and adsorbent. Both Mn and P removal process is rather fast. Results under flow conditions evidenced that sonication time, magnetic field strength and the Fe particles/P concentration ratio are the main factors affecting magnetic separation process whereas flow rate has no implications in P removal efficiency in the range 0.08 0.36 mLs-1. As a result, we can conclude that magnetic particles adsorb P and Mn from aqueous solutions improving water quality.

IS.P5

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ASSESSING THE ENVIRONMENTAL REQUIREMENTS OF CORBICULA FLUMINEA USING SEVERAL DISTRIBUTION MODELS

The Asian clam is an invasive freshwater bivalve, native to Southeast Asia that over the last few decades have spread throughout all major river basins worldwide. This exotic clam is able to tolerate a wide range of physical conditions which allows it to colonize a variety of habitats and has large economic and ecological impacts in several aquatic ecosystems. By using human dispersal vectors (ballast water transportation, dredged river sand transport, use as fish bait, among others) it's dispersal abilities and consequently increased dispersal area into new habitats is likely to occur. Understanding the environmental conditions determining the successful establishment of these invasive populations is essential.

The use of ensembles of distribution models may be a good tool for a quantitative description of the environmental conditions favoring the establishment of these invasive mollusks. To model the potential distribution of Corbicula fluminea, several different correlative algorithms implemented in the BIOMOD2 package were used and species occurrence data was coupled with pseudo absences data randomly generated worldwide. Several climatic variables were included to test the importance of temperature and precipitation patterns as well as a number of environmental variables representing landscape characteristics. The relative influence of the environmental variables in single models was averaged to achieve a consensus contribution of the variables. Preliminary results suggest that environmental variables such as annual mean temperature (climatic) or altitude (landscape) may be determinant for the suitability for the species in study. Additionally, projecting the potential distribution of the species into the future, using bioclimatic scenarios in a global warming context, may be a useful tool to prevent or mitigate the spread of asian clams into new freshwater environments.

AMWQ.P28

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POLLUTION LOAD ASSESMENT MODEL (M.E.C.A.), HIGH BASIN COMBEIMA RIVER, IBAGUÉ, TOLIMA, COLOMBIA.

Water sources in Colombia show high anthropogenic pollution, with deficient governmental controls, that have allowed the proliferation of various pollutants such as: nutrients (e.g., Phosphorus, Nitrates), heavy metals, mineral salts, as well as organic/inorganic substances that threaten water quality and as a result, overall human wellbeing. The high basin of Combeima River (184.45 Km2), which supplies the water systems of Ibagué and Espinal cities, Tolima, Colombia; shows contaminants from natural and anthropic sources with consequences in water quality and therefore on human health. Their comprehensive assessment is crucial in determining the potential threat represented by the pollution load through a model called M.E.C.A., whose aim focuses on strategizing the mitigation and pollutant removal actions through engineering works, mechanical-vegetative strategies and public education (awareness), necessary to recover water source quality and ensure its conventional treatment, making it suitable for human consumption. The threat was determined from the findings of potential anthropic and natural sources of water pollution within the watershed, where such tributaries can also be exposed to several kinds of pollutants. The measurement was carried-out based on samplings at strategic points, followed by water characterization and contaminant behavior (traceability). By means of physical, chemical and microbiological tests, the correlation is determined between anthropic or naturally occurring events and the pollution that is incorporated in the river. According to findings, anthropic action was demonstrated as prevalent in the deterioration of water quality, with the presence of phosphates and nitrates, a narrow relation between the turbidity parameter and the progressive increase from both fecal and total coliforms; outcomes that made it possible to determine: the main points and polluting sources, impact or affected areas, susceptibility of the water quality and threat represented by each pollutant factor manifested in the environment, finally the control and mitigation of the pollutants incorporated into the source were projected, propounding source water protection strategies with multi-barrier approaches, to improve the cost-benefit ratio; like bioretention areas and wet detention ponds, the use of a combined low-cost system including a layer of gravel filter, detention pond and infiltration tank, with a high pollutant removal efficiency has also been proposed.

RLWE.P16

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ECOLOGICAL ASSESSMENT OF LILLO WETLANDS (GUADIANA BASIN, TOLEDO, SPAIN)

Wetlands are components of the hydrological continuum that support the capacity to improve water quality, regulate hydrology, support food web and preserve environmental and cultural values. The highly varied saline precipitates and sedimentary structures appeared in some of them are of interest for sedimentologists. Playa lakes occurring in the central sector of La Mancha are ephemeral and saline wetlands where precipitation of evaporites (gypsum, sodium and magnesium sulphates, clorides) and, subordinately, carbonates and other minerals takes place. In the context of a holistic project (MIGEBIAMSAL Project) we considered four wetlands: Altillo Grande, Altillo Chica, La Albardiosa and El Longar (Lillo County). Herein we present preliminary results (2011-14) of an ecological assessment of the current conditions of the two former. El Longar Lake was not finally considered for the study because natural conditions are completely altered by inflows of a waste water treatment plant; during the studied period Albardiosa wetland was dry, even though precipitations were abundant. Physicochemical conditions of surface waters were determined in situ by means of a multiparameter device, and in the laboratory for dissolved inorganic nitrogen, soluble reactive phosphorus, anions and cations. Biological communities were sampled in the water column for zooplankton and macroinvertebrates, and in the sediments (Corer sampler) for macroinvertebrates; representatives of submerged vegetation were also taken. Bird communities were considered for their interest in the potential bioturbation of the sediments. The pH of the waters ranged between 7.53 and 10.01, electrical conductivity between 4.01 and 46.80 mS/cm; main ions appeared were Mg-(Ca-Na) and SO4-(Cl). Samples processed to date shown macroinvertebrate communities strongly dominated by Anostraca, with very smaller presence of Chironomidae. These communities are greatly different than those more usual and present in Coca-Olmedo Lakes (i.e. Diptera, Coleoptera, and Heteroptera). Although gypsum precipitated phase is the dominant one, some of the minerals are very uncommon (e.g. konyaite) showing processes acting in very extreme environments.

This study is part of the MIGEBIAMSAL Project (Mineralogenesis, geobiological processes and environmental evolution in saline lakes, Central Spain). Implications for the interpretation of evaporitic successions", supported by the Ministerio de Economía y Competitividad of Spain (Ref. CGL2011-26781).

SS1.P1

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ZOOPLANKTON, DENSITY OR BIOMASS?

Zooplankton plays a key role in the transfer of matter and energy in aquatic food webs, usually connecting primary producers and higher consumers. As its size structure, reproduction and survival, among other characteristics, are affected by both, top-down (fish or invertebrates) and bottom-up (nutrients and phytoplankton) controls, they should be considered as a keystone group on ecosystem functioning. They also have being frequently considered as a complementary measure of ecosystem functioning and health. Nevertheless, under the term "zooplankton" we usually include organisms with great heterogeneity and very different characteristics (phylogenetic, size, development time, population growth, life spans). Some studies are focused on particular groups (ex. rotifers, cladocerans, copepods) similar insize, which sometimes are compared only considering their densities; but other studies include diverse groups with very different characteristics, such studies need to consider more integrative measures, as could be the biomass. Density is easier to obtain, but when large differences in size between organisms exists it should be used with caution. Biomass is more laborious to estimate, but when such differences exist, seems to be a more integrative and comparative measure. We have studied zooplankton assemblages (rotifers and microcrustaceans) in 20 reservoirs from mediterranean hydrological basins. We have used both metrics (density and biomass) to study the relationship of zooplankton with several environmental features of the reservoirs including geographical, morphological, biological, physical and chemical characteristics. The aim of this work is to show our results and to discuss about the advantages and disadvantages of using only one of these two methodologies.

AMWQ.P18

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THE TYPOLOGY SENSU WFD OF LAKES IN THE EBRO BASIN RESPONDS TO PHYTOPLANKTON COMMUNITIES LIVING IN THEM?

The Annex II of the Water Framework (Directive 2000/60/CE of the European Parliament) shows the descriptors to establish the typology of each water body. According these parameters, in 2005 the types of water body were established for Spanish lakes (MARM, 2005) . The descriptors used refer to geographical, geological and morphological characteristics of the water bodies. However, the Water Framework designates as priority the use of biological indicators in the classification of ecological status. This study uses the phytoplankton data collected in the monitoring programs of the Ebro basin, between 2005 and 2012, in order to lay down possible correlations of different types of lakes with the phytoplankton communities that inhabit in them. First of all, the potential pressures that could affect phytoplankton have been isolated, in order to determine those communities naturally present in the different types of lakes. Thereby, it has been determined whether the group of lakes in the existing rates in the Ebro basin, corresponds to equivalent phytoplankton community. The analysis was performed through taxonomic groups of phytoplankton, and by groupings based on morphometric descriptors of different taxa. The size and morphology of each taxon are related to physiological and ecological characteristics of phytoplankton, and therefore, are adaptive characteristics of each type of ecosystem (Naselli-Flores and Barone, 2011) .

AMWQ.P20

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ESTUDIO COMPARATIVO DE METODOLOGÍAS DE MUESTREO USADAS EN DISTINTAS REDES DE SEGUIMIENTO

La aprobación de la DMA en el año 2000 y su posterior proceso de implantación ha dado lugar a un desarrollo amplio de trabajos cuyo objetivo ha sido la estandarización y comparabilidad de metodologías y sistemas de calificación del estado ecológico y el estado químico, conceptos básicos en el establecimiento de objetivos ambientales.

Todo el proceso de calificación del estado ecológico depende de la bondad o no de la recogida de información en un área determinada, lo que denominamos muestreo siendo el listado taxonómico la unidad esencial de todo el proceso. Este listado es un inventario de biodiversidad de un área determinada y de su idoneidad dependerá la fiabilidad y robusted de la calificación que obtengamos con sus datos. Pero nos planteamos una pregunta ¿es necesario recoger toda la biodiversidad de un área determinada para que un sistema de calificación de la calidad de una masa sea fiable?

Hemos planteado una comparación entre dos metodologías de muestreo, la establecida por el MIMAM, con un esfuerzo de muestreo superior (20 Kicks) y la establecida por la Agencia vasca del agua que es una adaptación del muestreo multihábitat estratificado a los ríos vascos. Este sistema presenta una modificación que implica la reducción del esfuerzo de muestreo y posterior identificación pasando a una media de 4-5 unidades de extracción (kicks).

Para la comparación entre procedimientos de muestreo, se utilizaron estimadores no paramétricos y se construyeron curvas colectoras de especies. Se han obtenido unos resultados que muestran que ambas metodologías de muestreo proporcionan listados faunísticos fiables y representativos de la biodiversidad real existente en el tramo estudiado. Las diferencias entre ambas metodologías son evidentes ya que la de mayor esfuerzo de muestreo recoge inventarios cercanos al 100% mientras que la de menor esfuerzo de muestreo recoge valores cercanos al 80% de muestreo; sin embargo, ambas curvas de acumulación y modelos aplicados nos establecen que los listados recogidos por ambas metodologías proporcionan la misma fiabilidad y son representativos de la biodiversidad de un lugar.

BB.P5

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NATURAL SWIMMING POOLS: STEPPING STONES HABITATS AT THE LANDSCAPE SCALE?

Natural swimming pools are artificially created ponds, where the ecological processes occurring in the natural water bodies are recreated. These ponds constitute recreational spaces of low environmental impact, because no chemical products for water purification are used. Clarifying and purifying of the water is achieved through biological filters and plants growing in the system. Since no conventional chemicals are added to water, these ponds are rapidly colonized by a wide range of organisms such as plankton, macro-invertebrates and some vertebrates. Therefore, natural swimming ponds promote biodiversity maintenance and increase the aesthetic value of the surrounding landscape meaning. In this work are presented the results of faunal surveys performed in several natural swimming pools across Portugal. The zooplankters more frequently found were: the copepods A. robustus and C.numidiacus; the cladocerans Ceripdaphnia pulchella, Daphnia longispina/pulex, Simocephalus vetulus, Alona sp. Chidorus sphaericus and the rotifer Keratella cochlearis. The most emblematic macro-invertebrates found, were the dragonflies Anax imperator, Coenagrion scitulum, Crocothemis erythraea, Diplacodes levebvrei, Erythromma lindenii, Gomphus pulchellus, Ischnura graellsi, Libellula quadrimaculata, Orthetrum cancellatum Orthetrum chrysostigma and Orthetrum coerulescen. Amphibians such as, the newts Lissotriton boscai, Triturus marmoratus and Triturus pygmaeus; the salamander Pleurodeles waltl, the tree frog Hyla meridionalis; the frog Rana perezii; the toads, Pelobates cultripes and Bufo spinosus use natural swimming pools for reproduction. The most common reptiles were the viperine water snake (Natrix maura) and the terrapins (Mauremys leprosa) were frequently found. Concerning birds, squacco heron (Ardeola ralloides), grey heron (Ardea cinerea) and kingfisher (Alcedo atthis) were the commonest species found in the pools surroundings. The presence of otter (Lutra lutra) was also detected. Some of the mentioned species are considered to be endangered. The role of natural swimming pools as stepping stones habitats at the landscape scale is also discussed.

BB.P2

Gómez, Eulalia[1]*; Gutiérrez, Pilar*[1]*; Zamora, Laia*[2]*; Currás, Andrés*[2]*; Riera, Santiago*[2]*; Julià, Ramón*[3]*; Mesquita-Joanes, Francesc*[4]*; Armengol, Xavier*[4]

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BIODIVERSITY OF MICROCRUSTACEANS IN LAKE SOMOLINOS (GUADALAJARA)

Most limnological studies in lentic systems are focused on the water column, paying less attention to the benthic zone. However, in shallow lakes, which are the predominant type in the Iberian Peninsula, benthic/littoral communities can be very important. The aim of this study is to characterize the microcrustacean assemblages (cladocerans, copepods and ostracods) of Somolinos Lake in Guadalajara (Spain). This karstic lake belongs to the Tajo basin; it is located South of Pela Range (at 1250 m a.s.l.) and is mainly fed by the Manadero River. It has a flat bottom with steep banks and a maximum depth of around 8 m. It covers 2.3 ha and the water is oligotrophic and oligosaline. To characterize its littoral microcrustacean fauna (cladoceran, copepods and ostracods) four sampling campaigns were performed in May and September 2007 and in February and June 2008. In order to take into account the high variety of habitats in the littoral area, thirteen sampling points around the shore were selected, plus two sites located at the South and North central area of the lake. Littoral samples were taken with a 65 µm handnet and planktonic ones by vertical hauling a 45 µm plankton net from the bottom. Planktonic assemblages were poorer in species composition, and dominated by Cyclops sp., Tropocyclops prasinus, Daphnia longispina gr. and Ceriodaphnia cf. pulchella. We found a high specific richness with 42 species, including 13 cladocerans, 16 copepods and 13 ostracods, out of 4800 individuals identified. The most abundant cladocerans were Acroperus neglectus followed by Alona affinis, Simocephalus vetulus and Alona quadrangularis. Conversely Alonella sp., Ceriodaphnia sp. Oxyurella tenuicaudis and Pleuroxus laevis were scarcely represented. Among copepods, Paracyclops fimbriatus, Macrocyclops albidus, Eucyclops serrulatus and one Harpacticoid species were very abundant while the more scarce species were Cyclops sp., plus three Harpacticoid species and Microcyclops rubellus. Ostracods were analyzed only from the samples collected in May 2007 and were dominated by Cypria ophtalmica and Cyclocypris ovum, two small phytophilous species typically found in mountain lakes in the Iberian Peninsula and widely distributed in Central Europe.

AE.P14

Gonçalves, Ana M. M.[1]*; Neves, Micael*[1]*; Vidal, Tânia*[1]*; Vieira, Ricardo*[1]*; Coutinho, João A. P.*[2]*; Castro, Bruno B.*[1]*; Gonçalves, Fernando*[1]

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BIOCHEMICAL AND POPULATIONAL RESPONSES OF DAPHNIA LONGISPINA TO COMMERCIAL FORMULATION (PRIMEXTRA ® GOLD TZ) AND ITS ACTIVE INGREDIENT (S-METOLACHLOR)

The growing demand of human populations has led to an increase in the use of synthetic products, mainly pesticides. These xenobiotics may produce effects going beyond target organisms and ecosystems, affecting for example the aquatic biota of agroecosystems. Once in the aquatic system, these chemicals may disturb molecular mechanisms, common to several organisms, leading to underperformance of the most sensitive species, causing ecosystem unbalance. In this study, the effect of a commercial formulation of a herbicide (Primextra® Gold TZ) and its main active ingredient (a.i., S-metolachlor) was studied on freshwater cladoceran populations, at different levels of biological organization. This included life history effects and changes in lipid biomarkers (namely fatty acids). Fatty acids are important indicators of food web dynamics, allowing the identification of the organisms' physiological status, particularly given their role on the growth and reproduction of herbivores. S-metolachlor is used in many herbicide formulations applied in corn/maize cultures, which is a relevant culture in Portugal and in Europe. Daphnia longispina was the model organism chosen, since it occupies a key position in the food web of lentic systems. In the first experiment, both chemicals (formulation and a.i.) negatively affected the cladoceran's reproductive parameters, with the commercial formulation being slightly more toxic than the a.i., being prejudicial to the aquatic ecosystems above 4.0 mg/L of S-metolachlor. A second experimental design allowed assessing potential multigenerational impacts of the exposure to the a.i. alone. No significant populational changes (except in the 1st clutch) were found after exposure to S-metolachlor in this second experiment. Fatty acids analyzes did not show significant changes in lipid profiles. More important, this experiment showed that S-metolachlor did not cause effects in the subsequent generation, thus suggesting that biotic communities may recover after exposure to the xenobiotic.

BB.P9

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BIODIVERSITY PATTERNS AND CONSERVATION OF STYGOBIONT FAUNA FROM KARST AREAS OF PORTUGAL

In Portugal around 2000 caves and several types of subterranean habitats are known. Intense field work in caves and wells of karst areas, over the last nine years, increased considerably our knowledge of subterranean environment. Several new groundwater species are being described for science and a better knowledge of species distribution is revealing new biogeographical and richness patterns for the stygobiont fauna in karst areas of Portugal.

We mapped the distributions of all stygobiont species in karst areas of Portugal. Based on species similarity analysis, several factors were tested to explain diversity in individual sites. Evapotranspiration and the consequent high productivity on the surface may be an important determinant of species richness in the different karst units, but the unique geological features of every massif seemed to play a more important role.

Severe problems of reduction of the subterranean habitat as a result of limestone quarries and the impact of human pollution will lead to the extinction of this important biodiversity. The protection measures to subterranean species are clearly insufficient and there is an urgent need to set rank priorities for stygobiont species, since the resources are not enough to protect karstic aquifers. Subterranean animals are among the most rare, threatened and worldwide under protected, it is therefore urgent to prioritize sites for conservation in karst areas of Portugal.

IS.P6

Gonçalves, Fernando[1]*; Rosa, Inês*[1]*; Pereira, Joana L.*[2]*; Costa, Raquel*[3]

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INSIGHTS ON THE DISPERSAL ABILITY OF THE INVASIVE ASIAN CLAM CORBICULA FLUMINEA

The Asian clam Corbicula fluminea is one of the most successful invasive species in fresh and brackish waters worldwide. The outcome of previous studies indicates that the current distribution and establishment of the clam in Portugal is somewhat limited, which explains the mild impacts of this biofouler in the national freshwater-dependent industries. The somehow constrained ability to disperse may be the reason underlying this picture provided the typical relevance of dispersal in driving the success of biological invasions. C. fluminea dispersal mechanisms are not yet fully understood, but a mucous drogue line produced by mucocytes packed along the inner demibranchs of the clam's gills seem to play an important role in assisting drifting and flotation in the water column, which favours downstream dispersal with the water flow. An American and a Portuguese population were examined for clams drifting behaviour and relevant preliminary differences in mucous drogue line production and flotation were found. Following this evidence we hypothesised that genetic variability and seasonal variations should explain the differences noticed. In this way, the present study addressed: (i) whether the two populations were genetically distinct; (ii) the seasonal dynamics of the Portuguese population (14 months) with particular attention given to the previously suggested link between mucous drogue line production and reproductive periods. The results show that the populations belong to the same haplotype, thus genetic variation can hardly explain the differences in mucilaginous drogue line production. Also reproductive events did not link to an enhanced mucous production in the studied population. By contributing to the understanding of a physiological trait that may play a key role in the dispersal of the invasive Asian clam, this study may be of practical relevance from a pest management point of view.

RLWE.P12

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CONTRIBUTION TO THE STUDY OF ZOOPLANKTON COMMUNITIES OF AZOREAN LAKES

Zooplankton is an important biological community, since it operates in lakes trophic structure between producers and consumers, contributing to water quality. However, the study of zooplankton assemblages in the Azorean lakes has been neglected over the years. The zooplankton communities from 21 lakes in 5 Azorean islands' were studied in 2011 during spring, summer, autumn and winter for deep lakes, while shallow lakes were sampled during the summer in relation to physical and chemical characteristics of the these lakes. Zooplankton spatial and temporal distributions were investigated using PERMANOVA, a permutational multivariate analysis of variance, and the links between physicochemical variables and zooplankton assemblages were assessed using DISTLM, a linear model for distance-based multivariate analysis.

A total of 141 freshwater zooplankton taxa was found in the present study, where 58 were new records for the Azores archipelago. Most zooplankton species presents a cosmopolitan distribution, and have a high success dispersal and colonization rate. Despite the Azores presents low zooplanktonic diversity when compared to continental systems, it appears to be more diverse than other oceanic islands. This may be due to the archipelago distance to the mainland, the geological age of the islands and, manly, to the high diversity of Azorean freshwater habitats.

Zooplankton communities differ significantly over time but not between islands. The species that contribute most to these differences are species associated with eutrophic states and higher temperatures (Ascomorpha saltans, Gastropus hyptopus and Diaphanosoma mongolianum) that occur in summer. Therefore the water temperature and photoperiod show a positive relationship with freshwater zooplankton community in the Azores archipelago, while available minerals in water, such as calcium and silica, are negatively correlated.

The results of this study provide support for current and future lake ecosystem research and baseline information for developing integrated freshwater management strategies on the Azorean archipelago.

AMWQ.P2

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RESPONSE OF SEVERAL INDICATORS OF BIOLOGICAL QUALITY ELEMENTS IN THE SURROUNDINGS OF THE PILOTUERTO'S DAM (NARCEA RIVER, NORTH OF SPAIN) THROUGHOUT TOTAL EMPTYING PROCEDURE OF THE RESERVOIR.

In order to study the variation produced on indicators of biological quality elements by the total emptying procedure of the reservoir of Pilotuerto, located in the Narcea river (north of Spain), benthonic macroinvertebrates, fishes and phytobenthos populations have been analyzed.

Sampling procedures were completed on four points before and after emptying, under standardized protocols for the ecological status assessment in Cantabrian rivers: Three points were located downstream from the dam and another one located on the upper side.

In case of benthonic macroinvertebrates, the analysis considers the response of IBMWP, NORTI and intercalibration MULTI-METRIC indexes. Simultaneously populations' diversity, density and structure were analyzed too.

For fishes, the study considers the number of captures per effort-sampling unit, differences in age classes' distribution and population structure.

Finally, with the aim of studying the response of diatom communities, IPS and NORTI indexes were calculated.
The analysis of the results obtained shows different types of response depending of indicator selected and indexes considered. The EQR (Ecological Quality Ratio) obtained from intercalibration Multimetric index for benthonic macroinvertebrates, rises as the one which seems to respond better to the expected effects as a result of drain procedure in the reservoir.

AMWQ.P8

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AN INTENSIVE MONITORING STATION INSTALLED IN BILLINGS RESERVOIR TO GENERATE WATER QUALITY COLUMN PARAMETERS IN REDUCED TIME AND DEPTH INTERVALS.

The Billings reservoir is located in the metropolitan region of São Paulo (Brazil) an its water supplies 1.2 million people, uptaking 4.8 m³/s and other 4 m³/s are transferred to Guarapiranga reservoir, which supplies more 3.8 million people. In this scenario, Billings receives contributions from polluted rivers, as Pinheiros river, the second largest of São Paulo city, which waters are pumped to reservoir during the rainy events that can cause flooding. Billings reservoir has been suffered eutrophication process and in consequence having cyanobacterial blooms. Attempting to this fact the proposal of this study was install an intensive monitoring station in Billings reservoir located on a nautical buoy. It was developed a winch with a built-in motor that promote multiparametric probes going up and down in time and depth intervals as an innovation in consequence of the space limitation. The probes have sensors registering typical parameters plus chloride, ammonium ion, nitrate, chlorophyll-a and cyanobacteria concentration. The monitoring station also measures rainfall intensity, photosynthetic radiation, wind speed and direction. The completely operation of the monitoring station has been found some problems. One of them is the vegetation and garbage accumulated in the probes. They hamper the ascending and descending probes movement by the winch. Another difficulty is the interference of bottom depth in the system of probes stopping, because they could not collide in the deeper sludge. To solve these problems a robust level sensor was installed in the bottom of the reservoir and another one in the probes. The data from both sensors are compared and the probes stopping depth is determined. The winch has been tested up to 4 m depth. The parameters profiles each 0.4 m show that the system has been operating satisfactorily and can be used for profiling throughout the 12 m water column. The parameters have been registered since 02/12/2014 to 02/18/2014. The dissolved oxygen concentration throughout water column during the morning is less intensive (0.21 to 0.85 mg/L) than during afternoon (0.21 to 3.0 mg/L) and this pattern has been also repeated for temperature, pH, conductivity, ammonium and nitrate.

