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Book of Abstracts



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Plenary Sessions

GLOBAL-SCALE EXPERIMENTS: AN EMERGING TOOL FOR EXPLORING THE FUNCTIONING OF FRESHWATER ECOSYSTEMS

Individual ecological studies, although suitable for testing hypotheses and developing theory, provide site-specific information that is difficult to extrapolate to provide broad generalizations. Today, emerging globally relevant questions (e.g., climate change, biodiversity loss, invasive species or habitat degradation) require a reconsideration of what approaches would be best for understanding large-scale ecological patterns and processes. A technique commonly used for this purpose is meta-analysis, a quantitative approach to reviewing, integrating, and summarizing large numbers of independent studies. However, the robustness of a meta-analysis relies on the individual studies selected for inclusion, and issues of scale and methodology cannot be controlled retrospectively. An emerging, alternative approach is global-scale coordinated experiments, run in parallel by several research groups in multiple locations around the globe. These experiments have the advantage of addressing global problems and exploring general ecological theory, while offering the precision of controlled experiments. We will review the existing global-scale experiments conducted by freshwater ecologists and discuss the potential of this type of studies for developing ecological theory and advancing our understanding of freshwater ecosystem functioning.

ENVIRONMENTAL IMPACTS CAUSED BY THE INVASION OF EXOTIC PLANTS IN RIVERBANKS

Floodplains have environmental filters which are little intense for the establishment of vegetal life. In one side, soil resources are abundant, both water and nutrients. On the other side, competence is not too intense, thanks to perturbations that periodic floods cause, clearing vegetation and delivering resources for pioneer species. If we add anthropic perturbations (such as riparian forest cutting for agriculture, flood regulation, riverbank alterations, etc) and the fact that rivers are efficient dispersers of all kind of propagules, it is easy to understand that these are one of the most propitious environments for the establishment and propagation of exotic plants. The invasion of exotic plants is recognized as a very important factor of global change, together with the climate change and land use change. In this work we analyze the environmental impacts on rivers and riverbanks caused by exotic tree invasions. We focus on the consequences on water and soil matter cycles caused by the entry of exotic trees leaf trash, and how these changes may influence on the taxonomic composition of invertebrates processing this organic matter

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BIOGEOGRAPHY OF STREAM-DWELLING DECOMPOSER FUNGI: CURRENT KNOWLEDGE AND FUTURE PERSPECTIVES

Until the recognition of the crucial role that fungi play in plant-litter decomposition in streams, limnologists largely ignored these organisms. In particular, Ingoldian fungi or aquatic hyphomycetes, abound in well-aerated waters and are regarded as the dominant fungal decomposers of decaying leaves in streams. The predominance of aquatic hyphomycetes on submerged decaying leaves over other fungal groups is mainly attributed to physiological adaptations to fast flowing waters. These include: i) the high production rates of characteristically shaped conidia; tetra- or sigmoid types of spores that act as miniature anchors, arresting on a suitable substratum in rapid flowing waters, and ii) the ability to produce a variety of extracellular enzymes able to break the major plant polysaccharides, which increase litter quality to invertebrate detritivores. Since Ingold's (1942) initial description that mycologists have been interested in deciphering global distribution patterns of aquatic hyphomycetes. Much of this knowledge emerged from species classification based on their characteristic conidial shapes (morphospecies). Based on data from 352 publications, documenting 335 morphospecies, I will present distribution patterns of aquatic hyphomycetes from studies throughout the world in an attempt to better understand the magnitude of global species richness, patterns of biodiversity and the extent of cosmopolitanism versus endemism, as well as the relative influence of contemporary environmental factors versus the legacies of historical events on present-day distribution patterns.