AMWQ.P4

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Universidade Federal Rural do Semi-Árido

AVALIAÇÃO DA SUSTENTABILIDADE DE UM SISTEMA DE CULTIVO DE TILÁPIA DO NILO EM UM RESERVATÓRIO DO SEMIÁRIDO BRASILEIRO

O objetivo deste trabalho foi avaliar a sustentabilidade de um sistema de cultivo de tilápia do Nilo (Oreochromis niloticus) em tanques-rede localizados em um reservatório no semiárido brasileiro. Quarenta e nove indicadores foram aplicados para verificar a sustentabilidade ambiental, social e econômica do empreendimento. A sustentabilidade do sistema de cultivo foi modelada através do arcabouço teórico Drivers-Pressure-State-Impact-Response, no qual foram considerados quatro cenários hipotéticos com diferentes densidades de estocagem, a saber, 225, 175, 150 e 125 ind./m³, enquanto a sistema real opera com 200 ind./m³. A análise econômica revelou uma taxa interna de retorno de 52% e um valor presente líquido de US$ 84088,63, produzindo lucro de US$ 18238,26 para os envolvidos. A relação renda/investimento foi de US$ 1,18 e o período de retorno do capital investido foi de 3,2 anos. O sistema foi ineficiente no uso de insumos como nitrogênio, fósforo e energia, sendo retirado na biomassa animal apenas 21, 17 e 5%, respectivamente. Um montante de 0,08 Kg de material particulado foi gerado durante o cultivo para cada quilograma de pescado produzido. Por outro lado foi constatado um potencial de eutrofização e acidificação do ambiente aquático relativamente baixo, com lançamento de 56,9 Kg de fósforo e 7,7 Kg de enxofre por tonelada de pescado despescado. Socialmente o sistema distribui equitativamente a renda gerada e remunera a mão-de-obra em US$ 1,14 por quilograma de pescado, apresentando ainda um custo do trabalho proporcional ao custo total igual a 42%. Entretanto o trabalho requerido é de apenas 0,44 homens-hora por quilograma de pescado, e a renda fixada na comunidade local é de 2%. A modelagem mostrou que o sistema atualmente é potencialmente sustentável, e que alterações em sua densidade de estocagem podem aumentar a sustentabilidade das dimensões separadamente, mas com uma diminuição da sustentabilidade global. O cultivo de tilápias do Nilo em tanques-rede foi economicamente viável, entretanto pode ser mais eficiente no uso de recursos e mais benéfico à comunidade local, elevando o sistema a um patamar mais sustentável.

AEBC.P6

Herrera, Tony[1]***;*** *Magdaleno, Fernando*[2]*; Blanco-Garrido, Francisco*[1]*; Bonada, Núria*[3]

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DISTRIBUTION OF NATIVE RIPARIAN SPECIES ALONG RIVERBANKS IN MINIMALLY DISTURBED MEDITERRANEAN RIVERS: DIFFERENCES BETWEEN ADULT AND YOUNG FEETS

Riparian species distribution varies with river zonation and riverbank topography because of the particular environmental requirements of each species (e.g., hydrological needs or substrate). This study assesses the distribution of four native riparian plants and their respective adult and young feets along riverbanks in three rivers in southern Spain. The selected reaches were located in the semi-arid area of the Mediterranean Iberian Peninsula and were minimally disturbed by human disturbances. In all cases, the riparian area was wide enough to allow the development of the four target species analysed in this study: black alder (Alnus glutinosa), salvia leaf willow (Salix salviifolia), narrow-leafed ash (Fraxinus angustifolia), and oleander (Nerium oleander). Thalweg height was used to define the riverbank topographic gradient. Black alder and salvia leaf willow were distributed between 0-150 cm from the channel thalweg, with adult alders and willows being more common between 51-150 cm and young alders being more common under 50 cm. In contrast, adults of narrow-leafed ash and oleander were mainly located between 151-200 cm and 201-250 cm, respectively, whereas the young feet of both species covered the entire riverbank. Therefore, adult feet of the four species were spatially segregated along the riverbank topographic gradient, indicating their differential ability to cope with water stress from the non-tolerant alders and willows to more tolerant narrow-leafed ash trees and oleanders. Young feet, however, showed a strategy more closely linked to the initial availability of colonisation sites within riparian areas, to the dispersion strategy of each species, and to the distribution of adult feet. In Mediterranean areas, where riparian management has traditionally faced great challenges, the incorporation of species preferences along riverbank gradients could improve the performance of restoration projects.

AE.P18

Huarachi, Ronald E.; *Dueñas, Alex; Yapo, Ursulo; Gonzalez, Rosaura*

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ARSENIC BIOACCUMULATION OF CHLORELLA VULGARIS (CHLOROPHYTA: CHLORELLACEAE) IN EFFLUENT FROM RIO SECO INDUSTRIAL PARK (RSIP) AND ACUTE TOXICITY IN DAPHNIA MAGNA (CRUSTACEA: DAPHNIIDAE), AREQUIPA, PERU.

Bioaccumulation of arsenic (As) effluents from rio Seco Industrial Park(RSIP), was measured using Chlorella vulgaris in a gravity flux system; Likewise, toxicity was evaluated in neonates of Daphnia magna. In a preliminary study, resistance test was done with the application of As (III) in 1,6; 3,2 and 6,4 mg/L in form of Na2HAsO3 in C. vulgaris culture. For the circulation of effluent from RSIP, a gravity flux system was built using containers interconnected in cascade shape and packed with 1,5 L of C. vulgaris pure culture; The operation system was to environment conditions; The capacity of arsenic bioaccumulation of C. vulgaris was determined with the chlorophyll "a" concentration through the residual concentration of Arsenic (As) after the exposition of the samples to the effluent flux speed of 20; 40 and 80 mL/min in the gravity flux system. The toxicity test was done through a bioassay with Daphnia magna to which the neonates mortality in the sample that had the less residual concentration of As in the system was tested; likewise, the determination of lethal concentration (LC50). The results show an effective decrease of As III by bioaccumulation in C. vulgaris, evidenced by an increased growth in the different concentration of As (III), compared with the pure culture of C. vulgaris. Arsenic reduction was observed in 60.05 % samples of the gravity flux system to speed flux of 20 mL/min, showing a slight reduction of biomass, evidenced for the decreasing in the concentration of Chlorophyll "a", having a 50% of mortality in neonates of D. magna to 48 hrs with 3.25 mg/L; the arsenic concentration was less toxic compared to the reported, due to the transformation of arsenic in less toxic forms.

SS4.P3

Hughes, Samantha J.[1]*; Cortes, Rui*[1]*; Santos, Mario*[2]*; Bastos, Rita*[2]*; Cabral, João A.F.*[2]

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A SIMPLE MODEL TO PREDICT THE ECOLOGICAL STATUS OF NON-MONITORED WATER BODIES FROM LAND USE DATA TO MEET WATER FRAMEWORK DIRECTIVE CRITERIA

The Water Framework Directive requires all waterbodies meet "good" status by the end of the 1st management cycle in 2015. Different monitoring networks, defined for different purposes (surveillance, operational and investigative) in Annex V of the WFD are used to report overall status based on Ecological Status (biological quality elements - BQE, physicochemical and hydromorphological support elements) and Chemical Status (Priority and Dangerous Substances). However, River Basin Managers need to know the status of all waterbodies within River Basin Districts they oversee including those that not included in monitoring networks in order to take appropriate action via Programmes of Measures for those not meeting "good" status. This is difficult for Member States with no long term data series, scant data or limited financial resources as is the case of Portugal. These obstacles can be overcome by using existing data from monitored waterbodies to build models and extrapolate to non-monitored waterbodies. Using 2010 monitoring data of WFD intercalibrated BQE (benthic macroinvertebrates and diatoms) and support elements from just under 100 sites covering three River Basin Districts (RBD) in northern Portugal, together with land use data and geological data, we built a simple static model taking into account hierarchically organized drivers of change, to extrapolate ecological status to non-monitored lotic waterbodies. Non-redundant data sets (correlation coefficients and VIFS) of geological and land use data were derived for all waterbodies from CORINE satellite imagery data and geological maps using Patch Analyse for ArcGIS. Using Model Selection and Multi-Model Inference and the Akaike Information Criterion on monitoring data, best Ordinary Least Square (OLS) models of explanatory geological and land use variables were derived for physicochemical support and intercalibrated metric response variables. At a lower spatial level, physicochemical parameter estimates averaged across all calculated OLS models were derived for intercalibrated metric response variables. Constants and coefficients derived from the two types of models on land use and geological data to calculate physiochemical parameters and metrics and a final weighted value was calculated. The ultimate goal is to couple monitoring assessment and the described modelling techniques for WFD management and decision making processes.

AMWQ.P38

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CHARACTERIZATION OF THE BENTHIC MACROINVERTEBRATE COMMUNITIES OF AN URBAN RIVER (RIO TINTO , PORTUGAL)

The Water Framework Directive (DQA-2000/60/EC) establishes as its main objective the achievement of a good ecological quality of all inland surface waters and groundwater by 2015 , and introduces the concept of "ecological status" of an ecosystem , which includes the study of a wide range of parameters and factors for determining the "health" system.

This work, carried out within a project which main objective is the rehabilitation of a small watercourse in high degree of ecological degradation, aims to make the study of benthic macroinvertebrate communities and some parameters related to the ecological state of Rio Tinto (Douro watershed) in order to determine the main sources of pollution and to propose measures for its rehabilitation.

This study compare results (metrics and functional structure) of samples of the benthic macroinvertebrate communities collected at 10 sampling sites along the river in 2013/14 and values of some hydro-morphological, physical and chemical parameters. The results indicate that it is a water course which presents a high degree of degradation due to problems with artificiality of the channel and receipt of domestic and industrial effluents.

IS.P4

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EVALUATION OF BIOLOGICAL COMMUNITIES IN RESPONSE TO CHEMICAL CONTROL OF AN INVASIVE GRASS IN THE MEDITERRANEAN RIVER ECOSYSTEM

The aim of this communication is to show the results obtained from the evaluation of the biological communities (aquatic macroinvertebrates) in response to the application of chemical methods for the control and eradication of an invasive plant with a very wide distribution in the Mediterranean basin, especially in ecosystems freshwater.

During the application of chemical methods (glyphosate) for the control of invasive alien specie, Arundo donax (giant reed), it has conducted an assessment of possible impacts to macroinvertebrate communities present in various sections of rivers in the Valencian Region.

Sampling was carried out before the application of glyphosate, several weeks after application and nine months later. We have tried to carry out a sampling plan for comparing taxa present before the application of chemical treatment and then allowing to assess possible alterations in ecological characteristics of the river ecosystem.

The results showed that no significant changes that may pose an impact or alteration of diversity and taxa of macroinvertebrate community in the ecosystem are appreciated. The applications of the chemical glyphosate to control the invasive grass (Arundo donax), taking the proper precautions and using the recommended dosage on the label, do not pose adverse effect on aquatic macroinvertebrates.

IS.P9

Jiménez, Jesús*[1]*; *Santín, Inés*[1]*; Sánchez, F. Javier*[2]

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AUTECOLOGY OF THE INVASIVE SPECIES ARUNDO DONAX IN THE MEDITERRANEAN REGION

Arundo donax, known as giant reed, is a perennial rhizomatous species of Asian origin and tolerant of a wide range of ecological conditions. Invade the channels preventing natural drainage, infrastructures and threatens species and freshwater ecosystems. A. donax is a species capable of growing in a wide variety of environmental conditions, possibly as a result of phenotypic plasticity, a trait common to many invasive plants but little studied in this species.

Analysis of these data, were results from a previous study of populations in different regions of the Iberian Peninsula and the botanical knowledge of their distribution . This information has been obtained morphological indices that provide an understanding of the abiotic factors limiting the geographical distribution and morphology.

We analyzed their latitudinal distribution, altitude and the relationship different bioclimatic agroclimatic indices and the presence / absence of the species. Among the results is a high correlation between bioclimatic factors and insolation factor, and we obtained a ecodynamic regime of A.donax.

IS.P1

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LAS INFRAESTRUCTURAS DE LA CUENCA DEL EBRO SIGUEN LUCHANDO CONTRA EL MEJILLÓN CEBRA…

Desde que en la cuenca del Ebro se detectó la presencia de mejillón cebra (Dreissena polymorpha) en el año 2001 y de almeja asiática (Corbicula fluminea), las Administraciones públicas y usuarios afectados han ido tomando medidas para paliar los efectos que ambas especies invasoras ocasionan en las infraestructuras que utilizan el agua proveniente de masas de agua afectadas, para el desarrollo de sus actividades. La Confederación Hidrográfica del Ebro (CHE) estimó para el periodo 2001-2009 unos costes en defensa, control y prevención de los distintos sectores económicos y administraciones afectadas por mejillón cebra de aproximadamente 13,7 millones de euros. Parte de estos costes derivan de la aplicación de tratamientos de control y eliminación de esta especie en sistemas cerrados con el fin de salvaguardar los equipos existentes y evitar obstrucciones, colapsos y roturas de zonas sensibles de las mismas. Los métodos más comúnmente utilizados siguen siendo la desecación y limpieza mecánica manual y los productos químicos, en base a estrategias de choque dirigidas a la eliminación de adultos. De manera paralela, con la vista dirigida a los asesoramientos que el Organismo de cuenca ofrece a los nuevos afectados de la cuenca, la CHE ha realizado pruebas con productos novedosos con el fin de analizar su efectividad en el control de la especie en sistemas cerrados. Desde que comenzó este servicio, alrededor de 70 afectados han solicitado esta medida. La finalidad de los mismos es ofrecer una orientación inicial y rápida a los nuevos afectados, pero también asegurar las buenas prácticas de los productos utilizados, de modo que se preserve el buen estado de las masas de agua de la cuenca.
En 2014 la CHE va a editar una nueva versión del Manual de Control de Instalaciones Afectadas, cuya primera edición se realizó en el 2007, que aúna las experiencias de las entidades afectadas en la cuenca del Ebro durante estos 13 años.

EH.P5

Llena, Manel [1]*; Lobera, Gemma*[1]*; López, José A.*[2]*; Palau, Antoni*[1]*; Vericat, Damià*[2]

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EFFECTS OF GRAVEL MINING OVER THE MORPHO-SEDIMENTOLOGICAL CHARACTERISTICS AND RIVER DYNAMICS IN THE ÉSERA RIVER (ARAGON PYRENEES)

Rivers continuously transport water and sediment from de headwater basin to the sedimentation areas, in the lowest points of the basin. The break of this process generates a sequence of effects to the fluvial dynamics and its associated processes. ARIDS extraction is one of the main anthropic impacts in the balance condition of the rivers, generating a serial of impacts in the fluvial processes. The aim of this project is to analyse the impact of in-stream gravel mining in a mid-mountain river (Esera River – Aragon Pre-Pyrenees). It has been compared geomorphic and grain-size data collected before the gravel mining process (T0), July 2011, and data collected after the extraction (T1, T2). After analysing the results, it has been considered that: (1) Changes in the morphology and grain-size distribution after gravel mining. There has been a notorious alteration in the distribution and the size of the morpho-sedimentary units. There has been a reduction of the particles size (D50 = 92 to D50 = 86) and an increase of the dispersion degree (σ = 0,96 to σ = 1,29), and this indicates a greater availability of grain-size distribution fractions. After the extraction, the entire central point bar disappeared, and half of the upstream point bar also disappeared. Afterwards, there have been identified sedimentation processes in the river banks, becoming a one channel river (it was a bi-channel river before). (2) The post extraction rising regime hasn't been enough competent to re-structure the riverbed. Topographic observations indicate important erosive processes – especially in the upstream-left point bar – next to impossible to succeed in natural conditions, so that they can be attributed to in-stream gravel mining.

AMWQ.P17

Luzón, Julio [1]*; Jáimez-Cuéllar, Pablo* [1]*; Palomino, José A.*[1]*; Durán, Concha*[2]*; Navarro-Barquero, Patricia*[2]*; Alba Tercedor, Javier*[3]

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STUDY TO IMPROVE SAMPLING PROTOCOLS FOR THE IMPLEMENTATION OF THE WATER FRAMEWORK DIRECTIVE: SAMPLING OF MACROINVERTEBRADTES IN NO WADEABLE RIVERS

The sampling methodology of aquatic macroinvertebrates presents an implementation problem in certain water bodies where you can not access all habitats present due to the channel depth. This is common in the major axes of the peninsular rivers, where such water bodies are important extensions. Traditionally this problem has been solved by the use of artificial substrates, making the sampling difficult and expensive. The aim of this study was to determine the sampling effort of banks required to obtain a correct evaluation of the ecological status through the indicator " benthic macroinvertebrates " without placing artificial substrates. For this purpouse 27 sampling stations were selected. A comparison of the results obtained by sampling different areas with communities obtained by artificial substrates were performed. Sampling took place in the months of August and September 2012.

AMWQ.P31

Macário, Inês[1]*; Castro, Bruno*[1]*; Nunes, Isabel*[1]*; Pizarro, Cristina*[2]*; Coelho, Carla*[2]*; Gonçalves, Fernando*[1]*; de Figueiredo, Daniela*[1]

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STEPWISE STRATEGY PROPOSAL FOR MONITORING TOXIC CYANOBACTERIAL BLOOMS: VALIDATION WITH FIELD DATA FROM PORTUGUESE WATER BODIES

Climate change is causing a global increase in frequency, severity and duration of harmful algal blooms, with negative impacts on water quality. This makes the establishment of water management strategies indispensable. For cyanobacteria, in particular, several methods are currently employed in monitoring programmes, such as the quantification of chlorophyll a levels, microscopic taxonomic analysis and cell counting, and cyanotoxin analysis, all used as baseline screening analyses. However, these methods are time-consuming, require specialists, and results are usually only available several days after sampling; also, not all of these metrics are necessarily informative in all cases. Bearing this in mind, this work aims to propose and validate a strategy for a faster, easier and more cost-effective monitoring of cyanobacterial blooms, consisting on a stepwise approach using sequential methodologies: i) fluorometry (for phycocyanin determination) at an early stage; ii) chlorophyll a determination, microscopic observation and enumeration of dominant cyanobacterial species; iii) PCR-based methodologies to screen the potential for cyanotoxin production; and iv) cyanotoxin quantification, only when necessary. The idea is to proceed to the subsequent tier only if alarm levels are triggered in the previous phase, thus progressively allocating human and financial resources to the monitoring program. In order to test this methodological strategy, nine lentic freshwater bodies from Portugal were sampled and analyzed using this approach. Samples were sequentially evaluated and selectively excluded for further analyses, ending up with only two samples with effectively high health risks. No false positives or false negatives were found, which highlights the potential of this approach. Comparatively, according to WHO guidelines, eight of the nine samples were scored as having "moderate risk of adverse health effects". The rationale of the proposed stepwise strategy is embedded in the need for efficient risk assessment and resource allocation in management strategies, thus optimizing effort and costs by sequentially excluding samples that do not represent a risk for public health. This approach proved to enhance the effectiveness and accuracy of the risk assessment process in water bodies where cyanobacterial blooms occur, showing potential as a valuable and cost-effective alternative to the current monitoring programmes.

AMWQ.P32

Macário, Inês[1]*; Castro, Bruno*[1]*; Nunes, Isabel*[1]*; Antunes, Sara C.*[1]*; Pizarro, Cristina*[2]*; Gonçalves, Fernando*[1]*; de Figueiredo, Daniela*[1]

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NEW INSIGHTS FOR THE ESTABLISHMENT OF PHYCOCYANIN CONCENTRATION THRESHOLDS CONSIDERING INTER-SPECIFIC VARIABILITY FROM BLOOM-FORMING CYANOBACTERIA

The development of cyanobacterial blooms in natural waters causes negative impacts on water quality, and risks to public health due to the potential for cyanotoxin production. Therefore, several governments and international organizations, such as the World Health Organization (WHO), have developed monitoring programmes for assessing the safety of recreational waters, concerning cyanobacteria. However, the majority of these programmes are based on metrics (cell density and chlorophyll a concentrations) that may not be the most adequate. Phycocyanin (PC) is a cyanobacteria-specific pigment that can be used to assess cyanobacterial concentration in an easy, fast and cost-effective way, using in vivo fluorometry. However, the establishment of PC thresholds is essential before this technique can be used in routine monitoring programmes. The main objectives of this work comprise: 1) the assessment of potential inter-specific variation of fluorometric PC content from cyanobacterial strains (Microcystis aeruginosa, Nostoc muscorum and Cylindrospermopsis raciborskii) belonging to different genera; 2) the evaluation of strength and reliability of the in vivo PC signal to interference from massive algal growth and mixtures of different bloom-forming cyanobacteria; and 3) setting grounds for the establishment of PC thresholds. PC showed high linear relationships with cyanobacterial cell densities, but inter-specific variation among PC contents of the tested cyanobacteria was observed. In the interference evaluation assays, increasing microalgal densities (using Pseudokirchneriella subcapitata) showed no significant effect on the PC signals. Also, dual mixtures of cyanobacteria revealed strong relationships between measured PC and the expected PC content (obtained through the sum of species-specific PC concentrations). Results suggest that PC provides a reliable signal of cyanobacteria abundance, which strengthens the implementation of this technique in monitoring programmes and opens possibilities for its application in the current classification scheme endorsed by the Water Framework Directive. However, due to the significant inter-specific variation, a set of thresholds should be implemented, rather than a general threshold, depending on the dominant bloom-forming cyanobacterial species.

AER.P6

Manrique, Marta[1]*; Cirujano, Santos*[2]*; Santiago, N. Felicidad*[1]

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PRODUCTIVITY OF A SEASONAL MEDITERRANEAN WETLAND: LA NAVA (PALENCIA, SPAIN)

La Nava wetland, located in the province of Palencia (Castilla y León, Spain), is one of the most important Mediterranean seasonal wetlands in the North of the Iberian Peninsula. Currently covers an area of over 400 ha, which was recovered from the late 90s, where water management and vegetation control are artificially regulated. This wetland has a high ecological value due to the diverse aquatic and marsh vegetation and the large number of animal species that harbors, representing a hotspot of biodiversity in the region.

Our goal is to establish the evolution of the most representative plant communities in relation to different control methods in La Nava wetland.

We estimate the annual plant productivity of the major vegetation groups (hydrophytes and helophytes) and the real effectiveness of different emerge vegetation control methods (mechanical withdrawal, mechanical mowing, controlled burning and grazing horses). The high rate of productivity obtained in the study justifies the analysis of the most suitable control method compatible with the scientific interest and the use and exploitation of the wetland (livestock, tourism), as well as the maintaining of its high biodiversity.

AER.P4

Marín, Nines[1]*; Adell, Luis M.*[1]*; Companys, Clara*[1]*; Ordóñez, Inmaculada*[2]

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INFLUENCE OF A SMALL DAM PARTIAL REMOVAL ON MACROINVERTEBRATE COMMUNITY IN A PYRINEAN RIVER

Font Grossa weir, is one small dam (4,55 m upon foundations) in the interior of Aigüestortes i Estany de Sant Maurici National Park (NE Spain), built in 1956 for hydroelectric purposes on the Peguera River, downstream from Lladres Lake. Since it has became obsolete has been experimenting a general deterioration over time, low temperatures and freeze-thaw cycles common in the area. Partial removal of the dam was decided in 2010 to get, as far as possible, improve the original river continuity and, at the same time, preserving, at least, a portion of the lentic environment established by the weir, certainly unique in ecological terms.
To monitoring partial removal effects of the dam, a study of the physicochemical water quality and macroinvertebrate community (composition and trophic structure) downstream weir, was carried out. Three points were chosen to make regular monitoring at different times of the year, after a first reference sampling previous to the dam partial removal. The results shows, at the moment, no differences in the values obtained upon actuation. The physicochemical variables have not been affected, preserving the original nature seasonality patterns. Similarity indices have been applied to identify possible differences in the composition of the macroinvertebrate community before and after removal, as well as, possible differences with respect to The River Continuum Concept have been also analyzed. The small size of the hydraulic structure and its only partial removal justifies, in all probability, the results found.