Fennessy, Siobhan

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ANTHROPOGENIC STRESSORS AFFECT CARBON STOCKS AND FLUXES IN WETLANDS AT A VARIETY OF SCALES AND REGIONS

Wetland ecosystems are one of the largest global carbon sinks holding approximately 30% of the estimated 1,500 Pg of global soil carbon, despite occupying only 5-8% of its land surface. Globally, more than half of the historical wetland area has been lost due to anthropogenic activities resulting in a net transfer of carbon from the soil to the atmosphere. There have been few comprehensive studies to quantify wetland soil carbon stocks over large geographic regions, nor how human disturbance affect these stocks through processes such as altered rates of soil carbon accretion and methane emissions. Here I report on studies conducted in three regions to investigate patterns in soil carbon stocks and fluxes. The Ebro Delta (Catalonia, Spain) is an ecologically important region where wetlands are under threat from sea level rise, subsidence and reduction of fluvial sediment inputs. Here rates of C sequestration ranged from 20 to 500 gC m⁻¹ yr⁻¹, with highest rates seen in areas where hydrologic and sediment subsidies were greatest. Methane emissions were low in salt and brackish sites, making them net carbon sinks. In the U.S., soil carbon data were collected in the National Wetland Condition Assessment, a probabilistic, spatially representative national survey, to provide unbiased estimates of soil carbon at the national scale. Carbon stocks varied as a function of location and wetland type, which are intrinsically linked, and regional carbon densities reflect a high degree of variability. Carbon stocks decreased significantly as anthropogenic stressors increased and the deepest soil layers sampled (90-120 cm) showed the greatest differences in carbon content. These results are compared to mechanistic studies conducted in the Eastern US to identify the factors that affect carbon sequestration along a gradient of human disturbance. Here, as in the Ebro Delta, we found a strong link between land use, hydrologic patterns, and carbon accretion and storage. These C accretion rates were related to changes in land use that generate and deliver water sediment to down gradient wetland sites. Overall these studies provide a mechanistic explanation of how human activities decrease soil carbon at regional scales. Efforts to protect climate should address the role of wetlands as climate regulators and include measures for the conservation and sustainable management of their carbon stocks.

THE INFLUENCE OF MEDITERRANEAN RIPARIAN ZONES ON STREAM NITROGEN DYNAMICS

A CATCHMENT APPROACH

During last decade, anthropogenic activities have doubled the available nitrogen (N) in catchments, leading to several environmental problems. Within catchments, riparian areas are recognized to be natural filters of N because they can substantially diminish the delivery of this essential nutrient from terrestrial to aquatic ecosystems. However, understanding the influence of riparian zones on regulating N export from catchments still remains a challenge, mainly because stream water chemistry integrates biogeochemical processes co-occurring within upland, riparian, and fluvial ecosystems. In this talk, I will summarize the results of different empirical and modelling approaches in order to examine in detail some of the processes and mechanisms by which Mediterranean riparian zones can regulate both stream hydrology and catchment N exports. In addition, I will show how the combination of different catchment pools (soils, groundwater and stream water) and temporal scales (ranging from daily to annual) enables the analysis of the riparian systems within a unique upland-riparian-stream context. Overall, findings gathered in my thesis question the well-established idea that riparian zones are efficient N buffers, at least for Mediterranean regions, and stress that an integrated view of upland, riparian, and stream ecosystems is essential for advancing our understanding of catchment hydrology and biogeochemistry.

A QUANTUM LEAP EVERY WHICH WAY? UNDERSTANDING THE EXTENT AND ORIGINS OF MICROALGAL SPECIES DIVERSITY AND THEIR RELEVANCE IN A CHANGING WORLD.

Margalef [1972: *Trans. Connecticut Acad. Arts & Sci* 14: 211] noted that "... the limitation of the human capacity to handle diversity probably influences any description of nature ..." and so the measurement of diversity "... is a function of the beholder as well as of what is measured". Certainly this applies to microalgae. While our perceptions of microalgal diversity were based on light microscopical observations of morphology, it seemed that there were rather few, widely distributed species, leading to the idea [cf. R.M. May 1988, *Science* 241: 1441] that there is a diversity 'deficit' that requires explanation. A series of papers by B.J. Finlay and colleagues in the early years of the new millenium suggested that low diversity and lack of endemism in microalgae and protists might be the consequence of enormous population sizes driving high dispersal rates and restricting opportunities for allopatric speciation – the 'ubiquity hypothesis'. But is there in fact a diversity deficit among microalgae and protists? Recent evidence, which I will review, suggests that species diversity is much higher than previously thought and that, while lineages do seem to spread rather rapidly (so that there are few higher taxa that show endemism), there is ample opportunity for population divergence and speciation. Some practical questions arise: is it necessary to take this 'extra' diversity into account, e.g. in ecological studies or biomonitoring? And if it is necessary, how can it be done?

Mitsch, William J.

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THE ROLE OF WETLANDS IN MITIGATING POLLUTANTS IN OUR LANDSCAPE AND PLANET

The world is faced with unprecedented threats to our aquatic ecosystems from excessive nutrients, caused by agricultural and urban runoff and discharges. Fully 750 aquatic ecosystems suffer from degraded ecosystem services with impairments described as hypoxia, dead zones, and harmful algal blooms, most due to pollution caused by excessive nitrogen and phosphorus. Also, we have increased the atmospheric pool of carbon by 40% since industrial times leading to several impacts related to climate change. In the meantime, it has been estimated that, on a global scale, we have lost half of our original wetlands to our current extent of 8 to 12 million km², most of that loss in the 20th century. I am proposing here a sizeable increase in our wetland resources around the world, solving the diminishing wetland problem, with the strategic purpose of minimizing the excess phosphorus, nitrogen, and carbon in our rural landscapes in a sustainable fashion. Examples include attempts to minimize phosphorus inflows to the Florida Everglades with wetlands to quite low concentrations and a proposal to restore the Black Swamp in NW Ohio to minimize eutrophication of Lake Erie in the Laurentian Great Lakes. Nitrogen retention by wetlands and riparian forests in Midwestern USA has been proposed for 15 years as a solution to the seasonal hypoxia in the northern portion of the Gulf of Mexico. Finally the case of wetlands being carbon sinks through carbon sequestration will be presented in the context of mitigating human-caused increases of CO₂ in the atmosphere, with the full understanding that greenhouse gas CH₄ emissions typical of most wetland ecosystems need to be taken into account.

DOMIPEX - Jóvenes AIL Collaborative Project

Catalán, Núria^{1,*,†}; **Pastor, Ada**^{2,6}; **Abril, Meritzell**²; **Arce, María Isabel**³; **Aristi, Ibon**⁴; **Arroita, Maite**⁴; **Bravo, Andrea G.**¹; **de Castro-Català, Núria**²; **del Campo, Rubén**⁵; **Casas-Ruiz, Joan Pere**⁶; **Estévez, Edurne**⁷; **Fernández, Diego**⁸; **Fillol, Mireia**⁶; **Flores, Lorea**⁴; **Freixa, Anna**⁹; **Giménez-Grau, Pau**¹⁰; **Gómez-Gener, Lluís**²; **González-Ferreras, Alexia María**⁷; **Hernández-del Amo, Elena**⁹; **Lupon, Anna**²; **Martín, Eduardo J.**¹¹; **Martínez, Aingeru**⁴; **Monroy, Silvia**⁴; **Mora-Gómez, Juanita**⁹; **Palacin-Lizarbe, Carlos**¹⁰; **Pereda, Olatz**⁴; **Poblador, Silvia**²; **Rasines-Ladero, Rubén**¹²; **Reyes, Marta**¹¹; **Rodríguez-Castillo, Tamara**⁷; **Rodríguez-Lozano, Pablo**²; **Ruiz, Celia**¹³; **Sanpera-Calbet, Isis**²; **Solagaistua, Libe**⁴; **Tornero, Irene**⁹

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CARBON UPTAKE IN HEADWATER STREAMS: INSIGHTS FROM THE FIRST COLLABORATIVE EXPERIMENT AMONG AIL YOUNG RESEARCHERS