AE.P2

Marques, Sérgio[1]*; Gonçalves, Ana*[1]*; Pereira, Ruth*[2]*; Gonçalves, Fernando*[1]

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ASSESSMENT OF THE RESISTANCE OF CULTIVABLE BACTERIAL BIOTA FROM PELOPHYLAX PEREZI (IBERIAN GREEN FROG) SKIN TO COBALT AND CADMIUM

Environmental contamination in aquatic and terrestrial compartments, caused by metals is a well-known problem and results, among others, from the application of pesticides and fertilizers and mining. This type of contamination is persistent in the environment, and even at low concentrations may cause adverse effects on local flora and fauna. Thus, it's imperative to assess how this kind of contamination may affect key ecosystem species such as amphibians that occupy a central position in trophic chains and establish a bridge between the terrestrial and aquatic compartment. In recent years, amphibians have suffered a large decrease in their number due to diseases that result from an increased vulnerability to pathogens caused by contamination. Whereas the bacterial biota of the amphibians' skin is partly responsible for their immunity, it becomes essential to understand how this is affected by metal contamination. Similarly, it's important to assess whether, in amphibians inhabiting areas historically contaminated by metals, bacterial sensitivity is different from that of animals living in non-contaminated water bodies. For that purpose six P. perezi adult frogs, three from Vouga river (uncontaminated site) and three from Pantanhas' stream (metal contaminated stream) were sampled for bacteria through swabbing of their dorsal, side and ventral skin. Bacterial isolates from each site were then obtained, identified by molecular methods and exposed to six different concentrations of two metals (cobalt and cadmium). The tested concentrations in order to obtain growth inhibitory concentrations were the following; 0, 6.25, 12.50, 25.00, 50.00 and 100.00 gL-1 for cobalt and 0, 0.25, 0.50, 1.00, 2.00 and 4.00 gL-1 for cadmium. Overall, for the 35 species of bacteria obtained, from sampling P. perezi in both sites, cadmium proved to be the most toxic metal. Furthermore, for 8 of the 25 species of bacteria obtained from the contaminated site, the growth inhibition concentration couldn't be found for one of the metals. On the other hand similar results were only observed for 2 of the 12 species found in the uncontaminated site, which may eventually indicate higher sensibility of the isolated bacteria and more vulnerability of the frogs to diseases, nonetheless further studies are required.

AE.P4

Marques, Sérgio[1]*; Gonçalves, Fernando*[1]*; Pereira, Ruth*[2]

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EVALUATION OF GROWTH AND BIOCHEMICAL PARAMETERS IN PELOPHYLAX PEREZI TADPOLES EXPOSED TO URANYL NITRATE AND DIFFERENT TEMPERATURES

In the most recent decades we have witnessed worldwide declines in amphibian's populations due to a wide variety of factors. The contamination with metals is one of the causes responsible for many localized declines in various regions of the globe and has been already the focus of many studies. Nonetheless the effects of some metals, such as uranium, which in some regions represents a major threat for wildlife, remain quite unstudied in amphibians. Furthermore the ongoing climate changes are likely to act as an additional stress factor which is expected to contribute either for increasing the toxicity of some elements, and also to induce changes in the responses of organisms to toxicants. Therefore, the present study intends to clarify the potential combined effects of temperature and uranium exposure in the development of amphibians' early-life stages. In order to evaluate the effects of both factors Pelophylax perezi (Iberian green frog) larvae were exposed simultaneously to two different temperatures (20 and 23 ºC) and six concentrations of uranyl nitrate (UO2 (NO3)2 6H2O) (0, 0.987, 1.481, 2.222, 3.333, 5.000 mg.L-1), using FETAX water as a test medium. Twenty larvae in Gosner stage 21-22 were placed in each replicates, in a total of four per concentration, at the beginning of the assay. Parameters such as survival and malformations were assessed throughout the test. For each temperature the assay ended when 100% of the tadpoles, in the 0 mg.L -1 concentration, reached the 25th stage of development. At the end of the test growth and antioxidant biomarkers, such as Glutathione peroxidase (GPx), Glutathione-s-transferases (GSTs) and Glutathione reductase (GRed) were also assessed. Furthermore oxidative damage was evaluated through determination of lipid peroxidation (LPO). The comprehensive analysis of the assessed biochemical parameters provides further knowledge over possible toxicological pathways of U. Overall, the approach made by this study gives more realistic insight of the threats faced by wild amphibian populations dwelling in contaminated sites and subject to a rapidly changing environment.

EH.P7

Marques, Marcelo[1]*; Andrade, Fernando*[2]*; Arantes, Elaine P.*[1]*; Okawa, Cristhiane M. P.*[1]*; Pereira, Osni*[1]

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TWO-DIMENSIONAL COMPARATIVE ANALYSIS OF METHODS FOR FETCH CALCULATION APPLIED TO THE LAKE SANABRIA

In continental waters the shape of the margins is the most important factor that reduces the rate of energy transfer from the wind to the water in the wave formation process. The fetch is proportional to the surface of the water in contact to the wind and in inland waters the fetch is limited by the surrounding land. Therefore, the fetch distribution in two-dimensional space is appropriate to express the potential energy transfer from the wind to the water surface. There is no agreement in the scientific community on the most adequate method for fetch calculation. Two methods have been recommended in publications of the Shore Protection Manual, editions of 1966 and 1984, and will be here called MS and SPM. In this paper a comparative analysis between these two methods is performed. The results were obtained to the case study of Lake Sanabria and the comparative analysis is performed by means of two-dimensional fetch field comparisons. A computational model named ONDACAD was applied to automate the calculation. Results showed that the methods are similar in terms of the maximum fetch locations, which occur in the downwind margins. However, the SPM maximum fetches are approximately 30% larger than those obtained by the MS method. It was also noted that the MS method was superior in the lateral margins, whereas the SPM method generated larger results in the central region of the lake. These results can contribute to understanding the behavior of the methods in two-dimensional space.

IS.P10

Martín, Ana[1]*; Villar, Elena*[1]*; Lopez, Raquel*[2]*; Green, Andrew J.*[3]*; Peinado, José*[1]*; Alcántara, Judit*[1]*; Álvarez-Manzaneda, Inmaculada de V.*[1]

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EVALUATING THE IMPACT OF CYPRINUS CARPIO ON CHANGES IN WÁTER QUALITY IN A MEDITERRANEAN SHALLOW LAKE

Medina lake is a Mediterranean shallow lake located in a calcareous endorheic area (Jerez de la Frontera, south-western Spain). It is the second largest inland playa lake in Andalusia (c. 120 ha). The great importance of Medina Lake for water birds led to its protection as a nature reserve and its declaration as a Wetland of International Importance under the Ramsar Convention in 1989. Although in September 2007, the invasive and allochthonous carp (Cyprinus carpio, Linnaeus, 1758) was removed with rotenone, it has been again established in the study site since 2010. The reintroduction of this benthivorous fish has dramatically changed lake water quality. In this paper we deal with evaluating the impact of Cyprinus carp reintroduction in water quality (nutrient availability and algal biomass) and in sedimentation and resuspension rates. For that, we will compare physico-chemical, chemical and biological data before (2008) and after (2012-2013) the reintroduction of this invasive specie.

GC.P4

Martínez, Carlos; *Carramiñana, María; Rodrigo, María A.; Rojo, Carmen*

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THE FORESEEABLE GLOBAL WARMING WILL DIFFERENTIALLY AFFECT CHARA VULGARIS POPULATIONS FROM DIFFERENT ALTITUDES

A 2-4ºC increase in temperature is predicted in the Mediterranean region for the ending of XXIst century due to Global Change. This warming is particularly important for shallow waterbodies which are the main freshwater ecosystems in the Mediterranean and they are very sensitive to temperature changes. For instance, the Global Change might cause changes in growth and distribution of freshwater macroalgae, such as charophytes, leading to drastic changes in the whole system functioning. In order to predict the possible changes in the distribution range of a particular charophyte species facing global warming, we subjected four populations of Chara vulgaris (a ubiquitous species in the Iberian Peninsula) to a common garden experiment with different temperature treatments. Each population came from locations at different altitudes, hence living at different mean temperatures: 3m a.s.l., 100m a.s.l. (low altitude populations, LAP), 999m a.s.l. and 1270m a.s.l. (high altitude populations, HAP). Individual charophyte cultures were initiated with specimens from the four origins by planting the three upper nodes in pots with sediment, and led to acclimate at 20ºC in a controlled environment for 3 weeks. For the experiment, all populations were incubated under 3 water temperature treatments: 20ºC (control), 22ºC and 24ºC. Six replicates were used for each temperature treatment and population origin (72 individuals in total). A two-way ANOVA (temperature x population origin) showed that the temperature treatment significantly affected the growth calculated on normalized dry weight (NDW) and on length of the main axis (LMA), number of ramifications per node (RN), respiration rate and ratio NDW:LMA. Moreover, a significant effect of the temperature x population origin interaction was detected for NDW, LMA and RN. For instance, the growth rates (NDW) increased by 14%±3% for LAP and 4%±2% for HAP in the 4ºC-increase treatment. Similar results were obtained for LMAV and RN (12.2cm±4.4cm, 6.3cm±3.1cm and 1.9±0.6, 0.9±0.4, respectively). These results suggest that lower-altitude populations have wider tolerance to temperature increase and they will be the ones mainly favored by Global Change. These different intraspecific responses to warming will impact the local and regional distribution of the species, finally affecting the infra-specific (ecotypes) diversity.

BB.P7

Martínez-Sanz, Carlos; *García-Criado, Francisco; Fernández-Aláez, Camino; Fernández-Aláez, Margarita*

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LITTORAL MACROINVERTEBRATE RICHNESS IN MOUNTAIN PONDS OF CASTILLA Y LEÓN (SPAIN)

Mountain ponds are one of the most isolated and undisturbed aquatic environments of Europe. Moreover, the habitat heterogeneity of these ponds harbors high species richness, contributing significantly to regional freshwater biodiversity. However, the available information on their ecology is still scarce, especially in the Iberian Peninsula. Taxon richness is the simplest and most intuitive parameter for characterizing these communities in biodiversity studies and trophic ecology for conservation and biogeography. Among the biological communities present in these ecosystems, benthic invertebrates are excellent indicators of local as well as global climate changes, being also one of the most common groups of organisms used to assess the health of aquatic ecosystems. In this work, we present some of the results obtained during a 10-years research of macroinvertebrate richness of mountain ponds of Castilla y León (Spain). Among others, the three main objectives of this research were the following: (i) We tested the performance of some of the richness estimators across nineteen mountain ponds in Castilla y León (Spain), in order to provide a guidance on their potential use in future researches about macroinvertebrate communities. (ii) We have sampled littoral macroinvertebrates at 51 mountain ponds in order to define a set of environmental variables responsible of the observed differences in species richness. (iii) We tested the relative contribution of small ponds to regional species richness in Sanabria Natural Park (NW Spain), comparing with a large lake in the same area. The results of this study showed that Jackknife 2 was the best of the evaluated methods based on all chosen criteria and also performed well across all studied ponds. The model generated showed that number of habitats and fish stocking as the only significant variables, showing their relative importance against variables traditionally considered to influence richness in mountain ponds and lakes (for example, altitude and pond size). On the other hand, the results showed that richness in each individual pond was much lower than in the Sanabria Lake. However, the contribution to regional biodiversity of the set of ponds was higher than that of the lake in spite of their smaller overall area.

EF.P2

Medina-Sánchez, Juan M.[1]*; Dorado-García, Irene; Syväranta, Jari; Devlin, Shawn P.; Jones, Roger I.*[2]

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EVALUATION OF MICROBIAL PRIMING EFFECT IN A HUMIC BOREAL LAKE

The carbon cycle understanding is one of the challenges for ecologist. However, global change models normally do not included the interaction effects of the different pools of recalcitrant humic organic carbon (HS), which alter the carbon cycle through biological activities. This ecological issue is especially important in Northern regions due to be subjected to high input of allochthonous dissolved organic carbon (A-DOC) from the great amount of surrounding peatlands. In this regard, we investigated the threshold of added labile DOC necessary to promote priming effect (i.e. PE, stimulation of bacterial metabolism with a subsequent increase in the mineralization of recalcitrant DOC) and the changes in microbial structure (algae and bacterial abundance; AB and BA respectively) and function (primary and bacteria production; PP and BP respectively) that this effect could generate. Our investigation was carried out in a small highly humic lake (Mekkojärvi, southern Finland). The lake had been divided by a plastic curtain into two experimental sites, one with presence of fish (+FISH) and the other fishless (-FISH). On each site, we performed a factorial experiment in which different amounts of labile DOC as cane sugar (control, +6, +9, +12mgC L-1) were supplied to 8L mesocosms. These enclosures were sampled 24h, 3days and 5days after addition. Our results showed a null priming effect in all carbon treatments, such in +FISH as in -FISH sites despite of a decreasing trend in DOC concentration. BA and BP did not increase regardless carbon treatments while mixotrophic algae increase their abundance over time. In overall, our study shows that the most beneficed organisms after a DOC addition were mixotrophic algae, due to they can transform carbon to biomass obtaining the inorganic resources through phagotrophy. On the other hand, the priming effect was null in oligotrophic humic lakes and therefore, bacterioplankton did not degrade HS using their potential advantage to take inorganic nutrients relative to phytoplankton in order to increase their populations. This fact could be due to the bacterioplankton strong top-down pressure (phagotrophy) plus the bacteria high N limitation, the dependency to the resource availability and the stoichiometry.

AEBC.P4

Mellado, Andrés; *Toro, Manuel*

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SELECTING LOTIC HABITAT TYPES TO INCLUDE IN THE SPANISH NATIONAL CATALOGUE OF HABITATS IN DANGER OF DISAPPEARING.

The Spanish government decree RD 556/2011 of 20 April, for the development of the Spanish Natural Heritage and Biodiversity Inventory, establish the creation of the National Catalogue of Habitats in Danger of Disappearing. A series of general criteria, already cited in Law 42/2007, must be applied in order to select those habitat types considered as threatened of disappearance. These criteria are: 1) very restricted and diminishing distribution area; 2) destroyed in the major part of the natural distribution area; 3) drastically damaged in composition, structure or ecological functions in the major part of the natural distribution area and 4) high risk of short-mid term irreversible transformation in a significant part of the distribution area.

Using available GIS based information and water masses classified by lotic habitat types, we applied a series of objective criteria to fulfill the legal requirements and propose a preliminary list of lotic habitat types for their inclusion in the Catalogue. We use the relative stream network length as a surrogate for the first part of criterion 1 (very restricted area). A regression-derived temporal trend (from 1945 to now) of the proportion of stream length destroyed by reservoirs was used as a metric for the second part of criterion 1 (diminishing area). The proportion of stream length already occupied by reservoirs and channelizations was used as a surrogate for criterion 2 (destroyed in the major part). Finally, criterion 3 was fulfilled by means of calculating the proportion of stream length corresponding to water masses classified as being in “bad ecological status” sensu the European WFD. We could not use criterion 4 (risk of irreversible transformation) because of the lack of data on current rates of change or future estimates of land use or climate. Ten lotic habitat types fulfill one or more of the three proposed criteria: they include various habitat types in the main stems of the principal rivers, and other particular systems such as Mediterranean karstic streams, Mediterranean saline streams or piedmont siliceous streams of Sierra Morena mountains.

EH.P3

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THE IMPACTS OF DAMS ON STREAM MACROINVERTEBRATE COMMUNITIES: IS THERE A DOWNSTREAM RECOVERY GRADIENT?

Environmental consequences of dams include direct impacts to aquatic communities. We investigated the effects of dams on stream macroinvertebrate communities in 6 regulated Iberian streams with contrasting environmental settings and different reservoir management frameworks, to test whether there are consistent downstream recovery trends, and how these factors affect them. We were interested on finding common impacts and downstream patterns of change that could serve as a basis for ecologically sound longitudinal delimitations of heavily modified reaches (HMWB, sensu the WFD) downstream of reservoirs. We selected 6 dammed reaches (30-40 km) belonging to different ecotypes, with no other or very minor anthropogenic alterations, to avoid confounding factors. 3 to 5 sampling sites (100 m long) were located downstream of the dam, separated by ca. 10 km, and 1-2 upstream sites served as reference sites. Another 2 reference sites were located in the nearest unregulated stream (same ecotype) when possible. A dam-impact gradient was expected from reference sites (group 0) to sites immediately downstream of dams (group 5), then decreasing with distance downstream (groups 4 to 1). Ordination diagrams, with superimposed downstream trajectories and environmental factors fitting, were used to visualize community changes. Additionally, trends were investigated in diversity and biotic integrity metrics. A range of multivariate responses was observed, depending on ecological type and reservoir management. Highly regulated Mediterranean streams in agricultural catchments, showed strong community changes immediately downstream of dams, with long sustained directional trajectories (Guadalquivir river) or showing some signs of recovery (Cabriel river). More northern temperate streams in forested mountainous catchments (with lower hydrological alteration) showed shorter trajectories, with Najerilla or Porma streams characterized by cyclical recovery trends and Avia and Jarama streams showing more erratic patterns. Diversity metrics showed variable trends along the dam-impact gradient depending on the considered river. The IBMWP index showed a consistent impact-recovery trend in 4 of the 6 rivers, although values were always very high, being near reference conditions for every stream typology. We discuss the convenience of developing new biological indicators to specifically assess dam impacts and hydrological alterations in regulated rivers.

RLWE.P4

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STREAM MICROHABITAT FACTORS: INFLUENCE ON AQUATIC INVERTEBRATES TAXONOMICAL AND FUNCTIONAL RESPONSES

Benthic invertebrate assemblages in lotic ecosystems are structured on multiple spatial scales, from small (microhabitat) to large (watershed) levels. In each one of these scales the habitat structure acts in different ways as a filter on the organization of species taxonomy and functional attributes Aquatic insect distribution at small scales is influenced by abiotic factors, mainly substrate type and heterogeneity, coarse organic matter and current flow. We evaluated the influence of these microhabitat factors on the taxonomical and functional diversity structure of macroinvertebrate assemblages. We also assessed the relationships between each trait category and the microhabitat factors. We constructed two types of artificial substrates differing in heterogeneity: homogeneous and heterogeneous. We defined 7 biological traits: food, feeding habits, body size, body flexibility, body form, specific adaptation and mobility/ locomotion, distributed on 36 trait categories. The affinity of each taxa for the 36 categories was described by fuzzy code. Functional diversity (FD) was calculated and to evaluate the influence of microhabitat factors on taxonomic richness, abundance and functional diversity, we used linear models. FD was similar between the substrates while invertebrate richness was greater on heterogeneous substrates. Taxonomic richness and abundance were positively influenced by organic matter. Also, organic matter was the factor that showed more relationships with trait categories. Homogeneous substrates acted as a filter to streamlined body organisms with shredder habit and feeding on coarse particulate organic matter and sediment particles. Microhabitat characteristic showed greater influence on invertebrate taxonomical and functional composition.

AE.P13

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BACTERIAL COMMUNITY OF EBRO DELTA MICROBIAL MATS AND SELECTION OF MICROORGANISMS WITH CAPACITY FOR CR-REMEDIATION

Introduction: Ebro delta microbial mats are coastal benthic stratified ecosystems formed by vertically laminated microbial communities, which develop colored layers. Among microorganisms living in the Ebro delta, cyanobacteria and algae are primary producers in these habitats and play an important role in stabilizing delta sediments. The Ebro delta is a protected area of major ecological and economic value, but despite this, the river is nowadays subjected to heavy metals pollution. Among these metals, chromium, which is highly toxic for many living organisms, is present in this ecosystem as a consequence of industrial activities. Our work group has isolated different phototrophic (Scenedesmus sp. DE2009 and Geitlerinema sp. DE2011) and heterotrophic (Paracoccus sp. DE2007, Micrococcus luteus sp. DE2008 and Ochrobactrum sp. DE2010) microorganisms from Ebro delta mats, and their characteristics and capacity to capture lead and copper have been studied (1, 2 and 3). The aim of this work is to analyze the potential of these microorganisms for remediating chromium by means of different high-resolution microscopy techniques.

Methods: The tolerance-resistance to chromium for phototrophic microorganisms was determined in vivo and at cellular level by Confocal Laser Scanning Microscopy (CLSM- βscan function). On the other hand, to assess the capacity to capture chromium extra- and intracellularly for all the isolated microorganisms selected, Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) respectively, coupled to an Energy Dispersive X-ray detector (EDX) were used.

Results: The data obtained in this work demonstrate that Scenedesmus sp. DE2009 is more Cr-resistant than Geitlerinema sp. DE2011 and that the microalga has the ability to sequester chromium extracellularly in the extrapolymeric substances and intracellularly in polyphosphate inclusions.

Conclusions: 1. Scenedesmus sp. DE2009 must be considered for the removal of chromium from polluted ecosystems. 2. The results obtained also show that all the heterotrophic bacteria assayed were able to bio-adsorb chromium.

FW.P1

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ZOOPLANKTON GRAZING ON ALGAE AND BACTERIA UNDER HYPERTROPHIC CONDITIONS

Hypertrophic lakes are often in a turbid state dominated by phytoplankton, mainly by filamentous and colonial cyanobacteria. Since these organisms are poorly edible for zooplankton, heterotrophic bacteria represent an important alternative energy source. The goal of this work was to assess the contribution of heterotrophic bacteria and phytoplankton to zooplankton feeding during periods of differing water transparency. Zooplankton clearance and assimilation rates were estimated in vessels containing 50 ml of radiolabelled algal (NaH14CO3) and bacterial (3H-leucine and 3H-thymidine) solutions. These solutions were prepared labeling the planktonic community of water freshly collected from the lagoon before the experiments. Experiments were performed in two occasions, during a clear water phase in March and in May, being chlorophyll a double in the latter date. In March, Daphnia magna was the only planktonic cladoceran, whereas in April Bosmina longirostris dominated; however, also a few of the genera Chydorus sp. and Ceriodaphnia sp. individuals were found. Daphnia magna clearance rates were higher than those observed for Bosmina longirostris, but they were lower than values reported for other lakes, because of clearance rate inhibition caused by the high abundance of filamentous cyanobacteria found in the lake of study. Daphnia magna clearance rates where equal for phytoplankton and bacteria, corroborating the unselective feeding of this species. The results showed that the most abundant rotifer species also fed on bacteria, highlighting the relevance of the microbial food webs in this system.

AMWQ.P6

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COMPARATIVE PERFORMANCE OF INDICATORS ECOLOGICAL BASED IN DIVERSITY TO MACROINVERTEBRATES AND ZOOPLANKTON COMMUNITIES AND TROPHIC STATE TO CAPTURE THE ECOLOGICAL CONDITIONS IN SUBTROPICAL RESERVOIRS: PARADOXICAL OR COMPLEMENTARY RESPONSES?

The macroinvertebrate community has been largely used how tool for evaluation of environmental quality, on the other hand the zooplankton community has, to some extent, been ignored in this context. However, it has been recognized the necessity of using different indicators, with the intention of obtaining a more complete picture of water quality assessment system. We aimed comparatively evaluate the information obtained through diversity indicators (macroinvertebrates and zooplankton) and trophic status in the context of assessment of ecological status in tropical reservoirs. Two reservoirs, Poções and Camalaú, were selected in the Paraíba Basin, northeastern Brazil. Samples were taken at eight points, being four in the littoral region and four in the limnetic region (April and June 2012). Zooplankton was sampled by filtering (net 68µm) water 100L and macroinvertebrates were collected with the aid of dredge (Ekman-Birge, 225 cm2). The trophic classification was obtained by Carlson index, modified by Toledo and the index of the Brazilian Society of Environmental Technology Agency. The correlation between ecological indicators was performed through bivariate correlation series (Draftsman's Plot). The data set shows that ecological indicators of communities responded differently front of trophic classification of reservoirs.The specific richness it was one of indicators that shows this divergence. In the zooplankton the specific richness was positively related to the hypereutrophic conditions, due to the higher number of rotifer species, including tolerant generalist species and, at the same time the exclusion of species of other groups. For macroinvertebrates, the specific richness was negatively related to hypereutrophic conditions, because it have submitted that the local dominance of of these conditions have had Melanoides tuberculatus, that beyond the capacity of tolerance, exhibits high ability to compete, leading to exclusion of endemic species and reducing Local richness and diversity. In this way, the use of indicators of diversity of macroinvertebrates and zooplankton generates paradoxical responses in the context of environmental assessment in tropical reservoirs, suggesting that the zooplankton community is effectively inserted in the development of assessment tools, classification and restoration of water bodies.