The study of ecological processes requires a broad spatial coverage in a consistent time frame and methodology, which makes Coordinated Distributed Experiments (CDEs) a valuable tool for the study of freshwater ecosystems. In this context, the Iberian Association of Limnology (AIL) launched its first call for Collaborative Projects among young researchers in 2013 with the double aim of funding original research and promoting networking among the young researchers of the association. Here, we present the main results achieved by the awarded project, DOMIPEX, and we discuss the major benefits experienced by the participants in order to provide relevant guidelines for future collaborative studies.

The main objective of DOMIPEX was to examine the variability of carbon (C) uptake and metabolism linked to flow variation in headwater streams across different European regions. Specifically, we aimed to determine

the influence of regional (e.g. precipitation or land uses) and local factors (e.g. nutrients or dissolved organic matter (DOM) quality and quantity) on these ecosystem functional responses. We conducted *in situ* pulse additions of acetate and nitrate and monitored dissolved oxygen concentration for 48 hours in eleven European headwater streams during low (summer) and high (fall) flow conditions. Selected streams presented similar characteristics (i.e. calcareous lithology, non-impacted by human activities and heterotrophic) but differed in dissolved organic carbon (0.8 to 2.9 mg/L) and nitrate concentrations (0.1 to 9.5 mg/L).

Biological uptake of acetate strongly differed among locations and regions (uptake length varied from 44 to 1547 m) and such regional variability prevailed over to the flow conditions, which presented no relationship with uptake. C retention was also influenced by nitrogen availability, a major proxy of the ecosystem trophic status, and DOM quality, which exerted a greater control on C retention than DOM concentration. Stream metabolism, that showed a clear tendency to heterotrophy, presented a similar behavior, as it was not influenced by the flow conditions. However, mean precipitation, air temperature, land uses and reach morphology were significant drivers. Together, this study indicates the high reactivity of headwater streams with regard to organic C cycling and points towards regional factors, mediated by local factors, as main drivers of this reactivity.

Finally, we analyzed additional outcomes (training, networking or engagement of the participants, among others) and highlighted the potential of CDEs to empower young researchers. DOMIPEX constitutes the first CDE exclusively led and conducted by young researchers and the analysis of this experience is pivotal to provide effective guidelines and recommendations for future collaborative projects.

Pontón Merino, Paloma.

Observatorio de la Igualdad URV

IGUALDAD Y PERSPECTIVA DE GÉNERO EN LA INVESTIGACIÓN

El equilibrio de género y la promoción de la investigación y el desarrollo son los dos temas de mayor importancia para la Comisión actual y la futura.

J. Barroso, Presidente de la Comisión Europea al Grupo de Helsinki de Género y Ciencia, 2009.

Esta ponencia tiene tres objetivos principales: 1) introducir al público en el binomio ciencia-género, 2) presentar algunas recomendaciones y buenas prácticas sobre como llevar a cabo investigaciones sensibles al género, y 3) acercarnos al ámbito del medio ambiente desde la perspectiva de género.

Tanto las instancias europeas (Comisión Europea) como nacionales (Estrategia Española de Ciencia y Tecnología, Plan Estatal de Investigación Científica y Técnica) dedicadas a la investigación, promueven la incorporación de la perspectiva de género como una categoría transversal en la investigación y la tecnología, de manera que su relevancia sea considerada en todos los aspectos del proceso, desde la definición de las prioridades de la investigación científico-técnica, los problemas de investigación, los marcos teóricos y explicativos, los métodos, la recogida e interpretación de datos, las conclusiones, las aplicaciones y desarrollos tecnológicos, y las propuestas para estudios futuros. Además, promueven los estudios de género y de las mujeres, así como medidas concretas para estimular y dar reconocimiento a la presencia de mujeres en los equipos de investigación.