AE.P7

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CHANGES IN GROWTH, EMERGENCE AND BEHAVIOR OF CHIRONOMUS RIPARIUS LARVAE EXPOSED TO THE INSECTICIDE FIPRONIL

Fipronil is a phenylpyrazole insecticide that affects the central nervous system of insects by interfering with gamma-aminobutyric acid (GABA)-gated chloride and Glutamate-gated chloride (GluCl) channels. This specific mode of action makes fipronil very effective in controlling terrestrial insect pests. However due to runoff, spray drift and leaching events, fipronil may contaminate adjacent aquatic systems, threatening non-target aquatic organisms.

Chironomids often dominate the benthic communities of lotic and lentic environments in number and biomass, and although they have been described as crop pests in some rice growing countries, they play a key role freshwater systems by recycling organic detritus and serving as a major food source for fish and aquatic birds.

In this study, the effects of fipronil on two different instars of Chironomus riparius larvae (1st and 3rd instars) were investigated with concentrations reported for surface waters near agricultural areas. Acute toxicity and physiological responses such as larval growth, survival, burrowing capacity, emergence and development time were used as endpoints on chronic toxicity tests. Exposure to fipronil resulted in a decrease in growth and emergence, and a delay in development. Survival of the larvae in the fipronil-contaminated water was significantly affected at concentrations as low as 0,08 µg L-1 (nominal concentration). At 0,08 µg L-1 less than 40% of exposed larvae emerged while at 0,16 µg L-1 no adults have emerged. Moreover, adult weight was also affected at concentrations as low as 0,04 µg L-1. At these concentrations, the burrowing capacity of the larvae in the sediment and the ability of emerged adults to fly were also affected which ought to compromise reproduction and could make chironomids more vulnerable to predation.

The results suggest that environmental relevant concentrations of fipronil may severely affect aquatic insect populations with adverse consequences to the ecological integrity of freshwater ecosystems.

MSF.P3

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RESULTS OF THE QUANTITATIVE FISH ASSESSMENTS IN EBRO BASIN RESERVOIRS AND THEIR RELATIONSHIPS WITH SOME PRESSURE FACTORS

Between 2007 and 2013 the Ebro Water Authority promoted intensive reservoir fish assemblage assessments within the context of the Water Framework Directive. Using a combination of remote (hydroacoustics) and direct sampling gears (gillnetting and boat electrofishing), the fish assemblages of 21 reservoirs were quantified and characterized.

Surveyed reservoirs belong to 6 different typologies, as defined by IPH, and extend from headwaters, both Cantabrian (Ebro reservoir) and Pyrenean (Lanuza), to lowlands (Mequinenza and Ribarroja).

Fish density and biomass estimations range from 0.7 to 47.7 fish/dam3 and from 0.3 to 42.3 g/m2, respectively. The presence of invasive exotic species also varies along the Ebro basin: from low-diversity systems composed of native species (brown trout, Ebro nase and gudgeon) to highly diverse reservoirs with centre Europe-like fish assemblages.

A number of fish metrics derived from quantitative and/or semiquantitative biological variables has been compared with different pressure variables and Ecological Potential diagnostics based on other biological indicators, showing some divergences and the usefulness of fish as an indicator of complementary aspects of the quality state in non-vadeable water bodies. The methodological approach applied during these studies, has produced useful insight into fish stock and assemblage composition in reservoirs, and thus it could be used as a multi-purpose protocol for ecological potential assessment, fisheries management or scientific research.

Further studies in the rest of the Ebro reservoirs are strongly recommended in order to complete the entire basin fish fauna picture, which would permit development of fish-based ecological potential assessment methods and establishment of restoration priorities and preventive measures to limit the spread of exotic species.

SS3.P2

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THE ADVANCED AUTONOMOUS WATER QUALITY MONITORING SYSTEM OF CUERDA DEL POZO RESERVOIR: FOUR YEARS OF HIGH RESOLUTION LIMNOLOGICAL INFORMATION

La Cuerda del Pozo reservoir (Soria, Spain) collects the waters of the Duero River near its source and is a key element of the drinking water supply to some regional cities; its catchment is scarcely anthropized, with low human population and well forested areas. In spite of this, the reservoir is eutrophied and suffers from potentially toxic cyanobacterial blooms (involving Anabaena sp., among others) during the late summer and early autumn.

A remote autonomous multisensor platform and its associated cyber infrastructure has been continuously operated since 2010 to monitor cyanobacterial biomass, besides a large set of physical, chemical, meteorological and solar radiation variables. Also, a scale of potentially toxic cyanobacterial risk levels for drinking and bathing waters have been assigned and implemented.

This remote infrastructure continues to provide high temporal resolution data and has been advocated as a must to monitor cyanobacterial dynamics due to their complex dynamics compared to other microalgae. A descriptive analysis of more than 50.000 limnological multivariate records is provided, showing the depth x time evolution of limnological variables and some interesting relationships with cyanobacterial biomass.

BB.P1

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NEW RECORDS AND ECOLOGICAL NOTES ON FRESHWATER SPONGES IN THE DUERO WATERSHED (NW SPAIN)

This work is a contribution to the knowledge of freshwater sponges (Porifera, Demospongiae; Spongillidae) of the Duero River watershed. Distribution and several ecological data were obtained in 24 sampling sites located along 25 wadeable river transects (20+/5-) and 7 lakes (4+/3-). The sampling in the deepest lakes was carried out by means of diving underwater transects using autonomous diving equipment (GEMOSCLERA Cultural Association). With this technique it is possible to take live samples “in situ” and to study the species morphology and habitat in deep areas and even in the aphotic zone.

Specimens were collected during the dry season and inspected alive. A fragment of each specimen was preserved in 70% ethanol. The siliceous scleras were studied using optical microscopy and scanning electron microscopy, after digestion of the samples in 65% nitric acid. We examined both, the macro- and microspicules present almost all year (growth tissues and reduction bodies), and the gemmuloscleres present only in summer (reproductive gemmules). A total of 509 scleras were measured in detail in order to obtain specific biometric ranges.

Four species were recorded throughout the survey: Ephydatia fluviatilis, E. mulleri, Heteromeyenia baileyi and Spongilla lacustris. The maximum species richness was found in the Negro River, where sympatric coexistence was detected in three species. H. baileyi showed a preference for shallow areas in flowing waters, and was only present on hard stony substrates (quartzites). S lacustris and E fluviatilis were found on compacted sediments, rocks and submerged wood substrates, and in a wide interval of depths. E. fluviatilis was absent in mountain lakes, whereas it was the most frequent species in rivers. E. muelleri was only found on submerged wood substrates and on alder roots in the Aliste River, and it is the first record of this species in the Duero watershed. The influence of physical and chemical water parameters on the morphology of each species is remarked.

AMWQ.P3

Mori, Nataša[1]*; Leskošek, Tina*[1]*; Bertoncelj, Irena*[1]*; Žibrat, Uroš*[2]*; Brancelj, Anton*[1]

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LINKING LAKE SHOREZONE FUNCTIONALITY INDEX (SFI) AND INTERSTITIAL INVERTEBRATE ASSEMBLAGES FROM THE LITTORAL ZONE OF THE ALPINE LAKE BOHINJ (NW SLOVENIA)

The lake Shorezone Functionality Index (SFI) was applied in the Lake Bohinj (Slovenia) in order to assess the ecological status of the lakeshore zone. Concurrently, the water chemistry and benthic meiofauna in the littoral zone and in the interstitial zone in depth of 30 cm was investigated. Spatio-temporal patterns in measured parameters and meiofauna were linked with SFI. Water chemistry indicated oligotrophic lake with little spatial variability in the measured parameters while moderate variability was observed in the interstitial zone of the littoral. Benthic and interstitial meiofauna was rich in species. In the benthos, Cladocera prevailed by Acroperus neglectus Lilljeborg, 1900, Camptocercus rectirostris Schoedler, 1862 and Chydorus piger Sars, 1862 species, while in the interstitial zone the copepod species Paracyclops fimbriatus Fischer, 1853, Bryocamptus rhaeticus (Schmeil, 1893) and Canthocamptus staphylinus (Jurine, 1820) dominated. The results corresponded with the SFI values which varied from excellent to moderate. In general, the geomorphology of the lakeshore and presence of the tributaries were the reasons for the spatial differences in the species assemblages and water chemistry.

AE.P19

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THE EFFECTS OF THE COPPER IN SEDIMENTS ABOUT THE BENTHIC MACROINVERTEBRATES IN TROPICAL RESERVOIRS

The copper is a trace element which is essential for living organisms but can be toxic when it is in high concentrations. Once the pollutants tend to accumulate in the sediments, the benthic macroinvertebrates can be considered as bioindicators of the sediments. Alterations can be noticed at various levels (individuals, populations or communities). The Cantareira System is a system of interconnected reservoirs which is responsible by water supplying for 58% of the population of the São Paulo Metropolitan Region which comprises 17.2 million people. The aim of this work was to verify morphological responses in Chironomidae larvae exposed to different Cu concentrations in the environment by the relationship between the relative abundance of organisms with mouth structure alterations (ligula, mentum and mandibles) with the metal concentrations in the sediments as well as the relationship of the metal with taxonomic richness and abundance. To determinate the Cu concentrations in the sediments they were sampled at nine stations along three reservoirs: Jaguari-Jacareí; Cachoeira and Paiva Castro. The determination of the pseudo-total Cu was performed by ICP-OES according the US-EPA methods with the total sediments. In relation to the organisms there were three samplings per station (27 samples). Analysis of Variance (factorial ANOVA) related to richness and density considering all samplings was performed as well a linear regression considering the averages of the replicates of the organisms with alterations by station in relation to Cu concentrations. The Paiva Castro reservoir presented the highest Cu concentrations followed by the Cachoeira summing two stations in concerning situation. Significative differences in richness per treatment were not noticed ($p>0.05$) but a significative relation between the alterations proportions and the Cu concentrations was observed ($R2=0.753$; $p= 0.007$). The data lead to the conclusions that the Chironomidae larvae exhibit responses to varying Cu concentrations with alterations in mouth parts. So the using of them like a monitoring instrument for Cu contamination is encouraged. Keywords: biomonitoring, Cantareira, metals, Chironomidae.

RLWE.P10

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TROPHIC DESCRIPTORS OF A SERIES OF RESERVOIRS IN CANTAREIRA SYSTEM (SÃO PAULO, SP, BRAZIL)

The comparative study of environments with different trophic status is a way of identifying patterns and general rules that explain phytoplankton associations along a particular trophic condition. The study was conducted in reservoirs Cantareira System, which is the most important source of supply for the Metropolitan Region of São Paulo (Brazil), accounting for 58% of the flows offered to 17.2 million inhabitants. The system consists of five reservoirs reservoir interconnected by canals and tunnels. This study aimed to characterize and compare the masses of water from the point of view of the trophic state of the reservoirs Cantareira System (Jaguari, Jacarei, Cachoeira, Atibaia and Paiva Castro) and verified how the phytoplankton community responds to these different trophic status. We collected integrated water column samples for physical, chemical variables and phytoplankton analysis in 19 sampling points from the reservoirs between May and June 2013. The reservoirs showed a trophic gradient. The Jaguari reservoir was classified as eutrophic, the Jacarei, Cachoeira and Atibaia reservoirs as oligotrophic and mesotrophic and the Paiva Castro reservoir as mesotrophic. A total of 77 taxa were identified , belonging to the class Cyanophyceae, Chlorophyceae, Zygnemaphyceae, Bacillariophyceae, Dinophyceae, Euglenophyceae, Chrysophyceae and Cryptophyceae. Phytoplankton density ranged from 280,897.0 ind.mL - 1 (Paiva Castro) to 818,338.9 ind.mL - 1 (Jaguari). A trend of increased phytoplankton density can be observed with increasing trophic reservoirs. It was observed in the reservoir Jaguari a low species richness and occurrence of invasive species Ceratium furcoides (Levander) Langhans 1925 with high abundance (40.3 %). According to the CCA analysis, the euphotic zone extension, chlorophyll a (correlated with total phosphorous, total nitrogen and pH), dissolved inorganic nitrogen and suspended matter could explains 87% of the variation observed in taxonomic composition along the sampling points.

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SS5.P2

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SUMMER PHYTOPLANKTON COMPOSITION OF LAKE SANABRIA

Lake Sanabria (NW Spain) is an oligo-mesotrophic system characterized by a high phytoplankton diversity and a balanced abundance of algal groups, which in summer tends to be integrated mainly by cryptophytes, dinophytes, cyanobacteria, chlorophytes and diatoms.

In order to detect changes in summer phytoplankton composition of the lake, we studied samples taken during the period from July to October of 2013, and the results were compared with those of previous studies carried out in this lake. In this work we show the conclusions of this analysis, focused on the most representative species of the lake and its relative abundance, with special emphasis on planktonic diatoms. Uthermöhl quantification technique and biovolume calculation by geometric approximation was the methodology used.

During the stratification period of 2013, diatoms were important in phytoplankton of Lake Sanabria, especially in August, and to a lesser extent, in October. In September chlorophytes were dominant, and in July similar proportions of diatoms, chrysophytes and green algae were found. Dinophytes and cryptophytes were also significant along the studied period but cyanophytes were a minor group.

We found about 90 algal taxa, most of them also found in other phytoplankton studies of the lake. However, a change in the composition and relative abundance within the diatoms in August-2013 is noteworthy. This group of algae was usually dominated by centric taxa of Cyclotella and Aulacoseira genera, but now, a marked increase of Urosolenia and pennate diatoms (Tabellaria) has been observed. Moreover, Tabellaria was the main pennate diatom during all summer.

Some differences in species composition between our study and previous works may be probably due to problems in taxonomic identification. Phytoplankton of Lake Sanabria, as it occurs in other oligotrophic lakes, includes many species that are difficult to identify, as is the case of many flagellates or small species belonging to the nannoplanktonic fraction. The consequences of this in phytoplankton description and even in the assessment of trophic status of the lake through phytoplankton water quality indices are discussed.

AER.P7

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BENTHIC DIATOM COMMUNITY RESPONSE TO RESTORATION OF TWO COASTAL LAGOONS (LIFE DELTA LAGOON): FIRST RESULTS.

Benthic diatom community response to restoration of two coastal lagoons (LIFE Delta Lagoon): first results.

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The main objective of the Delta lagoon LIFE project is to improve the ecological status of two coastal lagoons of Ebro Delta –Alfacada and Tancada– through habitat restoration and management measures, such as improvement of hydrological connectivity, elimination of infrastructure that interfere with connectivity, and the creation of new lagoon habitats in existing rice fields and abandoned aquaculture facilities. The project began in September 2010 and will be completed in December 2014.

To assess the ecological status of these lagoons, the project uses the biological indicators recommended by the Water Framework Directive: diatoms, macrophytes, benthic macroinvertebrates and fish.

In this communication we present the first results of benthic diatom community analysis. Diatom samples were obtained from 15 sites distributed across the two coastal lagoons, both before (2011) and one year after (2012) actions had been taken to restore the habitat.

To avoid the variability due to substratum and depth benthic diatom samples were taken from an artificial substratum (microscope slides arranged in a rack) which was kept at more or less constant depth by suspending it below a mobile float.
In total, 170 taxa have been identified, which are distributed among 50 genera. The genera represented by the highest numbers of species were: Nitzschia (31 spp), Navicula (20 spp) Mastogloia (12 spp) and Amphora (11 spp).

Differences in the composition and structure of the community will be discussed in relation to physico-chemical data, including nutrients.

RLWE.P17

Nuño, Carlos; *Peg, María; Toro, Manuel; Mellado, Andrés; González, Jorge R.*

Centro de Estudios Hidrográficos del CEDEX

MACROBENTHIC COMMUNITIES DISTRIBUTION IN THE GUADIANA RIVER ESTUARY AND THEIR RELATIONSHIP WITH LONGITUDINAL SALINITY GRADIENTS

Since 1998, the Centre for Hydrographical Studies of CEDEX has conducted several limnological research campaigns (1998, 2003-2005, and 2008-2012) in the Guadiana River estuary to study the effects of Alqueva dam in the ecosystem. Macrobenthos data samples have been collected by using artificial substrates, as well as different physicochemical data (temperature, conductivity, pH, turbidity, nutrients, etc.). In the last study period (2008-2012), the pattern for longitudinal salinity gradient is defined, taking into account the interaction between river discharge (mainly from Alqueva reservoir) and tidal influence.

When analyzing the distribution of macrobenthic communities throughout the estuary, a main dependence on salinity gradients is observed. Typical fresh water groups such as Diptera, Oligochaeta, some molluscs taxons and other insect groups are located in the upper range of the estuary. In lower parts of the estuary, where marine influence is stronger, Decapoda and some Isopoda groups are dominant. Some euryhaline taxa were present along the whole salinity gradient, such as Cyathura carinata, Corophium sp. or Nereis sp.

The presence of the alien species Synidotea laticauda (Benedict, 1887) is reported for the first time in the Guadiana estuary. This species, native to the NE Pacific San Francisco Bay, (California) grows mainly in warm and mesohaline waters. The species has been previously cited in Europe in the Gironda estuary, France (Mees and Fockedey, 1993), the Guadalquivir estuary, Spain (Cuesta et al., 1996), and the Schelde estuary, Belgium (Soors et al., 2010). The three of them have international ports, as the Guadiana estuary, making ballast water from ships the most probable vector for the species´ introduction.

BG.P4

Obrador, Miquel[1]*; Palau, Antoni*[2]

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DRINKING WATERS OF THE WORLD AND SPAIN: STUDY OF ITS CHEMICAL COMPOSITION AND RELATIONSHIP WITH THEIR GEOGRAPHICAL LOCATION

A comparative study of drinking water of Spain and the rest of world has been carried out. Based on the information contained on their labels, has allowed to check the reliability of the chemical analyses on the basis of the dry residue. A frequency distribution study of the total mineralization and its mineral composition (main anions and cations, silica and fluoride) has been also carried out. Subsequently, waters have been classified according to Piper diagram as well as their analysis of frequencies. In addition, in order to see which is the most abundant ionic dominance, the frequency distribution of both anionic and cationic dominance tags water, has been studied. In some cases, a variation of the physico-chemical composition of the water over time could be also studied based on the data labels of the different years.

This study also aimed to establish a relationship between the physico-chemical composition of water and the geology of the area for the Spanish drinking waters. The chemical composition found in Spanish tags was compared to the classification of the reservoirs according to their location (Margalef and Estrada,1975). Also Spanish waters have been compared with the reservoirs division made by Armengol et al. (1990) based on the concentration of dissolved salts and relative anionic composition. The notes from the Spanish waters labels that made reference to their degree of mineralization and ionic content were also analyzed.

AEBC.P1

Ondiviela, Bárbara; *Barquín, José; Recio, María; Álvarez-Cabria, Mario; Juanes, José A.*

Environmental Hydraulics Institute "IH Cantabria", University of Cantabria

FUNCTIONAL APPROACHES FOR ZONING AQUATIC NATURA 2000 SITES

The present contribution provides a zoning scheme for aquatic Nature 2000 sites (Directive 92/43/ECC) based on multicriteria techniques integrating the structural and functional attributes and the legal regulations affecting aquatic ecosystems. The scope of this work is to provide clarifications and perspective thoughts on the zoning of ecosystems functionally related to the aquatic environment (shoreline and riverside).

Zoning is the management tool to make compatible land uses with conservation. Consequently, the territorial management model developed for the conservation of aquatic Natura 2000 sites had as main priorities: to maintain the potential of flooding areas as an aquatic environment, managing them according to the natural processes; and to ensure its functionality as biological corridors and ecotone between the aquatic and terrestrial environments. With these purposes, the methodology proposed establishes distinct territorial areas (aquatic, transitional and terrestrial), based on the main hydrological and hydrodynamic attributes (frequency and intensity of river and tidal flooding) and recognizing the potential of the ecosystems, functionally related to the aquatic environment, to evolve into herbaceous, woods and shrubs formations. The implementation to different aquatic Natura 2000 sites at northern Spain (Bay of Biscay) showed a high degree of accordance between the zoning obtained and the intensity of human development, while reveled the importance of defining conservation objectives and regulates human uses and activities according with main ecosystem structure and functions.

AER.P5

Ordóñez, Inmaculada[1]*; Palau, Antoni*[1]*; Marín, Nines*[2]

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EVOLUTION OF BIOLOGICAL AND PHYSICO-CHEMICAL WATER QUALITY IN AN ARTIFICIAL LAKE DURING ITS FILLING PROCESS: THE CASE OF THE AS PONTES MINING LAKE (A CORUÑA, NW SPAIN)

The Lake of As Pontes (A Coruña) is an artificially formed water body. Its origin is the result of the filling of a 547 hm3 mining hole after more than 40 years of open-pit mining activity. The coal mine was closed in 2007 and the filling process began in 2008.

Since 2008, the physico-chemical quality of the filling waters has been monitored. This study examines the evolution of the surface measures of pH, alkalinity, dissolved sulphates, aluminium, iron and manganese from 2008 to 2013. In addition, vertical profiles of pH, electrical conductivity, temperature, reduction potential, O2 concentration and saturation since 2010 are also assessed, as well as the phytoplankton presence and distribution (algal biovolume and density, algae groups index, cyanobacterial presence and concentration of total phosphorus). Measures were taken from two locations, each one of them corresponding to one of the two areas of the former pit, known as East Field and West Field.

The graphic analysis of obtained data shows the progressive stabilization of the physico-chemical quality and phytoplankton values and their evolution towards levels suitable for diverse human uses, as well as for the development of the expected ecosystem from a naturally-originated lake.

RLWE.P3

Osti, João A. S.[1]*; Tucci, Andréa*[2]*; Camargo, Antonio F. M.*[1]

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THE INFLUENCE OF BLACK AND WHITE WATER RIVERS ON EPIPHYTIC ALGAE IN A NEOTROPICAL LOTIC ECOSYSTEM (SÃO PAULO STATE, BRAZIL)

Itanhaém River basin is located in the South Coastal Plain of São Paulo State (Brazil) and the rivers have different water colours (black, white and clear), with different physical and chemical characteristics. Despite these distinct characteristics, fish and macrophytes communities are not differently distributed in these rivers. The distribution of these communities forms an upstream–downstream gradient of the basin, regardless of the type of water. The macrophyte Eichhornia azurea is abundant in the basin, in rivers with black and white water. Thus, to assess whether the different water colours affect the species of epiphytic algae distribution, we evaluated qualitatively and quantitatively the community associated with petioles of E. azurea in a river with black water (Preto River) and in a river with white water (Branco River). We obtained the abiotic variables of the water in the macrophytes stands. Epiphytic algae were sampled from adult petioles of E. azurea and quantified using inverted microscope, according to Utermöhl. We determined the biomass by the concentration of chlorophyll a. We estimated the species richness, total den¬sity, descriptor species, diversity and evenness. In the Preto River we observed higher concentrations of total nitrogen (0,18 mg.L-1), nitrite (3,23 µg.L-1) and nitrate (101,93 µg.L-1) and in Branco River, higher concentrations of total phosphorus (49,31 µg.L-1), orthophosphate (4,91 µg.L-1), turbidity (3 NTU) and dissolved oxygen (92% saturation). In total, 80 taxa of epiphytic algae, 13 groups, were identified. The most abundant groups were Bacillariophyceae, Chlorophyceae and Cyanobacteria, both in the white and black water rivers. Zygnemaphyceae was also abundant in the Branco River. The diversity and evenness were higher in the Preto River (3.9 bits ind-1; 0.76) than in Branco River (3.0 bits ind-1; 0.56). The Branco River had higher biomass values (2.53±0.69 µg.cm-2), compared with Preto River (0.78±0.31 µg.cm-2), and lower density (14,527±4,405 ind.cm-2) than that found in Preto River (20,519±2,012 ind.cm-2). These results demonstrate that the epiphytic community responds differently in both rivers, unlike what has been registered for the communities of macrophytes and fish. Therefore, knowledge about the different aquatic communities is important to describe spatial patterns in river basins.

AMWQ.P24

Pahissa, José; *de Hoyos, Caridad*

Centro de estudios Hidrográficos del CEDEX

A COMPARISON BETWEEN PHYTOPLANKTON SAMPLING METHODS: THE MEDITERRANEAN APPROACH VS THE DRAFT CEN STANDARD

Phytoplankton sampling plays a key role in the assessment of ecological quality in reservoirs and lakes. It is therefore of crucial importance to ensure that the sampled depth is as representative as possible of the actual community. The European Comitee for Standardization CEN is developing a standard for phytoplankton sampling, and one of the key issues is selecting an appropriate depth range to integrate in a representative sample. In this context, seven reservoirs (Bao, El Atazar, Ricobayo, San Juan, Burguillo, Serones and Rosarito) and one lake (Sanabria) encompassing three ecotypes (clear stratified, turbid stratified and polymictic), were sampled in the summer of 2013. Four samplings per site were conducted following two different protocols, the one official in Mediterranean countries (euphotic depth multiplied by 2.5) and the more complex one proposed by Germany and now in the CEN draft (variable depth according to vertical temperature and chlorophyll-a gradients). Phytoplankton composition, biovolume and chlorophyll-a were measured for both depths, and the results compared. The differences observed were always very small. Additionally, the field experience showed that the Mediterranean approach to the depth sampled is simpler.

SS5.P1

Pahissa, José; *Fernández-Enríquez, Carmen; de Hoyos, Caridad*

Centro de estudios Hidrográficos del CEDEX

ECOLOGICAL STATUS OF SANABRIA LAKE ACCORDING TO ITS PHYTOPLANKTONIC COMMUNITIES OF THE SUMMER OF 2013; A COMPARISON WITH HISTORICAL DATA.

As a response to the request by the Duero River Basin (DRB) authorities, the Centre for Hydrographic Studies of CEDEX, conducted a limnological diagnosis of Lake Sanabria (42º07'30'' N, 06º43'00'' W; 1000 m.a.s.l.) and an evaluation of possible trends by analyzing current and historical data available. Lake Sanabria is a moraine lake and the biggest in Spain. It is a monomictic, acidic lake, typically oligotrophic to oligo-mesotrophic. With data from summer 2013 from the DRB and from an European project for the European Comitee for Standardization (CEN), the current conditions/state of the lake was/were assessed. Furthermore, historical data from a 3 year monitoring program the (monthly data from 1987 to 1989) was used to evaluate any variation from former conditions. Together with biomass measurements (Chlorophyll-a and biovolume), several composition metrics were applied (IGA, PTSI, PTI and IGA2), and the planktonic communities analyzed. Considering the applicable Spanish legislation for ecological quality assessment, the ecological status is high. According to both biomass and composition metrics, no changes in the trophic status seem apparent, although some evidence of a shift in species contribution to biomass from the 70s samples to the current ones is spotted. The shift from cyanobacterial taxons to diatoms is one of the changes observed, not necessarily implying a change in trophic status.

EH.P1

Palau, Antoni[1]*; Rocaspana, Rafel*[2]*; Mariño, Fernando*[3]

[1]*Endesa S.A.;* [2]*GESNA Estudis Ambientals, S.L.;* [3]*Ingeniería y Ciencia Ambiental, S.L.*

REVISIÓN DE LA APLICACIÓN DE LA INSTRUCCIÓN DE PLANIFICACIÓN HIDROLÓGICA EN LA DETERMINACIÓN DE CAUDALES ECOLÓGICOS

La Orden ARM/2656/2008, de 10 de septiembre, por la que se aprueba la Instrucción de Planificación Hidrológica (IPH), completa, junto con el texto refundido de la Ley de Aguas y el Reglamento de Planificación Hidrológica, la transposición de la Directiva 2000/60/CE o Directiva Marco del Agua. En el apartado 3.4 de la IPH, se aborda la definición y determinación del régimen de caudales ecológicos. De forma particular, dentro del método de modelación del hábitat, se establecen los criterios para la selección de especies y tramos de estudio, elaboración y utilización de las curvas de hábitat potencial útil-caudal y obtención de la distribución de caudales mínimos. En el presente trabajo se estudia y analiza, paso a paso, el proceso de determinación del régimen de caudales ecológicos mediante la simulación del hábitat, a partir de los criterios propuestos en la IPH. Para ello, se ha aplicado la metodología y los distintos criterios de cálculo propuestos, a un escenario real, único y común, que contiene la información hidrológica, hidráulica e ictiológica necesarias. Los resultados ponen de manifiesto el grado de variabilidad y los niveles de incertidumbre asociados en la definición normativa del caudal ecológico. Cabe indicar que lo métodos de cuantificación del hábitat físico para peces, no se desarrollaron para el cálculo de caudales ecológicos.

EH.P6

Palau, Antoni[1]*; Lobera, Gemma*[1]*; López-Tarazón, Jose A.*[2]*; Llena, Manel*[1]*; Vericat, Damià*[2]

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THE MORPHOSEDIMENTOLOGICAL EVOLUTION OF A GRAVEL-BED RIVER TO DIFFERENT MAGNITUDE FLOOD EVENTS: THE ÉSERA RIVER (ARAGON PYRENEES)

Rivers are dynamic bodies that change over time, being the main cause of modification their own flow regime. One of the river aspects that is more affected by the hydrological regime (i.e. flood events) is the channel-bed geomorphology (e.g., channel morphology, sedimentology) which in turn is the physical habitat for the biota so dramatic changes in river's geomorphology can produce huge alterations to the river's ecology. The main aim of this paper is the study of the morphosedimentological evolution to different magnitude flood events of a river-reach in the highly-dynamic gravel-bed Ésera River during the year 2012. This way, the relationships between the channel-bed geomorphological changes, the physical habitat alterations and the hydrological regime will be established. For this, several geomorphological variables (i.e. grain size distribution, definition of morphosedimentological units (UMs) with aerial photographs, topographical changes through the establishment of differences between consecutive Digital Elevation Models (DEMs)) together with the characterization of the hydrological regime were measured and evaluated for the study period. The definition of the UMs for the studied section was used as a proxy of the physical habitat. Variables were measured initially for a reference or control situation (Time 0), after a moderately-magnitude but sustained flood period caused by snowmelt (Time 1), and finally after a high-magnitude but punctual flood period associated with cold fronts (Time 2). Main results indicate that the period with the largest flood magnitude generated the highest (and very spatially located) erosion/sedimentation processes (i.e. morphological alterations). However, the river showed a tendency towards equilibrium due that the period with the sustained moderately-high flows compensated the effects of the high magnitude floods. Finally, it can be concluded that despite not having big alterations, some modifications have been observed affecting the channel-bed geomorphology and consequently, the physical habitat for the biota.

AE.P15

Parra, Mª Gema[1]; *Guerrero, Francisco J.[1]; Jiménez-Gómez, Francisco[1]; Jiménez-Melero, Raquel[1]; Sánchez-Moyano, Emilio[2]; Galotti, Andrea[1]; Conradi Barrena, Mercedes[2]*

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PRELIMINARY RESULTS IN DESIGNING AND OPTIMIZING ENVIRONMENTAL TECHNOLOGIES USING SIMULATIONS UNDER LABORATORY CONDITIONS OF THE CHRONIC EFFECTS AND THE LIFE CYCLE EFFECTS IN BENTHIC AND PLANKTONIC SPECIES EXPOSED TO HIGH CO2 CONCENTRATIONS (CASELDCO2).

It is expected an acidification of the aquatic ecosystems during the next years related to the increase of atmospheric CO2. One of the most recent technologies to mitigate the increase of atmospheric CO2 implies the geological storage of CO2. This technology has been appointed as one of the possible technical options (London Convention 2006, 2007; OSPAR Convention 2007; EC Directive, 17.12.2008). However, these international Conventions recommend the assessment of potential risks associated with this procedure too. Thus, there are potential scenarios, due to leakages of CO2 during the injection or during its short and long-term storage, which cause effects on the aquatic environment. This project has the main objective to generate new knowledge about the effects associated with acidification of water and sediments associated with an increase of CO2 using organisms exposed by means of designing and optimizing new technologies of assessment of water and sediment quality. First experiments pointed out over changes in phytoplanktonic communities in term of cell size and abundance. Moreover, zooplankton and benthic species had shown alteration in their reproduction capacities and behavior. The potential use of several biomarkers (Physiological, biochemical and behavioral) is discussed.

MSF.P5

Pascoal, Cláudia[1]; *Nogueira, Maria J.[1]; Abrantes, Nelson[2]; Cássio, Fernanda[1]*

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EFFECTS OF WILDFIRES ON LEAF-LITTER DECOMPOSITION BY MICROBES AND INVERTEBRATES IN STREAM MICROCOSMS

The occurrence of wildfires is increasing in the Mediterranean region with significant economic, social and environmental impacts. Among the environmental problems associated with wildfires, contamination of freshwaters by pyrolytic substances, including polycyclic aromatic hydrocarbons (PAHs) and metals, has been neglected. We used a microcosm approach to assess the effects of post-fire runoff on litter decomposition by microbes and invertebrates in streams. We collected ashes in a post-fire event in a forest in Várzea (Viseu, Portugal) and we simulated the runoff from burned areas by preparing aqueous extracts of ashes in the proportions of 0, 5, 10, 20, 40, 60, 80 and 100%. The effects of aqueous extracts of ashes were assessed on microbial decomposition of leaf litter, on fungal biomass and sporulation, and on the feeding behavior of the invertebrate shredder Allogamus ligonifer. Chemical analysis of the aqueous extracts of ashes indicated the presence of phenanthrene and five metals (manganese, copper, zinc, nickel and chromium) at low concentrations, and also high levels of inorganic nitrogen and phosphorus. The exposure to aqueous extracts of ashes had no significant effect on fungal sporulation rate or biomass production. However, a stimulation of litter decomposition by microbes and leaf consumption by shredders was found. Our results suggested that the presence of elevate concentrations of inorganic nutrients might have stimulated litter decomposition by microbes and invertebrates counterbalancing the putative negative effects of metals and PAHs.

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AER.P1

Pau, Roger[1]; *Marín, Nines[2]; Adell, Luis M.[2]; Obrador, Miquel[2]*

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LIMNOLOGICAL CHARACTERIZATION OF THE RECOVERY PROCESS IN “ESTANY D’IVARS I VILA-SANA” (NE SPAIN)

“Estany d’Ivars i Vila-sana” is an endorheic lagoon located in Lleida (NE Spain) which was drained in 1951 for the agronomical explotation and it was restored like a permanent water lagoon on 2005-2009 (Costa, 2007). Its surface is about 126 ha, with 2142 m and 730 m of length and width, respectively. Its maximum depth is about 4 m and mean depth 1.9 m.

This study aims to evaluate the evolution from the first 7 years after filling (2005–2011) (Casas et al, 2005; Palau et al, 2009 and 2011). It presents a water and thermal balances, as well as a trophic characterization; Huguet (1996) performed a study which predicted the eutrophic state of the lagoon and Morell (2004) studied the wind effect on islands that cause the erosion produced by the effect of waves.

In the study it was identified three different periods: one in the initial filling phase (2005-2007) characterized by a high primary production, another between 2008 and 2009 when there was an increase in the volume of water and a reduction of eutrophication, and finally, from 2010, when it reaches the water balance and the system has returned to a eutrophic state.

FW.P3

Peralta-Maraver, Ignacio; *López-Rodríguez, Manuel J.; Tierno de Figueroa, José M.*

Universidad de Granada

ESTRUCTURA, DINÁMICA Y ESTABILIDAD DE LA RED TRÓFICA DE UN RÍO MEDITERRÁNEO

Los modelos de redes tróficas suponen una herramienta de gran utilidad, pues integran tanto la composición de la comunidad (nodos) como las relaciones tróficas que se dan en ella (enlaces). Uno de los usos más extendidos de este tipo de modelos es el estudio de la complejidad, que está muy relacionada con la estabilidad de las comunidades. Sin embargo existe mucha controversia sobre si esta relación es positiva o negativa. Otro factor que determina la estabilidad es la diversidad de organismos, aunque en este punto también hay ciertas discrepancias, pues algunos autores señalan que esta relación es siempre positiva sólo cuando hablamos de diversidad funcional. En relación con ello, en el presente trabajo se ha llevado a cabo la construcción de la red trófica de una comunidad fluvial mediterránea en las cuatro estaciones del año. Para caracterizar los distintos componentes se ha realizado un profundo trabajo de identificación taxonómica con una gran resolución. Asimismo, se han determinado las relaciones tróficas entre ellos mediante el análisis de los contenidos digestivos. A partir de la arquitectura de la red se han extraído varios descriptores de la complejidad estructural y se ha estudiado su relación con los valores de diversidad biológica y funcional de la comunidad. Con estas comparaciones se ha observado una tendencia similar entre la conectividad y la diversidad (tanto biológica como funcional). Por otra parte, conociendo las relaciones tróficas entre nodos, se ha llevado a cabo un análisis cuantitativo de la fuerza de interacción, que ha puesto de manifiesto que no todos los enlaces que constituyen la red tienen la misma importancia; esto es, que existe un andamio estructural de enlaces fuertes sobre el que se sustenta el resto. En el presente trabajo se discute las implicaciones que puede tener este andamio en relación con la estabilidad de la comunidad. Finalmente se comparan nuestros resultados con los obtenidos en trabajos previos en otros ríos mediterráneos.

AE.P3

Pereira, Ruth[1]*; Castro, Ana M.*[1]*; Lopes, Isabel*[2]*; Vieira, Maria N.*[1]*; Rocha-Santos, Teresa*[3]

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EVALUATION OF THE TOXICITY OF TEXTILE EFFLUENTS AND ITS REMOVAL BY CORK ADSORPTION

Textile industry effluent, a byproduct from one of the most important economic activities of the country, are of great environmental concern due to their complex chemical content, toxicity and low biodegradability. For these reasons these effluents demand a proper treatment before being discharged in the environment. Traditional methods present many limitations such as high costs, addition of more chemical compounds and limited efficiency in the removal of hazardous substances. Is therefore necessary to find a more efficient and cost effective solution. In this context, this study aims to explore the efficiency of a byproduct from the cork industry (other important national economic activity), granulated cork, in the removal of organic compounds from a textile effluent, and in the reduction of their toxicity.

Due to the complexity of these effluents their risk assessment only through chemical analyses is insufficient, demanding the combination with ecotoxicological assays. For this reason, the ecotoxicity of a textile effluent, both before and after secondary treatment, was assessed for three trophic levels of the aquatic ecosystem, studying the influence of the samples in the bioluminescence of Vibrio fischeri, in the survival of Daphnia magna, in the feed rate of D. magna and in the growth of Pseudokirchinella subcapitata and Lemna minor. The results showed that raw effluent was toxic and that the treatment performed at the textile company reduced significantly its toxicity, although a certain level of sub-lethal toxicity remained. Adsorption assays evaluated the performance of the adsorbents in the removal of color, conductivity, chemical oxygen demand (COD) and toxicity of textile effluents. Two adsorbents were used: granulated cork 1 (G1), with 0.5-3 mm diameter and granulated cork 2 (G2), with a 3-5 mm diameter. The granulated cork (G1 e G2) adsorption assays were unsatisfactory in the removal of chemical parameters, such as color, conductivity and COD, however they eliminated the toxicity of the raw effluent for Daphnia magna. So far no solutions have been found for the complete remediation of textile industry effluents, however in this work we found promising results to proceed testing the adsorption efficiency of cork by products in parallel with ecotoxicity testing.

IS.P11

Pereira, Joana L.[1]*; Silva, Carlos*[1]*; Nunes, Bruno*[1]*; Nogueira, António*[1]*; Costa, Raquel*[2]*; Gonçalves, Fernando*[1]

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IN VITRO ENZYMATIC TOXICITY OF CHEMICAL MIXTURES AS A STEPPING STONE IN THE DEVELOPMENT OF PEST CONTROL METHODS

The freshwater bivalve C. fluminea has been increasing its distribution outside its native range, being now considered one of the worst 100 invasive species. This species is capable of operating changes in key aspects of ecosystems functioning and severe economic damages as a biofouler in water-dependent industries. Due to the increasing spread of the infestations and the extensive economic losses associated, the improvement of available control methods is still an up-to-date challenge. Since common control methods rely on the application of chemical biocides, improvements regarding both efficiency and ecological friendliness are much required. The combination of several biocides that may result in toxicological synergism would allow the reduction of the concentrations of each chemical used for the treatment, and still achieve satisfactory levels of biocidal efficacy. Bearing this concept in mind, we selected two known biocides already proven efficient against the Asian clam (copper sulfate and dimethoate) as chemical models; the choice of both compounds was also favoured by their toxicological mechanisms, which involves the inhibition of cholinesterase activity.

Assuming that mortality could be explained by the inhibition of cholinesterases (ChE), or is at least related to it, in a first phase we tested the single chemicals in order to determine LC50 values, which were subsequently used to define ranges of toxicant concentrations for in vitro ChE inhibition tests. In vitro testing aimed at determining the most likely effects, caused by single toxicants or combinations of both toxicants, on the enzyme cholinesterase - the Independent Action model for mixtures toxicity was used to plan the experimental design and further analysis of deviations from the theoretical assumption of non-interaction between chemicals. Cholinesterasic inhibition following single-chemical exposures resulted in an IC50 of 6.412 mg/L for copper sulfate and 0.688 mg/L for dimethoate. The joint activity of these compounds evidenced a synergistic behavior, which was neither dependent on the dose nor on the ratio between chemicals. Further studies, under in vivo conditions, are now required to assess whether the observed synergistic effects regarding cholinesterase inhibition relate to mortality, which is the downstream endpoint of interest in the development of pest control methods.

GC.P2

Pérez-Martínez, Carmen[1]*; Jiménez, Laura*[1]*; Romero-Viana, Lidia*[2]*; Conde-Porcuna, José M.*[1]

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BIOGEOCHEMICAL RECORDS OF PALEOENVIRONMENTAL CHANGES IN RÍO SECO LAKE, SIERRA NEVADA

Lacustrine sediment from a short core was taken in Río Seco Lake, an alpine lake located in Sierra Nevada Mountains (Southeast of Spain). The core was sectioned in 0.5 cm intervals and dated by radionuclide Cs-137 and Pb-210 covering a temporal range of the last 180 years. It was analyzed for elemental composition and ratio C/N, LOI, particle size, isotopic dating, isotope signatures (d13C), climate reconstruction and specific bio-markers (fossil pigments and its derivatives).

Among the twenty different identified pigments, cyanobacteria (zeaxanthin, echinenone and myxoxanthophyll), diatoms and crysophytes (fucoxanthina and diadinoxanthina) and green algae (lutein) pigments were recognized as the major components and showed significant concentration changes along the profile. These also are the main taxonomic groups founded at the present time in the lake. Specific pigments for diatoms and chrysophytes and for chlorophytes showed an increase of their concentration along the 20th century while cyanobacteria experimented a significant decrease from the beginning of the 20th century to the present time indicating a shift in the algal dominance. Additionally, cyanobacteria pigments profile was negatively correlated to C/N ratio, d13C and temperature values obtained by long instrumental temperature series. Sand:clay+silt ratio showed a similar evolution that Potasium-40, that confirmed the presence of higher particle size in the last decades coincident with the decrease in cyanobacteria pigment content. On the other hand, LOI and elemental C and N showed a high positive correlation indicating the organic matter source.

The shift in the algal dominance is likely related to climate change affecting the ice-free period duration and wet conditions in the catchment basin soil as well to direct catchment basin changes of Río Seco Lake.

EF.P1

Picazo, Antonio*; Miralles, Javier; Rochera, Carlos; Santamans, Anna C.; Benichou, Fatima Z.; Camacho, Antonio*

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METABOLIC DIVERSITY OF MICROBIAL COMMUNITIES FROM WETLANDS AND SHALLOW LAKES OF DIFFERENT SALINITY AND TROPHIC STATUS

Microbial plankton communities may differ in their abilities to use specific carbon compounds, this being an important subject to understand the carbon metabolism in lakes. To address this concern, in the framework of the projects ECOLAKE (CGL2012-38909, MINECO) and CARBONSINK (Fundación Biodiversidad), an analysis of microbial community-level physiological profiles was performed in wetlands from central and coastal sites of Spain covering a wide range of both salinity and trophic status. To this purpose we used Biolog EcoPlate™ microtitre plates. This involved inoculating mixed microbial assemblages from each lake in microplates containing separately 31 single carbon sources (in triplicate) in addition to tetrazolium (redox dye). The evolution of the dye color inside wells was then monitored over time, considering its optical absorbance as a single metric of the degree of carbon source usage. Multivariate analyses with preliminary results discriminated metabolic profiles depending on water salinity. In general, oligo- and mesohaline waters showed both higher functional richness and capability to oxidize the tested carbon sources, whereas metabolic diversity apparently decreased as salinity increased. Some carbohydrates like D-Cellobiose and D-Mannitol were notably metabolized in fresh and brackish waters compared to the others and regardless of trophic condition. Carbon substrates that further determined profiles in saline environments were some carboxylic acids, and polyols such as erythritol and mannitol, which are related with osmo-regulation mechanisms. Some critical aspects of the use of microtitre plates are also discussed, such as the differential rates of color development caused by differential microbial abundance in the inoculum, or the fact that not all bacteria are able to reduce tetrazolium. Considering the former issue, our results could be judged more like an actual rather than a potential carbon utilization. Additionally, we assessed direct enzymatic activity in the sediments and in water samples from lakes with the 4-Methylumbelliferyl method for cellobioside and phosphatase. In this case, we also found significant differences among the studied lakes and wetlands, as well as between the sediment and water compartments. Comparison of these findings with parallel molecular studies to better understand the structure-function relationships of these microbial assemblages addresses a major challenge in community ecology.

RLWE.P9

Pompêo, Marcelo[1]*; Martins, Natália A.*[1]*; López-Doval, Julio C.*[1]*; Freire, Rogério H.n F.*[1]*; Cardoso-Silva, Sheila*[2]*; Moschini-Carlos, Viviane*[2]

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HORIZONTAL SPATIAL HETEROGENEITY OF NITROGEN AND PHOSPHORUS IN FIVE BRAZILIAN CONNECTED RESERVOIRS – CANTAREIRA SYSTEM (SÃO PAULO STATE, BRAZIL): WATER AND SEDIMENT

The Cantareira System is one the more biggest water supply system in the world. This System produced 33 m3/s of water for nine millions persons in the São Paulo (Brazil). Is composed for five reservoirs, with its water passing from one to another connected through channels: the Jaguari (JG), to Jacarei (JC), Cachoeira (CA), Atibainha (AT) and finally reaching Paiva Castro (PC). This research evaluates the horizontal spatial heterogeneity of nitrogen and phosphorus in these reservoirs, with emphasis on the water and sediment. The sampling occurred in May and June/2013 (19 sampling stations distributed in the reservoirs). The nutrients levels in the sediment ranged from 313.41 to 548.12 mgTP/kgDW, from 1.62 to 4.10 gTN/kgDW. For the water column, the TP, DIN and chlorophyll a content ranged to below the limit of the method (9.0 mg/L) to 47.33 ug/L, 229.12 to 439.03 mg/L and 0.89 to 11.92 mg/L, respectively. For NO3- content ranged from 187.00 to 429.50 mg/L and NH4+ from 15.51 to 191.85µg/L. For TSI are considered oligotrophic to supertrophic. For the P contents in the water and sediment and another's correlationed variables, the cluster analysis (Ward's method and Euclidian distance), suggest tree compartments. The first compartment comprises the JG, another is formatted by JC and CA, and the third by AT and PC. For the PCA, JG is there correlated with higher values for pH, TP in the sediment and chlorophyll a values, mainly. For the cluster analysis for N (water and sediment) is not possible observed a market pattern, but the same compartments can be observed. For nitrogen PCA, the JG is correlated to higher values of chlorophyll a, pH and suspended solids, mainly. For both PCAs (N and P), the PC reservoir is correlated to the inorganic fractions, and the lower P and N values, for water and sediment. These data suggest that JG and PC differs from the others reservoirs, with JG more influenced by anthropogenic contribution, while PC had the lowest trophic level and nutrients of the System, which would be explained by the accumulation of nutrients in dams above.

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AMWQ.P19

Pujante, Ana M.; *Gimeno, Eduardo*

Laboratorios Tecnológicos de Levante

EJERCICIOS DE COMPARACIÓN INTERLABORATORIOS PARA MACROINVERTEBRADOS

Laboratorios Tecnológicos de Levante, S.L. (grupo Red Control), fue el primer laboratorio en España en obtener, en el año 2006, la acreditación ENAC para la recolección e identificación de macroinvertebrados bentónicos, según la norma ISO 17025. La implantación de dicha norma en los laboratorios dedicados a la determinación de macroinvertebrados que tienen por objeto la evaluación ecológica, hace necesario que se participe en ejercicios de comparación interlaboratorios.

Para cubrir esta necesidad Laboratorios Tecnológicos de Levante organiza dos ejercicios de intercomparación: el primero de determinación del índice IBMWP en una muestra de macroinvertebrados preparada y el segundo de toma de muestras de macroinvertebrados en cauces y determinación del índice IBMWP sobre la muestra tomada.

El primer ejercicio se prepara con los ejemplares de macroinvertebrados procedentes de la colección de referencia de Laboratorios Tecnológicos de Levante. Con este ejercicio se pretende medir la precisión y exactitud taxonómica de los técnicos y/o laboratorios que participan. La precisión se mide empleando tres criterios: desacuerdos, diferencias jerárquicas y ausencias. La exactitud se mide mediante el cálculo del PTD: porcentaje de desacuerdo taxonómico y del PDE: porcentaje de diferencia de la enumeración.