No obstante las recomendaciones y las obligaciones legales, hoy en día está ampliamente demostrado que en muchos campos del conocimiento científico, desde las humanidades hasta la medicina, pasando por las ciencias sociales o la ingeniería, las variables de sexo y género no son todavía suficientemente consideradas. Perviven estereotipos y sesgos en la investigación y en los desarrollos tecnológicos, que muchas veces construyen como norma universal lo que son las realidades, experiencias y expectativas de un grupo de personas, mayoritariamente varones.

Regular and Special Sessions

IDE.03

Alcaraz, Carles; Genua-Olmedo, Ana; Caiola, Nuno; Ibáñez, Carles

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IMPLICATIONS OF CLIMATE CHANGE FOR AGRICULTURE AND FISHERIES IN THE EBRO DELTA

The world's coastal zones are threatened by climate warming in a variety of ways, such as flooding of shallow areas, coastal erosion, salinization, wetland loss, and decreased agricultural, fisheries and aquaculture production. The Ebro River is 910 km long and with drainage area of 85,362 km² is one of the most important tributaries to the Mediterranean Sea, forming the Ebro Delta, one of the largest deltas in the north-western Mediterranean. It is a low-lying area characterized by an elevation gradient from a maximum of about 5 m close to the river, down to the lowest zones along the coast, with about 50% of the surface under +0.5 m above mean sea level. The delta plain contains a diverse number of ecosystems giving a high ecological value to the delta. Fresh water and nutrient inputs from the river allow the development of prosperous fishery and farming activities. In agricultural terms, the Ebro Delta is of considerable importance because 210 km² of the delta plain are devoted to rice production, ca. 65 % of the total surface, being the main economic activity. A small-scale (artisanal) fishery is also developed in the Ebro Delta lagoons, but it is not submitted to restrictive management and monitoring measures, consequently its status is unknown. Nevertheless, in the last 20 years the lower Ebro River has experienced a marked regime shift, from phytoplankton to macrophyte dominance, thus reducing both phosphorous and chlorophyll concentration; whereas the construction of three large dams in the lower Ebro River have reduced river run-off and floods (both in number and duration), and prevent sediment transport, thus leading to a reduction in sediment deposition in the deltaic plain. But the impacts on river ecosystem services are mostly unknown. By combining different statistical methods (e.g. GAM, GLMz, Model averaging) we built predictive models to investigate the relationship between river changes (i.e. regime shift), and fisheries reduction and rice production (i.e. ecosystem services) in a global change context. All Delta lagoons showed a similar pattern, with a large overall reduction in by-catch levels of ca. 60%. Although differences among lagoons, results suggest that river flooding pattern change and nutrients concentration reduction can be considered as effective factors affecting fisheries in the River Delta. Results also showed that surface elevation, clay presence and winter river flow were inversely related to soil salinity, the main factor limiting rice production. Thus, rice production followed a productivity gradient from areas along the river to the shoreline. The model also predicts a reduction in rice production related to an increase in soil salinity under a sea level rise scenario.

FEF.06

Álvarez-Cabria, Mario; Estévez, Edurne; González-Ferreras, Alexa María; Lezcano, María; Barquín, José

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ANALYSING THE STRUCTURE AND COMPOSITION OF INVERTEBRATE COMMUNITIES IN RELATION TO FEEDING RESOURCES