En el segundo ejercicio se comparan los resultados de muestreo e identificación en un mismo río, con tramos con características homogéneas, por los técnicos y/o laboratorios participantes.
En esta comunicación se presenta la experiencia de Laboratorios Tecnológicos de Levante en la organización de dichos ejercicios y la adecuación de los mismos a la Norma UNE-EN 16101:2013.

SS4.P1

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LAND COVER, WATER QUALITY AND RIVER ECOSYSTEM SERVICES

Rivers and streams are important ecosystems as they support a wide range of functions, and provide essential services and benefits to human wellbeing. Human settlements tend to establish next to rivers, aiming to take advantage from their benefits, but not always accounting for those services that are lost as rivers became impacted due to an incorrect management of their resources.

The aim of this study was to evaluate the influence of hydromorphology and ecological condition of rivers and surrounding landscapes for the goods and services they provide. For that, a set of distinct river segments were selected in the Ave River basin (NW Portugal), regarding physical-chemical parameters in the stream water and land cover patterns. Each river segment was divided into homogeneous stretches according to their land cover patterns, and inorganic nutrients in the stream water were determined at the beginning and the end of each stretch. For each stretch, the land cover patterns were designed for a buffer distance of 50m and the habitat quality was determined using the Italian Fluvial Functioning Index (FFI) and the visual-based habitat assessment from the United States Environmental protection agency (EPA).

Preliminary results indicated that stretches with natural surrounding areas tend to have a better habitat quality, a self-purification capacity or fewer nutrients intake. To better understand the mechanisms underlying the observed changes (e.g. improved water quality), a set of stretches showing significant decreases in dissolved inorganic nutrients or that did not change nutrient concentrations in the stream water were selected for determining rates of organic matter decomposition and diversity of benthic macroinvertebrates.

Results strongly suggest that river stretches surrounded by agricultural and urbanized landscapes tend to increase their nutrient concentrations, whereas the presence of natural and less disturbed riparian zones can improve habitats and water quality due to a greater self-purification capacity, and thereby benefiting river ecosystem services.

RLWE.P13

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WATERFOWL AND HYDROLOGICAL INFLUENCE ON BIOGEOCHEMISTRY AND MICROBIAL COMMUNITY IN AN ATHALASSOHALINE LAGOON

Fuente de Piedra is an athalassohaline lagoon in the Western Mediterranean that houses during the summer one of the most important colonies of breeding greater flamingos (Phoenicopterus roseus) reaching more than 50000 individuals and during the winter populations of the lesser black-backed gull (Larus fuscus) with more than 20000 individuals. This lagoon presents strong changes linked to the annual hydrological budget with salinities than oscillated, during 2010-2012 years, between 14.5 and 199 g l-1. We have studied the influence of both waterfowl and hydrological budget on the dynamics of major nutrients (C, N, P) and microbial community.

Nutrients ranged between 12 to 163 mg l-1 the dissolved organic carbon (DOC), between 0.5 and 11.2 mg l-1 the total dissolved nitrogen (TDN) and between 0.044 and 1.195 mg l-1 the total phosphorus (TP). Chlorophyll-a values were maxima during the summer reaching values up to 256 µg l-1. Prokaryotic heterotrophic activity, measured as 3H-leucine incorporation, ranged between 28 and 2171 pmol l-1 h-1 with maximum values during the summer. Virus abundance oscillated between 0.11 x109 and 1.09 x109 particles ml-1.

DOC and TP dynamics were mostly driven by the hydrological budget of the system. During the evaporation periods (higher salinity and more positive 18βO values), DOC and TP had the maximum concentration. However, the TDN dynamics was significantly related to the abundance of flamingos, likely due to high inputs of feces during the summer breeding period. Prokaryotic heterotrophic activity was also positive and significantly related to the abundance of flamingos, suggesting a relevant role of nitrogen for prokaryotes. In contrast, the abundance of viruses appeared to be determined mainly by the water evaporation (18βO values as surrogate).

AEBC.P9

Reyes, Isabel[1]*; Martín, Gonzalo*[1]*; Casco, Maria A.*[2]*; Sala, Silvia E.*[2]*; Toja, Julia*[1]

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¿LA DISTINTAS ESPECIES DE ALGAS BENTÓNICAS TIENEN PREFERENCIA POR ALGÚN TIPO DE SUSTRATO?

Las algas bentónicas (Cyanophyta, Chlorophyta y Bacillariophyceae) de varios ríos de las cuencas del Guadalquivir y Guadalete, se estudiaron mediante un muestreo extensivo primaveral, tomando muestras cuantitativas de los sustratos disponibles en cada sitio por triplicado. Aquí se presentan los resultados obtenidos para contestar a 2 preguntas: a) Para el estudio de estas comunidades, si no hay sustrato de roca natural ¿es indistinto muestrear en helófitos y/o limnófitos o en obras civiles o en sustratos artificiales colocados ad hoc? o, por el contrario, b) ¿La heterogeneidad de sustratos aumenta la biodiversidad del sistema? Para contestar a estas preguntas se han utilizado muestras de 19 tramos de río para la comparación de roca natural con helófito y/o limnófito y de 5 tramos para la comparación entre roca natural y sustrato lítico artificial. Los resultados, en general, indican que hay más diferencias en la flora algal entre los distintos tramos que entre los sustratos de un mismo tramo, hecho confirmado con un análisis MDS (ANOSIM, r=0,539). Por lo tanto las algas responden preferentemente a las características del agua. Comparando roca natural con macrófitas, se observa que en el caso de Cyanopyta, la paridad entre roca natural y macrófitas es total salvo en los tramos perturbados antrópicamente. En el caso de las diatomeas, también se observa la tendencia a colonizar de forma similar ambos sustratos, aunque si se instala Cocconeis placentula (en cualquiera de sus variedades) ésta limita el desarrollo de las demás especies. En el caso de Chlorophyta adnatas, se observan más diferencias (las hay en el 40% de los tramos). Cuando no hay paridad, la mayor diversidad de Chlorophyta está sobre los macrófitos, lo que sugiere una mayor afinidad de este grupo por este sustrato. En la comparación entre roca natural y substratos artificiales líticos (obra civil y/o tejas), aunque hay menos tramos estudiados, también hay una semejanza entre sustratos, sobre todo en lo que se refiere a Cyanophyta y diatomeas, diferenciándose bien la colonización entre los distintos tramos.

AMWQ.P22

Robles, Santiago[1]*; Muñoz-Martín, María Á.*[2]*; Perona, Elvira*[2]*; Zaragüeta, Mikel*[1]*; Valle, José M.*[1]*; Rodríguez, José*[1]*; Corral Hernán, María V.*[3]*; Viu, Marta*[3]*; Yañez, Antonio*[3]*; Mateo, Pilar*[2]

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USE OF CYANOBACTERIAL COMMUNITIES FINGERPRINTING APPROACH IN COMPARISON WITH TRADITIONAL BIOINDICATORS TO ASSESS WATER QUALITY STATUS IN THE TAGUS RIVER BASIN.

Rivers are environments subjected to several anthropogenic factors and disturbances leading in some cases to a loss of biological quality. Since no single taxonomic group always provides a superior signal of ecosystem changes, indicators derived from several groups have been proposed to be included in monitoring programs. Recently, a growing interest in the application of molecular methods for studying the microbial communities of aquatic systems has been observed in order to identify problem sources and determine the effect of implemented remedial solutions. Temperature gradient gel electrophoresis (TGGE) is a PCR-based tool that has been used to analyze the diversity of microbial assemblages in different environments. In previous studies we used this technique to measure changes in cyanobacterial diversity along a pollution gradient in a river while comparing the results with field-fixed and cultured samples through optical microscopy. The different 16S rDNA genes presented in the cyanobacterial community of each sampling point were separated by TGGE, giving a characteristic pattern of bands or “fingerprint” for each site allowing direct comparisons. TGGE results revealed that the structure of the cyanobacterial community differed along the pollution gradient of the river, and we proposed that these fingerprints could be used like a bar code, acting as a detector or sentinel for “early warning” of the presence of pollutants in the environment (Rodríguez y col., 2007; Loza y col., 2013). This study aims to evaluate the broader applicability of the proposed approach under the scope of a biomonitoring programme for ecological status evaluation launched by the Tagus River Basin Authority during the spring of 2013 (clave 11CO0054NE/S). For that, twelve river locations divided among five different river tipologies have been sampled in order to assess the feasibility of using benthic cyanobacteria, through TGGE analyses, as new indicators of river water quality. For that, the preliminary conclusions are compared with the results obtained from other well-known indicators such as diatoms and macroinvertebrates.

AEBC.P8

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EFFECTS OF A SEVERE SNOWMELT FLOOD ON DENSITY AND POPULATION STRUCTURE OF BROWN TROUT (SALMO TRUTTA) IN A RIVER SUBJECTED TO PULSED DISCHARGES FOR HYDROPOWER GENERATION

The density and population structure of brown trout (Salmo trutta) were monitored during three years (2011-2013) in two sites of the Noguera Pallaresa River (Northeast Iberian Peninsula). The first one was located immediately below a hydropower plant and it was subjected to pulsed flow discharges (i.e. hydropeaking) on a daily basis for hydropower generation. The second site was located upstream and was used as control section not subjected to hydropeaking. During the two first years (2011-2012) each site was subjected to its ordinary flow regime, but in June 2013 a severe snowmelt flood of ›25 years of return period greatly affected the entire study stream.

Before the flood, fish populations showed significant differences between the two monitored sites. In the upstream site, juvenile trout were more abundant than in the downstream site, where adult trout dominated the population structure. After the flood, the upstream site showed a decrease in trout density and proportion of juvenile trout, whereas no significant changes were observed in the hydropeaking site. Therefore, after the flood, both sites were similar regarding trout populations.

These results showed that severe snowmelt floods could reduce trout density, mainly because of the loss of the smaller individuals. However, hydropeaking stretches appear to be comparatively less affected because trout populations were already adjusted to frequent flow variations, chronically displaying sparser density and simpler population structure dominated by adult fish.

BG.P1

Rochera, Carlos[1]*; Corrales, Maykoll*[1]*; Picazo, Antonio*[1]*; Castillo-Escrivà, Andreu*[1]*; Valls, Luis*[1]*; Laguna, Celia*[2]*; Sánchez, Gema*[2]*; Florín, Máximo*[2]*; Gil-Delgado, José A.*[1]*; Mesquita-Joanes, Francesc*[1]*; Camacho, Antonio*[1]

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NUTRIENT SOURCES IN SHALLOW LAKES FROM CENTRAL SPAIN SHOWING CONTRASTING SALINITIES

This study is part of the ECOLAKE project (CGL2012-38909, MINECO) addressed to investigate ecological patterns in shallow saline lakes located at the Biosphere Reserve of La Mancha Húmeda (Central Spain). One of ECOLAKE's scientific concerns is the study of lake's nutrients import-export processes and balances. The confinement character of endorheic lakes categorizes them as terminal basins where the catchment nutrient runoff finally accumulates unless released to the atmosphere. Additionally to external inputs, likely influenced by anthropogenic pressures, other supplies of biologically available nutrients for the microbial community can be the internal load of sediments and, complementarily, inputs from waterfowl. Our survey embraced both impacted and clean lakes, which in terms of algal biomass (Chl-a) and total phosphorus concentrations (TP) ranged from oligotrophic to hyper-eutrophic. Total organic carbon (TOC) was consistently higher in more saline lakes because of the accumulation of the dissolved fraction (DOC), particularly during the warmer season, when concentrations usually ranged 8-28 mM. Actually, DOC and water salinity correlated positively in all the range of samples analyzed. Total nitrogen (TN) was also higher as salinity increased, ranging usually in these cases between 1 and 4 mM. This was explained by the partial correlation existing between DOC and the total dissolved fraction of nitrogen (TDN). However, during the studied period, total nitrogen was sometimes significantly higher in some of the lakes receiving wastewater discharges, ie. concentrations of ammonium as high as 120-300 µM were measured in some of the water flows entering some lakes. Soluble reactive phosphorus (SRP) also varied broadly from undetectable to around 50 µM, but even higher SRP concentrations (100~350 µM) were regularly measured in two lakes (Yeguas and Almodovar). TN:TP imbalance was notable (ratios usually ›100) in the lower extreme of the trophic gradient (i.e., Laguna Grande de Villafranca), however, values usually ranged 15-50, except in the aforementioned P-rich lagoons, which showed very low ratios. With regard to sediments, samples analyzed to date show that TN and TP content ranged 0.6-5.3 mg-N/g d.w. and 0.1-2 mg-P/g d.w. respectively, whereas the content in birds feces ranged 1.0-36.2 mg-N/g d.w. and 1.9-5.2 mg-P/g d.w. respectively.

AMWQ.P5

Rodrigues, Nina R.[1]*; Haas, Simone*[2]

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CYANOBACTERIA MONITORING IN TWO FRESHWATER BODIES IN RIO GRANDE DO SUL STATE-BRAZIL

In Brazil , national laws and the Ministries of Environment and Health set the standards for water quality, establishing physical, chemical and biological parameters for uses that include human consumption and recreational activities. Environmental Protection Foundation (FEPAM) monitors these parameters in the state of Rio Grande do Sul, including the quantification of cyanobacterial cells , potentially toxic organisms (capable of producing hepatotoxins, neurotoxins and dermatotoxins). Eutrophic environments usually show cyanobacteria blooming, representing a risk to human health and aquatic biota. This work presents results of qualitative and quantitative analyzes of cyanobacteria (predominant genera) , conducted between November 2011 and March 2012, in two freshwater bodies: A) Peixoto Pond, in Osorio (S 29º86'63" , W50°23'11"), coastal, shallow, used for recreation, fishing, irrigation, home evictions and human consumption; B) Gravatai Ri

SS3.P3

Rodríguez, María J.[1]*; Durán, Concha*[1]*; Soria, Juan M.*[2]*; Soria, Javier*[3]*; Kramer, Olga*[3]*; Ferriol, Carmen*[3]*; Morata, Sara*[3]*; Vicente, Eduardo*[3]

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ACTUALIZACIÓN DEL POTENCIAL ECOLÓGICO DE LOS EMBALSES DE LA DEMARCACIÓN HIDROGRÁFICA DEL EBRO DE ACUERDO CON LA DIRECTIVA MARCO DEL AGUA.

Tras veinte años de realización de los trabajos de seguimiento de la calidad ecológica de los Embalses de la Demarcación Hidrográfica del Ebro, y en los últimos siete años de acuerdo con los protocolos definidos por la Directiva Marco del Agua y su implementación en España por la Orden de Planificación Hidrológica ARM/2656 de 2008, se ha obtenido una serie de datos suficientemente larga que permite observar cuáles son las tendencias en el estado ecológico de estas masas de agua.
A partir del estudio de los resultados de las variables consideradas (transparencia del agua, oxígeno disuelto, concentración de P total, clorofila a, densidad y biomasa planctónica) se ha podido calcular por una parte el estado trófico de los embalses, basado en indicadores fisicoquímicos clásicos y, por otra, la determinación del potencial ecológico según la normativa establecida, así como comparar estos resultados con una aproximación al cálculo del potencial ecológico de forma experimental basado también en indicadores biológicos utilizando como elementos de calidad el fitoplancton y el zooplancton.

Los resultados obtenidos muestran cómo en general los 59 embalses estudiados mantienen su calidad o mejoran con el paso del tiempo. Los periodos de peor calidad parecen corresponder con los periodos de menor volumen de agua embalsado, mientras que durante los periodos de mayores aportaciones la calidad aumenta significativamente. Tan sólo una pequeña parte de los embalses presentan una calidad mala o deficiente, que corresponde con el estado eutrófico clásico. Casi todos los embalses han presentado un estado oligotrófico, con una calidad buena o moderada en el periodo estudiado.

La serie de datos obtenida permitirá que se puedan recalcular los potenciales ecológicos de forma experimental con una serie de datos suficiente para dar validez al procedimiento y aproximar su resultado al estado trófico clásico y al normativo.

AE.P6

Rojo, Carmen[1]*; Rodrigo, María A.*[1]*; Carramiñana, María*[1]*; Setyaningsih, Widiastuti*[2]*; Palma, Miguel*[2]

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HIGH PERFORMANCE ALLELOPATHY OF SUBMERGED MACROPHYTES POSSIBLY BASED ON POLYPHENOL COMPLEMENTARITY

Submerged macrophytes play a significant role in stabilising clear water conditions in coastal wetlands, partly due to their interference with microalgal growth via allelopathy. One of our recent studies tested allelopathic effects of several macrophyte species on microalgae. This study was carried out with the charophytes Chara hispida, C. baltica, C. vulgaris and Nitella hyalina, and with the angiosperm Myriophyllum spicatum. A higher inhibitory effect on natural microalgal assemblages was measured when charophyte exudates were present, particularly in the case of C. hispida. When mixed exudates from several populations were used, the inhibitory effects on microalgal growth were even stronger. Thus, it is likely that in aquatic communities macrophytes cause synergistic allelopathic effects on other organisms. Based on our previous results, the hypothesis that arises is whether the polyphenols of different macrophyte species with allelopathic activity are complementary rather than redundant. This fact would explain that diverse macrophyte assemblages exert a greater negative effect on the microalgae growth. To test this hypothesis, tissues of the several macrophyte species cultivated in the laboratory in monocultures were analysed for polyphenols. The analytical procedure consisted of extractions (Solid Phase Extraction Strata X Cartridge), separation (Ultra high Performance Liquid Chromatography (UPLC)) and setting ranges and calibration curves of compounds. The polyphenols found in the target macrophytes were: Gallic Acid, Protocatechuic Acid, Protocatechuic Aldehyde, Catechin, pOH-Benzaldehyde, Epicatechin, pCoumaric Acid, Quercetin, Epigallocatechin Gallate, pOHBenzoic Acid, Kaempferol 3-glucoside, Quercetin 3-Glucoside, Quercetin 3-Rhamnoside, Ethyl Caffeate. The number of different polyphenols in macrophytes varied from six in the angiosperm to one in C. baltica. M. spicatum's polyphenols were mainly of the flavonoid type. Benzenoic polyphenols were the most common in charophytes. A cluster analysis (Gower index and paired group method) of the macrophyte species based on the tissue polyphenol content (quantified as mg compound/Kg DW of plant) was performed. M. spicatum formed a monospecific group separated from charophytes, and Chara species grouped together separately from N. hyalina.

Thus, a complementary allelopathic effect might be likely to occur in aquatic systems dominated by dense and diverse stands of submerged vegetation.

BB.P6

Rojo, Carmen[1]*; Segura, Matilde*[1]*; Monrós, Juan*[1]*; Armengol, Xavier*[1]*; Piculo, Rubén*[1]*; Bonilla, Fabián*[2]*; Rueda, Ricardo*[3]*; Benavent-Corei, José*[1]*; Sasa, Mahmood*[2]*; Mesquita-Joanes, Francesc*[1]

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TROPICAL PACIFIC COASTAL WETLANDS AS A CONTINUUM OF MICROALGAE ASSEMBLAGES: NEUTRALITY AND NICHE PATTERNS BALANCED BY HYDROLOGY AND SPATIAL EXTENT.

"Niche" and "neutral" explanations of species assemblage structure, even in small ubiquitous organisms such as microalgae, depend on climatic circumstances in relation to different geographical extents. Moreover, this relation would be especially relevant to the wet-dry tropical biodiversity where climate allows periods of rain with flooding and dry periods with isolated and reduced water bodies. To test these hypotheses is the aim of the present work. We non-randomly sampled microalgae in 30 shallow water bodies to ensure that different sizes, land uses, connectivity and seasonality were represented for the studied regions along the Pacific coast of Costa Rica and Nicaragua. Three data surveys were conducted that correspond to the beginning, highest peak, and end of the annual hydrological cycle during the wet season. In respect to microalgae assemblages our primary predictions were tested with thanks to an analysis of the partition of variance: i) the relevance of distance in large spatial extents can be distinguished in the structure of ubiquitous microorganism assemblages; ii) flooding conditions are linked to spatial structuring and dry periods are linked to local environmental factors; iii) benthic populations are the most structured during the driest periods, and the planktonic fraction has an improved spatial structure in flooded areas of large and medium extents; and v) the microalgae metacommunities in areas of small extent and with wide connectivity between water bodies can be structured by any factor. Under no circumstances microalgae assemblies separated the two groups of lakes farthest; therefore tropical pacific coastal water bodies from Nicaragua to Costa Rica should be taken into account as a continuum. The biodiversity of small dispersive organisms should be preserved given large extends because the alternation of hydrological regime and heterogeneity of regional landscapes act trough different mechanisms on populations inside the assemblage favouring alternative assemblages and then biodiversity.

BB.P8

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MOLECULAR MARKERS TO STUDY GENETIC DIVERSITY IN CHAROPHYTES

The genus Chara L. makes an interesting case of study because of its complex evolution and difficult systematics. In this work, a preliminary analysis was performed to clear up the phylogenetic relationships between all the species of Chara with sequences available in GenBank for both the atpB (ATPase Beta-subunit) and rbcL (Ribulose-Bisphosphate Carboxylase) genes. The results obtained showed the limitations of protein-coding genes to resolve very recent divergence events. In order to accomplish a better characterization of genetic diversity within Chara spp, a bioinformatic pipeline was created to design new genetic markers using 454 reads from Chara vulgaris L. transcriptome. This represents the first characterization of the frequency distribution for the various types of microsatellites present in a charophyte, and our results were compared with similar data for other eukaryotes. New primer sequences were designed for a total of 11 microsatellite markers, and they were tested in several species of the genus Chara collected from water bodies in the Albufera de Valencia Natural Park (Chara hispida L., C. baltica A. Bruzelius, C. vulgaris, C. aspera C.L. Willdenow, y C. globularis J. L. Thuiller). This preliminary study should become a first step in the analysis of genetic diversity within species of Chara through the use of microsatellite markers. Furthermore, determining the phylogenetic connections between the different species will allow us to link evolutionary patterns and the species phenotypic response to environment changes.

AMWQ.P34

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ECOLOGICAL SURVEY OF SHALLOW SODA LAKES OF THE COCA-OLMEDO AREA (DUERO BASIN, SPAIN)

Some shallow and saline wetlands occurring in the center of the Duero Basin (Segovia and Valladolid Provinces) that are characterized as highly alkaline (i.e. soda lakes), are of special interest for sedimentologists. Among other precipitates, including nesquehonite hydromagnesite, it is highlighted the occurrence of sodium-bearing carbonates that are uncommon in the European region. Preliminary results (2012-14) of an ecological survey of the current conditions of three selected lakes: Laguna de la Eras, Laguna de Caballo Alba and Bodón Blanco, are presented in this Conference and compared with those of shallow saline lakes developed in La Mancha (i.e. MIGEBIAMSAL Project). Physicochemical conditions of surface waters were determined in situ by means of multiparameter devices (temperature, electrical conductivity, pH, and dissolved oxygen) and in the laboratory for dissolved inorganic nitrogen, soluble reactive phosphorus, anions and cations. Biological communities were sampled in the water column for zooplankton and macroinvertebrates, and in the sediments for macroinvertebrates by means of a Corer sampler; representatives of submerged vegetation were also taken and bird communities considered. Physical chemistry of waters resulted very different among lakes and sampling times too. The lake brine is a Na-Mg-Cl-SO4 type. Comparing to Lillo wetlands, here the waters are less saline (i.e. electrical conductivities varied between 3.46 mS/cm and 18.88 mS/cm) and more alkaline (pH from 9.60 to 11.31). Preliminary results show macroinvertebrate communities constituted basically by Diptera (majority Chironomidae), Coleoptera and Heteroptera, that are very different to those encountered in Lillo wetlands (Anostraca dominated). We suspect that nowadays salinity and alkalinity of some lakes of the Coca-Olmedo complex are in a dilution process, probably related to water excesses from irrigated industrial agriculture and managed aquifer recharge from river waters. Comparisons with the scarce historical data are in course.

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AMWQ.P7

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CONCENTRATION OF HEAVY METALS IN FEATHERS OF LITTLE EGRETS (EGRETTA GARCETTA) IN THREE COASTAL BREEDING COLONIES IN SPAIN

Heavy metal pollution in aquatic ecosystems is of great concern today due to its persistence in the environment and ultimate damaging effect on wildlife. Assessment of metal bioaccumulation by birds is a relevant tool to evaluate environmental risk due to metal pollution in aquatic ecosystems.