Relationships between invertebrate communities and the integrity of fluvial ecosystems has been usually analysed in relation to spatial differences on water physico-chemical conditions and physical habitat characteristics (flow, substrate size, riparian forest, etc.) among sites. However, we have not found many studies analysing how invertebrate communities change over time, in relation to temporal fluctuation of feeding resources (inter-annual variability). In this study we have defined a monitoring network in high mountain streams and springs from the Picos de Europa National Park (Sella and Deva-Cares river basins). This network is composed by 13 sites (10 streams and 3 springs) distributed according to a Control-Impact design (CI) with temporal (inter-annual) replication. These sites have been surveyed during the low-flow season (summer-early autumn) from 2012 to 2015. Thus, we have developed a database with inter-annual replication (4 years) including information on the structure and composition of invertebrate communities at the taxonomic level of genus/species. We have also recorded the availability of the different invertebrate trophic resources: 1- Coarse organic matter (CPOM in its different forms, such as leaves, mosses, seeds, twigs, etc.), 2- Fine particulate organic matter (FPOM), 3- biofilm epilithic biomass and 4- biofilm chlorophyll a. We have also analysed the variability of these feeding resources in relation to the main impacts in the study area (following the CI design: 1- organic effluents and diffuse 2- organic and 3- inorganic inputs). Our preliminary results indicate that diversity of feeding resources was higher in mid-affected sites. Sites affected by water organic enrichment showed higher concentration of chlorophyll a and epilithic biomass, while sites severely affected by the diffuse input of sediments (sand and silt) had the lowest concentration of organic matter and chlorophyll a. Finally, we have observed changes in the functional and taxonomic structure and composition of invertebrate communities in relation to feeding resource availability.

FEF.10

Arce, Marisa

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UNDERSTANDING THE FUNCTIONING OF INTERMITTENT WATER COURSES: IMPLICATIONS OF THE DRY PERIOD LENGTH AND RAINFALL EVENTS ON N AND C PROCESSING

Water scarcity represents a crucial driver for the functioning of intermittent watercourses as drying may impact sediment microbial communities and modify redox conditions. Punctuated rainfalls within dry periods can trigger biogeochemical reactions and shape the effects of drying on N and C fluxes. We aimed to investigate i) how the length of dry period impacts the magnitude and relative importance of biogeochemical processes and their consequences for N and C budgets and ii) whether the implication of a water pulse on N and C processing depends on its intensity and on preceding dry period length. In the laboratory, we desiccated river sediments for 3, 6 and 9 weeks. After each desiccation period, sediments were subjected to three rain pulses of different intensities (0, 4 and 21 mm). CO₂ and N₂O fluxes were monitored multiple times throughout 9 weeks and before and after water pulses. Following pulses, a destructive sediment sampling was done and N and C processing related-variables were studied. All variables were also analyzed before desiccation to account for initial conditions (i.e., wet sediments). We found undetected gas fluxes during wet conditions. Interestingly, we observed a gradual increase of CO₂ over desiccation which peaked after 11 days of drying (383 mg C m⁻² h⁻¹) indicative of an enhanced aerobic respiration during early desiccation. A sudden peak of N₂O was also detected after 11 days (120 ug N m⁻² h⁻¹) supporting nitrification as an alternative source of N₂O in intermittent streams during dry conditions. A significant drop of sediment NH₄ in parallel to an enrichment in NO₃ was found after 9 weeks compared with initial conditions, suggesting that denitrification, key pathway for NO₃ removal, is substantially reduced during drying. Rainfall events tended to amplify gas fluxes with a magnitude positively related with their intensity but only after 3 weeks of drying, while a scarce response was detected after 6 and 9 weeks, indicative of constrained microbial activity during long dry periods.

Our results provide insights on N and C processing and resulting budgets during dry periods, and on the importance of dry watercourses for controlling N and C fluxes at fluvial network scale.

MRM.11

Armengol, Xavier; Castillo-Escrivà, Andreu; Valls, Luis

Universitat de València

ROTÍFEROS DE LAS LAGUNAS CÁRSTICAS DE CUENCA: UN ANÁLISIS DESDE LA PERSPECTIVA DE LAS METACOMUNIDADES

Las lagunas cársticas de Cuenca han sido objeto de numerosos trabajos realizados por el grupo de limnología de la Universidad de Valencia, liderado por Rosa Miracle. El estudio de estas lagunas, entre las que destaca el complejo de Cañada del Hoyo, se viene realizando desde los primeros años 80 hasta la actualidad y ha culminado con la presentación de varias Tesis Doctorales y de numerosas publicaciones científicas sobre diferentes aspectos ecológicos de estas lagunas, como son: zooplancton, fitoplancton, bacterioplancton o paleolimnología.