In this study, Little Egret (Egretta garzetta), a common colonial waterbird (Ciconiiformes: Ardeidae) was used as a bioindicator of metal pollution in three different locations on the Spanish coast: in the north, Izaro Island (Biscay) and San Pedro Island (Cantabria); and in the south, Odiel Marshes (Huelva). All three sites are found in protected areas, with the surroundings of Odiel Marshes being located in a historically polluted area. Breast feathers of Little Egret nestlings were collected during the 2013 breeding period. Around 10 feathers per chick were pulled from a single chick per nest, including a sample of 5 chicks/nests from Izaro Island, 10 from San Pedro Island, and 17 from Odiel Marshes.

Concentrations of Cd, Cr, Cu, Hg, Pb, Ni and Zn in breast feathers were measured by ICP-MS (7500ce, Agilent Technologies). The differences among the three study sites were not significantly different for Zn, Ni, Cd and Pb. However, Hg levels were approximately three times lower in Odiel Marshes than in the two other sites, whereas Cr and Cu presented higher levels in Odiel Marshes. Hg levels were below the threshold (5-40 ppm) that may cause adverse effects and alterations in birds reproduction. In general terms, the three study sites showed low bioaccumulation levels of heavy metals in the feathers of Little Egret chicks.

GC.P3

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THE EFFECTS OF LOW OZONE EPISODES ON TWO CHARA VULGARIS POPULATIONS GROWING UNDER TWO CONTRASTING DIEL PHOTOPERIODS

Within the natural dynamics of the atmosphere, increments and/or reductions in the ozone layer thickness can take place due to both, vertical and horizontal ozone-rich/poor air movements. In mid-latitudes, like in the Iberian Peninsula, Low Ozone Episodes (LOEs) are common during winter and spring, implying a sudden short-term increase in UV radiation, affecting the organisms inhabiting aquatic ecosystems. The most frequent LOEs are caused by a 10% ozone layer reduction during 1-2 days, occurring even once a week. Longer LOEs (5 days) are less frequent, only once a year. Two different charophyte populations of the same species, Chara vulgaris, naturally growing under contrasting diel photoperiods: complete solar cycle exposure (CSCE, no shadow period), and interrupted solar cycle exposure (ISCE, with short shadow periods), were exposed to simulation of the two types of LOEs in the laboratory. The 5-day LOE was simulated by a single UV-enhanced period and the 2-day LOE by two consecutive LOEs, separated by 5 days. In both cases, a recovery period, consisting in subjecting the charophytes to the initial UV conditions, of five days was applied after ending the LOEs. Both populations reacted to the 5-day LOE bending the branches inward to the axis and increasing carotenoids (considered as protective molecules) concentration, opening the branches again and also reducing the carotenoid concentration after the recovery period. When two consecutive 2-day LOEs were applied, the ISCE population responded bending the branches during each LOE and opening them again both in the inter-LOEs and after the final recovery periods, and increasing carotenoids only after the second LOE. The CSCE population increased first the carotenoids, and bended the branches inward only after the second 2-day LOE. Genetic damage, measured as UVB-induced photoproducts concentration in DNA, was not detected in any case. According to these results, under longer UV-exposure, both populations showed the same response, including the recovery pattern. However, when the UV-exposure was shorter, it seems that two different responses occurred: an early-morphological response in ICSE and an early-physiological response in CSCE. Both strategies allowed C. vulgaris to avoid DNA damages caused by sudden UV enhancements and displayed high resilience.

IS.P7

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TESTING ULTRASOUNDS AS A CONTROL STRATEGY OF FRESHWATER BRYOZOANS IN GUADALQUIVIR BASIN IRRIGATION PLANTS

Crop farmers belonging several irrigation communities at Guadalquivir Basin have had to cope in the last years with heavy and pernicious infestations of brown “weeds”. The freshwater bryozoans, Paludicella articulata, Urmatella cf. Gracilis and Plumatella sp. grow on hard surfaces, in water pipes of irrigation canals and through the filters hall at irrigation plant. Their presence has intermittently affected normal operation of the plant. Bryozoans living in pipes may also reduce effective pipe bore diameter, increasing friction and thus slowing water velocities. The presence of fouling bryozoans, increases workloads, reduce efficiency and has impeded the delivery of irrigation water to Guadalquivir Basin crop farmers. The control of bryozoans proliferation is difficult due to resisting stage (statoblast) which act like a seed bank, allowing re-colonisation when conditions are optimal. Control strategies must be directed at reducing settlement and growth of young colonies. This work arises from the collaboration between Toscano Línea Electrónica S.L. and the Comunidad de Regantes del Valle Inferior del Guadalquivir (CRVIG) to design strategies of controlling this problem using an ultrasound treatment. A pilot project is being carry out in the filters hall of two irrigation plants of CRVIG to test the effects of the ultrasonic device DUMO algacleaner, which is manufactured by Toscano Línea Electrónica S.L. Weekly monitoring in treated and non-treated irrigation filters using settling plates and photographic surveys is being carry out. Preliminary results show that approximately 10% of statoblasts germinate in treated settling plates while almost 100% of statoblasts germinate in non-treated plates after nine days treatment. The control of freshwater bryozoans infestation is quite difficult, however ultrasound treatment appears to limit the growth of bryozoans as well as organic biofilm.

AEBC.P7

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MORPHOLOGICAL DISPARITY IN BROWN TROUT (SALMO TRUTTA L.) POPULATIONS FROM DOBRA RIVER IN PICOS DE EUROPA N.P.

Measuring morphological disparity, an approximation to diversity, within-group variance of forms is an essential stage in order to evaluate effects of selection pressures which are acting on populations, promoting morphological differences (phenotypic plasticity), specialization or microevolutive processes.
In this study, we examined morphological disparity of 1288 individuals for 13 brown trout (Salmo trutta L.) populations from Dobra river basin (Picos de Europa National Park).
Morphological analyses were performed separately on juveniles (0+ and 1+) and adults, in order to extricate the effects of genetic and environmental influences on the final morphology. Traditional morphometrics and Thin Plate Spline, a procrustean procedure, were performed using (tpsDig2 v.2.16; tpsRelw v.1.46 and Morpheus Dos/Win 16 Beta).

Thanks to a PCA, an orthogonal and empirical morphospace, was developed where differences in shapes within populations were analysed (MANOVA and Discriminant Analyses with p-value<0.05 in all cases). Morphological disparity was determined by using some indexes (Range, Mean Pairwise Distance and Median Pairwise, Total Variances, Mean Squared Euclidean Distance and Partial Disparity). And Euclidean distances of the populations in the morphospace were compared with geographical distances by using a non- parametric MANOVA (with a significant correlation between both matrices in all cases).

These results show that morphological distances are related to geographical differentiation, there are morphological differences between populations and those differences are not only referred to morphological differences but also differences in morphological diversity. So, the existence of a selection pressure was identified whose consequences could confirmed a microevolutionary dynamics. Environmental effects on individuals’ shapes were also verified with a genetic background.

RLWE.P15

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TEMPORAL VARIATION OF PHYTOPLANKTON BIOMASS AND FUNCTIONAL GROUPS IN OLIGOTROPHIC, MESOTROPHIC AND EUTROPHIC RESERVOIRS IN THE UPPER TIETÊ RIVER BASIN (SÃO PAULO STATE, BRAZIL)

This study aimed to analyze the biomass and functional groups of the phytoplankton community regarding mixture regime and resources availability (light and nutrients) in temporal scale in reservoirs with different trophic status. The principal hypothesis is that the amount of biomass, chlorophyll-a and the functional groups reflect primarily the trophic status of the reservoirs and secondarily the mixture regime. The water sampling to determine the physical, chemical and phytoplankton variables was performed in different depths and sites in the central body (deep site - near the barrier and shallow site - far from the barrier) of the oligotrophic (Ribeirão do Campo and Ponte Nova), mesotrophic (Paraitinga) and eutrophic (Taiaçupeba) reservoirs in rainy and dry seasons (2010). Phytoplankton was analyzed by chlorophyll-a, species composition, algal biomass and functional groups (sensu Reynolds). The first PCA axis represented the trophic status of the reservoirs and the second represented the seasonality. In the surface layer the algal biomass presented higher values in shallow sites in most of the reservoirs, whereas the chlorophyll-a presented little or no difference in the studied sites. The vertical profile of the biomass was heterogeneous in all reservoirs in both seasons, except in the mesotrophic reservoir in the dry season. According to the CCA, different functional groups were associated with the season and the different trophic status of the reservoirs: E, F, K, Sn and X1 in rainy-oligotrophic; A, S1 and T in dry-oligotrophic; J in rainy-mesotrophic; B, H1 and W1 in rainy-eutrophic; and C in dry-eutrophic. In the dry season (mixture period), the species that presented more biomass in the shallow site was also predominant in the deep site (Cryptomonas sp.- oligotrophic reservoir Ribeirão do Campo, Peridinium umbonatum - mesotrophic and Radiococcus planktonicus - eutrophic), except in Ponte Nova reservoir, whereas in the rainy season the species were different in each site. In general, it was concluded that the biomass and chlorophyll-a responded primarily to changes in trophic status, whereas functional groups responded primarily to temporal variations in temperature, depth of mixture zone and light availability.

AE.P10

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TOXIC POTENTIAL OF PARACETAMOL TO FRESHWATER ORGANISMS: A CRITICAL APPRAISAL OF STANDARD METHODS

Paracetamol is one of the most prescribed drugs worldwide, due to its activity as antipyretic and analgesic. However, it can be toxic in over dosage, when the detoxification capability of the exposed organism is surpassed. It reaches the aquatic compartment as a result of its use in human therapy, causing potential deleterious effects on non-target organisms. Thus, it is important to diagnose exposure of distinct aquatic organisms to paracetamol. Having this in mind, a comprehensive series of standardized assays was conducted in order to obtain a thorough diagnosis of its aquatic ecotoxicity. Data showed that paracetamol caused toxic effects on almost all organisms, particularly on crustaceans (Daphnia magna and D. longispina). In fact, low concentrations of paracetamol caused alterations in fecundity and population growth potential in daphnids, immediately followed by death. Literature review revealed that crustaceans (mostly zooplankters) are always among the most sensitive ecoreceptors of this drug. Work is in progress to clarify several research hypotheses that could explain an underlying mechanistic response. Moreover, an interesting finding is related to the modulation of toxic outcomes by unpredictable physiological conditions that can interfere in the biotransformation of paracetamol, e.g. by causing the exhaustion of co-factors required for conjugation of paracetamol metabolites. This resulted in highly variable EC50 values among literature sources and across related species, thus compromising the extrapolations and comparisons of responsiveness among distinct species. Thus, we reinforce the idea that adopting standardized toxicity testing guidelines to study the effects of pharmaceuticals in the wild may not be fully adequate, especially if a thorough study of toxicity mechanisms and responses is undertaken. The ecological relevance of data obtained from classical tests for this compound is further discussed.

AE.P16

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EXPOSURE OF THE SYMBIOSIS AZOLLA FILICULOIDES-ANABABENA AZOLLAE TO A CYLINDROSPERMOPSIN EXTRACT: EFFECTS ON GROWTH, PHOTOSYNTHETIC PIGMENTS AND ANTIOXIDATIVE ENZYMES

The global warming is favourable for the tropical cyanobacteria producing cylindrospermopsin (CYN) spreading in to temperate regions. The cyanotoxins are harmful to phytoplankton, zooplankton, animals and plant macrophytes (floating or submerged). The free-floating pteridophyte Azolla filiculoides has a worldwide distribution mainly in tropical and temperate regions forming blooms when the environmental conditions are optimal. The fern can be used to biofertilize rice fields, feed livestock or phytoremediate industrial and urban wastewaters. However, if the fern is collect in a river that has at the same time a bloom with cyanobacterial producing the cyanotoxin cylindrospermopsin (CYN), their use should be made carefully.

The aim was to evaluate the growth, biochemical parameters (photosynthetic pigments and antioxidative enzymes) and bioconcentration factor of the symbiosis A. filiculoides-A. azollae after 7 days exposure to CYN (0.05, 0.5 and 5 µg/ml).

The relative growth rate showed an abrupt decrease at the highest CYN concentration meaning that the A. filiculoides stop growing. The chlorophyll a and carotenoids decreased with the lowest CYN concentration and chlorophyll b, phycoerythrocyanin, allophycocyanin and catalase decreased with the two lowest CYN concentrations. The phycocyanin has an increase with the lowest CYN concentration the glutathione-S-transferase and glutathione reductase decrease with all the CYN concentrations while the glutathione peroxidase increase with all the CYN concentrations. The CYN was detected in A. filiculoides exposed to the highest CYN concentration. Those results point to adaptations in the photosynthetic pigments due probably to the presence of other compounds in the crude extract that may function as nutrients. Also, this macrophyte does not accumulate CYN.

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AE.P17

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EXPOSURE OF CHLORELLA VULGARIS BATCH CULTURES TO THE CYANOTOXINS CYLINDROSPERMOPSIN AND MICROCYSTIN – EVALUATION OF THE GROWTH AND THE PHYTOREMEDIATION CAPACITY OF THE MICROALGA

Cyanobacteria synthesize several secondary metabolites with diversified chemical structures and biological activities. Some induce cytotoxicity, neurotoxicity, dermatotoxicity or inhibit proteases. During the overgrowth of toxic cyanobacteria, the cyanotoxins are released to the water, contaminating the aquatic environment. The zooplankton, phytoplankton and aquatic animals are thus first targets of these toxins and likely contribute to the bioaccumulation and toxin transfer in the food chain. In this respect the impact of toxic blooms in the environment and human health can be diminished by controlling the toxin levels in the environment, for instance by employing bioremediation. Several studies have pointed the ability of the green microalga Chlorella sp. to withdraw diverse pollutants from wastewaters. Since the microalga showed to be relatively tolerant to cyanotoxins, it could be considered also to withdraw cyanotoxins from contaminated waters.

The aims of the present research are to 1) to compare the effects on growth of Chlorella vulgaris when exposed to a crude extract containing the cyanotoxins cylindrospermopsin and microcystin-LR and 2) to monitor the variations of toxin concentrations in the batch cultures of the microalga.

For each cyanotoxin were used two concentrations (55 and 150 µg/L) with C. vulgaris cell density of 1x105 cells/mL during 14 days. For both treatments (CYN and MCY), cell density increased with the two exposure concentrations (55 and 150 µg/L) and control, but no statistical significant differences were observed. These results may indicate that, at this range of concentrations, CYN and MCY have no effects on C. vulgaris growth. The concentration of cyanotoxins in the cultures did not change significantly from the control all along the exposure time. The results confirm the phytolerance of C. vulgaris to cyanotoxins however indicate that the microalga is not able to remediate the culture medium and thereby likely not suitable for phytoremediation.

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AMWQ.P30

Santos, Joana[1]*; Castro, Bruno B.*[1]*; Mendes, Cristiana*[1]*; Claro, Maria Teresa*[1]*; Vingada, José*[2]*; Pereira, Joana L.*[1]*; Gonçalves, Fernando*[1]

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WATER QUALITY AND BENTHIC MACROINVERTEBRATE COMMUNITY OF RIVER SABOR AND ITS TRIBUTARIES: REGIONAL AND LOCAL PERSPECTIVES

Assessing the ecological status of waterbodies is necessary within the scope of the European Water Framework Directive (WFD), whose main goal is to attain or preserve good ecological quality in all waterbodies. As part of the ecological assessment, WFD recommends biomonitoring plans, which rely on bioindicators and biotic indexes. These indexes are mostly effective to reveal the presence of organic pollution, but they may fail to indicate hydromorphological changes, alterations in river flow and other modifications of physical and chemical characteristics. The analysis of the community structure of benthic macroinvertebrates represents an added value to detect these subtle modifications. Macroinvertebrates are frequently used bioindicators in water quality assessments mostly because of their relatively large size and long life cycles, ease of sampling, low to moderate identification effort and well-developed analysis methods, including several biotic and diversity indexes. The present study focused on the macroinvertebrate community of one of the few undisturbed rivers in northern Portugal (river Sabor). The objective was to comprehend the diversity and current ecological status of the river and some of its tributaries; also, we intended to assess potential impacts of the ongoing construction of a hydroelectric power station (with two dams). Two sampling periods (2009-2010 and 2012-2013) were considered, each one represented by two annual sampling campaigns during spring. Results showed that, in general, the ecological status in the study area was good or above, especially in the river's tributaries. Indeed, the small streams that flow into the main course are globally more diversified and rich, which is not surprising. At some locations, the main river is poorly diversified, except when riffle habitats are found; this is a type of habitat that will be lost when the dam is filled. During the construction of the dams, some modifications were found in the macroinvertebrate community but they were only local and related with changes in flow; this produced some alterations in the ecological status. Community structure analysis also revealed inter-annual differences.

SS4.P2

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INFLUENCE OF SMALL CHANGES IN RIPARIAN FOREST STRUCTURE ON AQUATIC INSECT ASSEMBLAGES OF LOW-ORDER STREAMS IN SOUTHERN BRAZIL

Riparian forest has a positive effect on stream water quality and the biodiversity of aquatic insects. However, most studies have tested only the influence of distinct vegetation types or streams with and without forest, despite the fact that riparian forests differ in structure. In this study, we evaluated the effect of riparian forest structure and water environmental variables on aquatic insect assemblages in a small gradient of forest conservation states. The study was done in two Conservation Units (PMLP and UCAD) on Santa Catarina Island, Southern Brazil. In each area, five low-order streams were selected for collection of Ephemeroptera, Plecoptera and Trichoptera (EPT) across a forest conservation gradient, which included: one stream in a highly conserved primary or secondary forest area, three streams in intermediate forest areas, and one stream in a less conserved forest area. Three sampling points were established in each stream, to measure variables pertaining to riparian forest, stream habitat and water quality. The NMDS ordination showed that the structure of mayfly assemblage differed among five streams in two areas. The hierarchical PERMANOVA also showed significant differences among streams within both areas ($F=2.99$, $p=0.01$). The analysis of indicator taxa showed that Plecoptera were more sensitive across this environmental gradient. The relationship among dissimilarities in assemblage structure and environmental variables was assessed using the BioEnv approach. In PMLP, electrical conductivity, water depth, percentage of gravel and boulder, fruit biomass stream substrate, chlorophyll a and phaeopigments (stream habitat and water quality variables), and percentage of canopy cover (riparian forest variable) were the most important. In UCAD, percentage of sand and leaf biomass found in streams substrate, tree size and the percentage of exposed soil in riparian forest were the most important variables. Our results suggest that the EPT assemblages in a small gradient of forest conservation state seems to be influenced by multiple environmental variables, including structural characteristics of the riparian zone.

SS1.P6

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EFFECT OF SALVINIA AURICULATA AUBLET INFESTATION ON THE WATER QUALITY AND ZOOPLANKTON COMMUNITY IN A FLOW THROUGH NEOTROPICAL FISHPOND.

The present investigation aims at evaluating the composition of zooplankton community and water quality parameters, related with Salvinia auriculata that covered temporally the fishpond and after some months was removed manually. Thus, two periods was analyzed, one with aquatic plant and other without aquatic plant. Samples were collected at five sample sites: two in the inlets water (IW33 and IW13); another two in the fishpond (FP1 and FP2) and one in the water outlet (WO). Variations of physical and chemical parameters associated with the presence and absence of macrophytes exerted great influence on the zooplankton species. The high organic load derived from water flow conditions without treatment provided favorable conditions for natural growth of macrophyte. The presence of macrophyte increased the concentrations of ammonia, thermotolerant coliforms, biochemical oxygen demand and decreased the concentration of dissolved oxygen in the water, selecting resistant species in eutrophic environments, such as Filinia terminalis, Keratella cochlearis, Keratella serrulata, Brachionus havanaensis, Lecane elsa, Polyarthra dolichoptera, Proales doliares (Rotifera) and Thermocyclops decipiens (Copepoda). Variations in the water conditions of the fishpond were not spatially homogeneous, since differences have been observed not only in the periods but also between the different sites analyzed. In addition the fishpond studied is shallow and constantly receives large nutrients load (feed, fertilizers, fish waste) which contribute towards the growth S. auriculata, influencing the increase of some water parameters such as temperature, ammonia, thermotolerant coliforms, BOD5, and the decrease the concentration of dissolved oxygen during study period. Consequently, zooplankton composition was different during the periods under analysis. The macrophyte period favored the abundance of groups which were more characteristics of eutrophic environments, such as Rotifera and Copepoda Cyclopoida, with a decrease in Cladocera, which are the food-source organisms for fish. The floating macrophytes at the water surface of the fishpond, affected directly water quality and the zooplankton community.

AMWQ.P33

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LA DETECCIÓN DE LA PRESENCIA DE CIANOBACTERIAS POR MEDIOS INSTRUMENTALES EN EMBALSES DEDICADOS AL ABASTECIMIENTO DE POBLACIONES DE LA CUENCA DEL EBRO.

Las Cianobacterias son un grupo de algas fitoplanctónicas cuya presencia en las aguas destinadas al abastecimiento de poblaciones no es deseable. No sólo por la posibilidad de la presencia de las cianotoxinas, sino también por ser causa de mal sabor al agua, se procura tratar las aguas para retirarlas en los procesos de potabilización, siendo en ocasiones un problema grave su presencia abundante.

Dentro de los programas de seguimiento de la calidad en los embalses de la demarcación Hidrográfica del Ebro, la abundancia de las cianobacterias es un indicador de calidad de las aguas, evaluado por los métodos clásicos de identificación y recuento de la muestra de fitoplancton al microscopio invertido.
En este trabajo se ha evaluado la correlación entre la presencia de las cianobacterias evaluadas por la metodología clásica con la determinación instrumental avanzada por medio de la fluorimetría 3D de los pigmentos propios de este grupo fitoplanctónico, como es la clorofila a y la ficocianina.

La ventaja de la determinación instrumental radica en la automatización de la medida y no requerir personal formado en la observación e identificación del fitoplancton, así como la rapidez e inmediatez de la medida. Esto permitiría tomar las decisiones de gestión adecuadas en la utilización de las aguas como agua prepotable.

Los resultados obtenidos muestran una correlación significativa entre las variables consideradas en el estudio de tal manera que en general podría utilizarse como un buen indicador la determinación fluorimétrica de los pigmentos. Tan sólo en el caso de la presencia de algas que también contienen ficocianina y no son cianobacterias podría encontrarse falsos positivos de cianobacterias. Pero estos grupos algales también son indeseables en el tratamiento de aguas potables, por lo que en todo caso la presencia de ficocianinas indicaría que existen en las aguas grupos algales (cianobacterias o bien otras algas) que requieren una intervención seria en el tratamiento de las aguas para su potabilización.

EH.P4

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RELATIONSHIPS BETWEEN THE HYDRAULIC HABITAT AND THE BIOLOGICAL TRAITS OF MACROINVERTEBRATES IN THE SANTA FE STREAM (MONTSENY NATURAL PARK, CATALONIA/SPAIN)

Flow is the most important factor governing lotic ecosystems. In particular, the hydraulic habitat, determines the distribution of benthic organisms, depending on their particular biological adaptations and their feeding preferences. On the other hand, the ability to withstand particular hydraulic conditions is expected to change with the size of the organisms, with smaller individuals located in areas with lower hydraulic conditions. In this study, we analysed how the hydraulic habitat determines the structure and function of macroinvertebrates and whether there is a variation in the hydraulic preferences along their ontogeny. Macroinvertebrate Surber samples were collected at different hydraulic conditions in a reach of the Santa Fe stream (Montseny, Catalonia). Hydraulic conditions were examined using the Fliesswasserstammtisch (FST) hemispheres and hemispheres numbers were classified in three categories: high (A), medium (M) or low (L) hydraulic conditions. Macroinvertebrates were identified at family level and their corresponding biological traits were obtained from published literature. In addition, individuals of 8 genera belonging to the 5 most abundant families of Plecoptera and Ephemeroptera were identified at the genus level and measured: Amphinemura, Nemoura, Siphonoperla and Leuctra (Plecoptera), and Habroleptoides, Rhithrogena, Ecdyonurus and Epeorus (Ephemeroptera). As expected, both structural and functional richness and diversity decreased from A to L hydraulic conditions. In addition, structural and functional composition also changed from A to L conditions after applying correspondence analyses. In the case of the 8 identified genera, larger individuals where found at hydraulic habitats where their feeding resource was more abundant, while smaller individuals were located to areas potentially unfavourable with regard to the hydraulic habitat. Our results (1) confirm that hydraulic habitat determine richness, diversity, structure and function of macroinvertebrate communities, (2) give support to the River Habitat Templet, because of the existence a close relationship between hydraulic conditions and biological traits of organisms, and (3) show the ontogeny also plays an important role in the relationship between macroinvertebrates and their hydraulic preferences through the distribution of their feeding resources and the presence of adaptations to avoid being drift.

AMWQ.P25

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ECOSYSTEM SERVICES OF RIVERS VERSUS ECOLOGICAL STATUS: THE CASE OF THE SEGURA RIVER

Good ecological status of rivers is an ethical duty and a requirement of the WFD (Water Directive Framework) that beyond the environmental benefits should provide ecosystem services for the wellbeing of human society. WFD and the ecosystem services approach are independent but have a common conceptual basis: the final objective of WFD is to protect and enhance the water environment for the benefit of society and ES to ensure that society can maintain a healthy and resilient natural environment now and for future generations.

This work explores the relationships between the indices currently used in Segura River Basin to assess ecological status of water bodies and the ecosystem services provided by rivers and riparian forests (according to Millenium Ecosystem Assessment). The most currently indices used to assess ecological status of fluvial ecosystems in the Segura River Basin are: IBMWP for macroinvertebrates, IPS for diatoms, IM for macrophytes (related to biological elements), QBR for riparian forest and IHF for aquatic habitat (related to hydromorphological elements) and dissolved oxygen, oxygen saturation, BDO5, conductivity, pH, ammonium, nitrates and phosphates (as physico-chemical elements). The linkages between these indices and a list of 23 ecosystem services (according to EME-2011) provide by rivers and riparian forests have been explored through a matrix, where the strength of the relationships is classified in High, Medium and Low. Finally, the state of ecosystem services provided by rivers of the Segura River Basin has been mapped.

The results show that current indices of ecological status could be useful tools for assessing some of the ecosystem services, mainly those related to water quality, self-purification and scientific knowledge. In general, almost all indices are too much focused on biophysical elements and they are unable to assess regulating services which are related to functioning ecosystems. Thus, some key aspects, especially the functional aspects like hydrology, hydromorphology and fish fauna are almost ignored or have very little weight, even though explicitly required by the WFD. We propose the use of other indexes (IHG for Hydromorphological Integrity, ICF and IF for River Continuity…) that would improve information on the ecosystem services provided by fluvial ecosystems.

SS1.P5

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A HUMAN TWIST OF MESOZOOPLANKTON COMMUNITIES: THE GUADALQUIVIR ESTUARY

In the last decades the Guadalquivir estuary has been object of several studies concerning the physical and biogeochemical features as well as the hyperbenthos, decapods and small fish's communities. Nevertheless, very little is known about the mesozooplankton community and even fewer about the temporal shift in the settlement of the available ecological niches by its different species. The current status of the community is possibly the results of the cumulative effects of the anthropogenic activities that have been modifying the ecosystem across many decades.

The scarce information about the mesozooplanktonic community suggests that its structure has undergone changes in the species composition and quantitative distribution, especially in the last two decades. In the late 80's Acartia clausi was described as dominant species along a broad salinity range, whereas the occurrence, and in some cases the dominance, of several other species were occasional and related to specific conditions. The current structure of the mesozooplanktonic community instead is characterized by considerably high abundance of Calanipeda aquaedulcis and lower number of A. clausi and cyclopoids copepods. The colonization of the ecological niche by those species has occurred in such way that they do not overlap frequently. Also has to be pointed out that some of the species described in the past as stable or occasional component of the community are now absent or really minor.

The strong presence of C. aquaedulcis seems to be a neat indicator of changes occurred in the Guadalquivir estuary. This is an extreme habitat, being one of the rivers with the highest concentration of total suspended matter and turbidity in the world; these conditions inhibit almost completely the primary production of phytoplankton. The estuary is also a eutrophic and hypoxic water body for most of the mesozooplanktonic taxa. Few species can maintain stable populations in such environments. C. aquaedulcis is one of those species, having a considerably high degree of tolerance to environmental stresses. We hypothesizes that this species has become dominant as human pressure on the estuary increased across the years bringing extreme conditions where few species can develop stable populations.

MSF.P6

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IMPACTS ON AQUATIC ECOSYSTEM INTEGRITY OF PORTELO STREAM (DOURO BASIN, NE PORTUGAL) AFTER A LARGE SPILL OF MINING WASTES

During December 2009, after a period of intense precipitation, several millions of cubic meters of wastes from an abandoned mine were spilled into Portelo stream, a tributary of Rio Sabor (Douro basin) in the northeastern Montesinho Natural Park (NE Portugal). The large amount of wastes covered the riverbed with a layer of fine sediments, reaching more than half a meter in areas close to the mine. Both riparian and agricultural areas were also affected by these sediments from the mine. Wastes were spilled downstream until the main watercourse, River Sabor, by several strong rain events. This study, developed from 2010 to 2013, evaluated the impact of this event on ecosystem integrity, namely in the water chemistry, channel and riparian habitats and on macroinvertebrate communities. Samples were collected from eight different stations distributed along the hydric system. Toxicity experiments were developed in laboratory for one fish species, the barbel (Luciobarbus bocagei), an endemic cyprinid present in River Sabor. The results showed a substantial increase of conductivity (›300 µS.cm-1), total suspended solids (› 100 mg.L) and a decrease of pH (‹5) in the water analyses. From the 52 elements analyzed, including different heavy metals, it was detected a higher concentration of copper, aluminium and cobalt in the water. Aquatic habitats were severely disturbed and important changes occurred in riparian zone. Temporal and spatial differences were found and several metrics (e.g. taxonomic richness, diversity, evenness) confirming the disturbance detected on macroinvertebrate assemblages. As expected, the stations located near the mine showed the highest levels of contamination and disturbance. Biochemical indicators (Na+ and K+ plasmatic concentrations) used in laboratory tests were sensitive, under acute copper exposure of barbel populations (different copper concentrations, 0.06-0.48 ppm were used), and can help to justify the disappearance and or reduction of fish species in the affected area.

AER.P3

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RECONSTRUCCIÓN DE UN ANTIGUO HUMEDAL EN LA CUENCA DEL DUERO: LAS LAGUNAS DE VALCABADILLO.

Las lagunas de Valcabadillo constituyen un pequeño complejo lagunar (18406 m2) compuesto por 3 cubetas de distinto tamaño, situadas en el municipio de Tubilla del Lago, al sureste de la provincia de Burgos. Se construyeron en el año 2007, con la intención de recuperar un antiguo humedal, sobre una antigua turbera calcárea desecada debido a los drenajes agrícolas de la zona.

Tres años después de su llenado, con objeto de realizar una descripción limnológica de las mismas en base a características hidrogeológicas, composición físico–química de sus aguas y a la identificación de las comunidades de zooplancton y zoobentos, se realizaron 5 campañas de muestro desde octubre (2010) a agosto (2011) que nos permiten recoger la variabilidad estacional y su influencia en la dinámica del sistema. Las cubetas se asientan mayoritariamente sobre materiales calizos, margocalizas y calcretas del Terciario Superior, rozando una región de arcillas y gravas carbonatadas del Cuaternario. La alimentación hídrica dominante es debida a la descarga de aguas subterráneas. Respecto a la fauna, tras los muestreos semicuantitativos realizados, se encontraron 67 taxones, siendo Cyclopoida, Anomopoda y Rotifera los grupos más abundantes de la fauna planctónica, y los órdenes Diptera y Ephemeroptera de la bentónica. Se realizó un PCA con el que se pretendía observar patrones de variación en los parámetros físico-químicos entre las lagunas y a lo largo del ciclo estacional estudiado. También se llevó a cabo un NMDS con objeto de relacionar la variación en la composición de las comunidades biológicas con las variables ambientales tanto a lo largo del tiempo, como entre las lagunas. Así, se observó que las lagunas en febrero presentaban cierta homogeneidad entre ellas respecto a las variables ambientales debido al deshielo y la alta concentración de fosfatos, mientras que en el resto de fechas, las lagunas mostraban mayores diferencias entre sí. La laguna "Mediana" resultó ser la más estable de las tres. Las lagunas "Grande" y "Chica" presentaron un mayor patrón de variabilidad a lo largo de los muestreos, viéndose la "Chica" más afectada por las variaciones externas debido a su menor volumen de agua.

EF.P5

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Centro de estudios Hidrográficos del CEDEX

ICE COVER DETERMINES WINTER OXYGEN DEPLETION IN A HIGH MOUNTAIN LAKE

High mountain lakes are frequently characterized by water column oxygen depletion during winter ice cover. Even in oligotrophic lakes, this depletion can result in bottom waters anaerobic conditions if ice cover properties and length are appropriate. Winter ice cover represents a barrier to the gas exchange between water and the atmosphere, and also, depending of its thickness and structure, to the light penetration in the water column. In this study, winter oxygen depletion dynamic is characterized for a high mountain lake located in a Mediterranean continental environment in the Central Iberian Peninsula. In Cimera Lake (Zmax=9m, Gredos Mountains, Spanish Central Range) a chain of temperature data loggers (4 depths) and two multi-probe systems with dissolved oxygen, conductivity, pH, temperature and PAR measurements (0,5 m above sediment surface and 1 m below lake surface) were placed in the deepest point of the lake. Ice cover structure and physical properties were regularly observed during winter period.

Mostly, longer ice cover periods (thawing out later) make deeper oxygen depletion. Nevertheless, in winters with scarce snowfalls and therefore more transparent ice cover, it is observed: 1) more homogeneous water column thermal structure; and 2) less deep oxygen depletion.

Continuous lake monitoring systems allow time detailed descriptions of key changes and dynamic of ice covers such as: freeze and thaw processes, occurrences of heavy storms or snowfalls, or even effects of avalanches on the ice cover. Long-term monitoring of these processes will provide valuable information to detect possible signals of climate change.

EF.P6

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COMPARISON OF MACROPHYTE MASS LOSS VELOCITY BETWEEN IN SITU AND IN VITRO CONDITIONS

The decomposition of aquatic macrophytes is affected by biotic and abiotic factors. Decomposition studies can be conducted in field using litterbags and in laboratory under controlled conditions. We compared the mass loss of Pontederia cordata L. and Oxycaryum cubense Poepp. and Kunth in field and laboratory conditions. The plants and water samples were collected in a tropical reservoir (São Paulo State, Brazil), with acid waters (5.6 ± 0.4), low dissolved oxygen (3.3 ± 1.2 mg.L-1) and 23.2 ± 1.5ºC. For field experiment, 30 litterbags (15 g of dried macrophyte fragments) for each species were incubated close to region with higher occurrence of the corresponding species. In laboratory, 30 decomposition chambers (proportion of 10 g macrophyte fragments per L) were maintained in the dark, at 22.5 ± 1ºC and under anaerobic or aerobic conditions. In the sampling days (along 120 days) were measured the carbon from mass loss (POC) and mineralized carbon (MC) in situ and in vitro experiments. The MC is the difference between the initial contents and the remaining organic carbon determined on sampling days (particulate + dissolved). Linear functions were used to compare POC and MC data obtained from field and laboratory. The slopes and determination coefficients (r2) for field and aerobic incubations were 0.77 and 0.93, respectively. For aerobic and anaerobic conditions these values were 0.85 and 0.85, respectively. These parameters for the relation between MC aerobic and anaerobic were 0.81 and 0.82, respectively. The linear relations showed that mass losses in the aerobic incubations were slower than observed in field and that mass losses in the anaerobic incubations were slower than observed in the aerobic. Further the carbon mineralization was faster in aerobic incubation. These results showed that the processes were faster in field due to impossibility of controlling factors biotic (organism actions such as microbial mineralization, fragmentation by macroinvertebrates and enzymatic attack) and abiotic (limnological characteristics, photodegradation and sedimentation of small particles) and their synergy. Moreover the decomposition processes and MC in aerobic condition was faster probably due to the selection of microbial population with aerobic metabolism acting on higher spectrum of organic matter forms.

AMWQ.P21

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BIOASSESSMENT IN AGRICULTURE LANDSCAPE STREAMS: USING ALPHA AND BETA DIVERSITIES IN MULTI-SCALES APPROACH

The watershed of rivers and streams are constantly affect by anthropogenic activities. Among these activities, agriculture demand large areas, that affecting aquatic environments at different spatial scales. Riparian vegetation Removal and pesticides use are among the leading negative actions of agriculture on water resources. These multiple scales changes in the landscape, affect the alpha and beta components of aquatic communities diversity. In this study, we observed the effects of different land use on alpha and beta diversities of chironomid communities. In addition, we observed in spatial scales (riparian buffer and drainage area) there is an effect on chironomid communities. We collect the larvae in streams of small order (< 3rd order). In these streams, we measure limnological variables and calculate the percentages of different land uses using GIS techniques. Considering the environmental variables (limnological and land use variables), the streams showed an environmental gradient, generated mainly by acid pH and high electrical conductivity values, manly in streams dominated by agriculture. In both landscape scales (drainage area and riparian buffer) intensive agriculture influenced negatively the alpha and beta diversities. Still, the landscape heterogeneity associated with an increase in the riparian vegetation resulted in an increase in beta diversity of chironomid communities. Changes in canopy printed watershed influence the hydrological and biological behavior of these environments. Due to economical, ecological and social aquatic environments importance, proper watershed management can help in the improvement of its environmental quality. Thus, understanding how environmental factors at different scales affect the components of aquatic diversity can assist in the management of water resources.

BG.P2

Valdespino-Castillo, Patricia M.[1]*; Alcántara-Hernández, Rocío J.*[1]*; Merino-Ibarra, Martin*[2]*; Alcocer, Javier*[3]*; Macek, Miroslav*[3]*; Oseguera, Luis A.*[3]*; Gaona, Osiris*[1]*; Cruz, Antonio*[1]*; Falcón, Luisa I.*[1]

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DIVERSITY OF BACTERIOPLANKTON EXTRACELULLAR ENZYMES FOR DOP UTILIZATION IN A TROPICAL MONOMICTIC SYSTEM

Bacterial extracellular enzymes such as alkaline phosphatases have a major role in DOP transformations in aquatic ecosystems but the identity of microorganisms harbouring alkaline phosphatase genes is largely unknown. A detailed water column physicochemical characterization along with an ecosystem scale phosphorus balance were used to assess phosphorus cycling in a tropical oligo to mesotrophic crater lake. In this monomictic system, temperature, dissolved oxygen and nutrient status vary importantly within the hydrological annual cycle. Bacterioplankton from well-established circulation and stratification periods were sampled at different depths. Abundance and diversity of alkaline phosphatase genes phoX and phoD were analyzed to approach to DOP utilization potential. phoX and phoD genes found in Alchichica lake grouped with proteobacterial alkaline phosphatases. Our results showed a similar abundance of these two bacterial enzymes along the water column. However, alkaline phosphatases OTUs (Operational Taxonomic Units) found were different between the stratification and circulation periods, as well as along the depth gradient, showing a high genetic potential to respond to the major environmental changes of the ecosystem, which occur on the intra-anual time scale.

EF.P4

Valdespino-Castillo, Patricia M.[1]*; Ramírez-Zierold, Jorge A.*[1]*; Castillo, Fermín S.*[2]*; Jiménez-Contreras, Jorge*[1]*; Carrillo-Araujo, Mario*[1]*; Merino-Ibarra, Martin*[2]

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COMMUNITY METABOLISM ASSESSMENT IN A DEEP TROPICAL RESERVOIR DURING A PERIOD OF HIGH WATER-LEVEL FLUCTUATIONS

The response of deep reservoirs to water level fluctuations (WLF) is an under-studied field, partiularly in the tropics. We studied community metabolism through oxygen dynamics in a deep monomictic reservoir where high WLF (~10 m) have occurred in the last decades. Monitoring of environmental variables and plankton dynamics was used to assess the effects of WLF on the metabolism responses of the eutrophic Valle de Bravo reservoir, Mexico, where cyanobacteria blooms occur frequently. Mean gross primary production was high (2.1 gCm-2d-1), but temporal variation of GP was low, except for a drastic reduction during circulation, attributed to zooplankton grazing. The trophogenic layer showed net autotrophy, while the whole system oxygen balance showed net heterotrophy during mixing and furthermore when the aphotic respiration was considered. The high total respiration resulting (3.2 gCm-2d-1) is considered to be partly due to mixing enhanced by WLF. Net ecosystem production was equivalent to a net export of 4.0 mgCO_2 m-2d-1 to the atmosphere. Low water levels are posed to intensify, during the stratification, boundary-mixing events driven by the wind in VB. Long term monitoring showed changes in the planktonic community and a strong silicon decrease that matched with low water-level periods. The effects of low water-level on metabolism and planktonic community in VB suggest that water level manipulation could be a useful management tool to promote phytoplankton groups other than cyanobacteria.

AEBC.P3

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FISHING MANAGEMENT PLAN IN THE RIVER OLO ZPR

This work aims to make the comparison of fish potentialities of a typical mountain river before and after performing its management plan for trout fishing. Thus, we intended to describe the recent monitoring work on the River Olo Sport Fishing Reserve (Trás-os-Montes region of northern Portugal), carried out in order to assess whether the current five year old management model needed adjustment. A total of 36 fish samples (electrofishing) were taken from 12 stations established in 2007). Hydromorphological (River Habitat Survey) was not carried out since no observed significant changes had been observed in the quality of the watercourse and riparian habitats modification over the six year period. A considerable area of Mondim de Basto municipality, which is crossed by river Olo, at the time of the survey work, had suffered from wildfires in August and September 2013 (total burned area ›3000 ha) resulting in soil erosion and entrainment and deposition of ash on the riverbank and in the river channel. Despite this event, many habitats still exhibited a high degree of naturalness.

Analysis of data on age, growth and physical condition of catched indicates that trout and chub have a high spatial distribution, although Gobio lozanoi has progressed significantly in recent years along the last third of this water course, and is now present in the last three sampling stations (Canadelo, Ponte de Olo and Ponte de Souto - Vila Chã do Marão). Licensing and catch data was also analysed.

As a result of this work, it was possible to assess the relevance of adopting potential additional measures to improve recreational fishery management of in the River Olo Sport Fishing Reserve based on conservation principles to increase fish stock sustainability.

Keywords: fish, management plan, Fishing Reserved Zone, riparian habitats, exotic species, brown trout

SS3.P1

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APLICACIÓN DE IMÁGENES HIPERESPECTRALES PARA LA ESTIMACIÓN DE LA CALIDAD DE LAS MASAS DE AGUA SUPERFICIALES SEGÚN LA DIRECTIVA MARCO DEL AGUA EUROPEA (DMA)

En el marco de la colaboración Universidad de Valencia - Confederación Hidrográfica del Ebro para el estudio y clasificación del potencial ecológico de los embalses de esta cuenca, partiendo de las variables de calidad y de los datos limnológicos obtenidos, se propone una clasificación de su estado trófico y potencial ecológico.

Dada la extensión de estas masas de agua y su heterogeneidad espacial, se han aplicado técnicas de teledetección, en este caso con sensores hiperespectrales sobre plataformas orbitales, para extender a toda la superficie de estas masas de agua los valores obtenidos en los puntos muestreados.

Los sensores utilizados han sido el hiperespectral CHRIS del satélite Proba y el espectrómetro HICO instalado en la Estación Espacial Internacional (ISS). Se han seleccionado cinco imágenes digitales de cada sensor. Las imágenes de CHRIS (15 x 15 km) incluyen un solo embalse y las de HICO incluyen varios embalses en un área de 200 x 50 km. Se han aplicado algoritmos para la corrección atmosférica y para la estimación de las variables ambientales relacionadas con las propiedades ópticas del agua (clorofila a, ficocianina, transparencia, sólidos en suspensión, presencia de grupos algales dominantes, etc.).

Se presentan los resultados obtenidos a partir de la aplicación de diferentes algoritmos y los mapas temáticos de las áreas estudiadas, valorando su aplicación potencial a los criterios de calidad ecológica de la DMA.

AE.P11

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TOXICITY TESTING WITH THE BENTHIC DIATOM, NAVICULA LIBONENSIS SCHOEMAN: OPTIMISATION OF PROCEDURES AND ASSESSMENT OF THE SPECIES SENSITIVITY TO REFERENCE CHEMICALS

Periphytic communities are good indicators of river quality due to its broad sensitivity to several pollutants. This work's intent was to develop and optimize a new ecotoxicological testing methodology using a freshwater benthic diatom. Navicula libonensis was selected as a suitable test species due to its ubiquity and good attributes (relatively large size) for ease of handling in the laboratory, as well as its classification as sensitive to organic pollution by widespread water quality IPS index. The species was cultured in two synthetic growth media, Chu 10 and OECD TG201. Cultures in Chu 10 performed better compared to those reared in the OECD medium, which is likely to be due to the higher silicon content. In the second tier of the study, N. libonensis was exposed to two standard chemicals, potassium dichromate and 3,5-dichlorophenol. The diatom showed similar sensitivity to both chemicals with median effect concentrations being estimated within the same order of magnitude (Chu 10 medium): ErC50 of 0.119 mg L-1 for potassium dichromate and ErC50 of 0.799 mg L-1 for 3,5 – dichlorophenol. Provided the higher sensitivity of this benthic diatom to standard chemicals as compared to planktonic microalgae, and given the success obtained here in establishing rearing and testing procedures, standardisation of a toxicity test protocol with a benthic diatom such as N. libonensis should be seriously considered as a reliable tool for river quality assessment or as part of the ecotoxicological test batteries for Environmental Risk Assessment purposes.Therefore, a step was taken towards the establishment of alternative methodologies to assess the ecological status of freshwater lotic systems focused on the sediments compartment through the development of a toxicity test with a sensitive benthic diatom species representative of the microphytobenthic community.

AE.P12

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OPTIMIZATION OF GROWTH CONDITIONS FOR LABORATORY AND FIELD ASSESSMENTS USING IMMOBILIZED BENTHIC DIATOM

The availability of rapid and effective methodologies for assessing lotic systems with microphytobenthos are still quite scarce, in spite of the requirements set in the Water Framework Directive. Hence, the primary goal of this study was to optimize the growth conditions of the sensitive and ubiquous benthic diatom Navicula libonensis for laboratorial and field assessments. The effect of different conditions of temperature (15ºC and 23ºC), photoperiod (24L and 12L:12D), initial cell density (104 and 105 cells mL-1), test duration (6, 9 and 11 days), and cell encapsulation into calcium alginate (1.3 and 1.5%) beads were evaluated in a first set of experiments. There was a slight increase of the growth of free and immobilized cells at 23ºC, at lower initial cell densities and at the shortest experimental period (6 days) in trials run with synthetic medium. Through all the conditions, the growth profiles of free versus immobilized cells were fairly variable. The second experimental trial involved the validation of selected test conditions (according to the first trial's results: 104 cell mL-1 and 1.3% of calcium alginate), regarding the ecotoxicological response of N. libonensis to the EC50 of two reference chemicals - 3,5-dichlorophenol (DCP) and potassium dichromate (PD). Both chemicals were spiked into a synthetic medium and into a stream water sample from a natural Portuguese stream. In these tests, the variation of temperature and photoperiod did not seem to influence N. libonensis sensitivity to the chemicals. A similar response of free and immobilized cells was observed between exposures to the spiked stream water and synthetic medium. Indeed, the sensitivity of free and immobilized cells was overall similar through the treatments tested. This outcome indicates that N. libonensis may provide reliable responses for in situ assessments. However it should be further assessed under more realistic field scenarios involving the co-occurrence of different confounding factors, during in situ experiments.

AEBC.P2

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FCUP

BIODIVERSITY ASSESSMENT IN HYDROPOWER SCHEMES – ANALYSIS OF EIA AND MONITORING PRACTICES IN PORTUGAL

Hydropower has evolved increasingly and recent environmental concerns trace international and national policies highlighting the importance of renewable energy sources and clean production of electricity. In order to meet the consumption needs, Portugal has projected new hydroelectric dams and reinforcements to existing hydroelectric developments. However, this technology has environmental impacts whose magnitude depends on the location and size of the project. In Portugal, many hydroelectric projects are mainly located in areas with high conservation interest, raising the importance of a proper environmental impact assessment, mitigation measures and appropriate monitoring plans.

The main objective of this work was the comparison of methodologies of 24 Environmental Impact Assessments (EIA) of hydroelectric schemes in Portugal, with the intention of evaluating the effectiveness of these methodologies and mitigation measures and monitoring plans proposed in each project. To this end, we created a script with 98 assessment questions on different parameters to analyze the 24 projects studied. These questions were answered for each of the projects and all responses were compared using descriptive statistics that led us to the results.

The results revealed that most of the methodologies made in EIAs have huge gaps of information in different parameters discussed; many of them are difficult to understand and do not give full details. The proposed mitigation measures refer to actions and impacts generically and some of the projects proposals were ineffective in terms of monitoring plan and its objectives were unclear.

It was concluded that it is essential to develop methodologies for monitoring uniformly and to promote the exchange and facilitate access to clear information obtained through adequate monitoring to the key players, allowing to the proponents and regulators the possibility of implementing mitigation measures more effectively.

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