Los complejos cársticos de Cañada del Hoyo, Fuentes y Arcas-Ballesteros, constituyen sistemas que agrupan varios conjuntos de dolinas que comparten algunas características ambientales y que además, se encuentran próximos en el espacio. El zooplancton de esta zona se estudió a finales de los años 90, desde el punto de vista de la físico-química, morfometría y del análisis de algunas características de la comunidad.

En la actualidad uno de los “temas calientes” en ecología de comunidades es el estudio de los sistemas con un enfoque de metacomunidades, y estos conjuntos de dolinas constituyen un sistema muy adecuado para tal estudio. Por ello nos planteamos el objetivo de analizar los datos de esta comunidad, utilizando las técnicas estadísticas actuales y desde la perspectiva de las metacomunidades (MEMs, RDA, partición de la varianza, EMS). De esta forma podemos contrastar la influencia que presentan las variables ambientales frente a las espaciales en dos épocas del año, principio y final de la estratificación térmica, sobre la metacomunidad de rotíferos. Los resultados ponen de manifiesto que las variables ambientales explicaban un porcentaje significativo de la variabilidad entre comunidades, mientras que las componentes espaciales no resultaron significativas en ninguno de los dos periodos. En las muestras de final de la estratificación el porcentaje explicado por el ambiente fue mayor que en las de principios, lo que revela que la estructura de la metacomunidad puede tener también un importante componente temporal.

RLW.11

Arranz, Ignasi; Hsieh, Chih-hao; Mehner, Thomas; Bruce, Sandra

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DEVIATED PATTERNS IN FISH COMMUNITY SIZE STRUCTURE REFLECT PREDATOR-PREY INTERACTIONS IN LAKES

Aquatic systems harbor more small-sized individuals than larger ones, and the number of organisms decreases as greater body sizes. Theoretically, the abundance-size spectrum (log-log relationship between abundance and body size) in a steady state represents this linearly decreasing function. One of the intriguingly properties of the size spectrum is the appearance of deviations in the theoretical size spectra under steady state conditions. The predator-prey interactions play a key role in the overall structure of the community size spectrum. That is, according to the predator-prey theory, changes in the body-size range of prey taken by a predator may lead to a change in the curvature of the deviations describing the size distribution. Yet, the shifts of predator and prey proportions can indirectly be caused by overfishing, habitat modifications or environmental factors. The present study identifies systematic deviations from linearity of the abundance-size spectrum (log abundance regressed against log body size) of fish communities in 74 lakes of the European Central Plains. By assessing the residuals from the linear regression of the size spectrum, we explored the similarity of non-linear size structures of fish communities across the study lakes. We hypothesized that predator-prey or interactions may primarily be responsible for accumulation or under-representation of certain size groups of fish community. The most deviated patterns were found in lakes with higher densities of predators per prey, but smaller predators relative to their prey length. Human activities also showed a significant effect on the deviated patterns. The deviated patterns from the steady-state distribution in fish communities may be used to develop ecological indicators and to detect anthropogenic affects in aquatic systems.

EIC.06

Barragán, Carles

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DESARROLLO DE UN NUEVO ÍNDICE DE DIATOMEAS PARA LA EVALUACIÓN DEL ESTADO ECOLÓGICO DE LOS RÍOS DE LA DEMARCACIÓN HIDROGRÁFICA DEL TAJO

Se ha desarrollado un índice de calidad de aguas basado en diatomeas para la evaluación del estado ecológico en los ríos de la demarcación hidrográfica del río Tajo (España) que integra la variabilidad natural de las comunidades de la cuenca y que valora la “distancia ecológica” de la comunidad de diatomeas de una estación de muestreo a su comunidad de referencia. Para ello, se han caracterizado las comunidades de referencia existentes en la cuenca utilizando los SOM (Self Organizing Maps) y, posteriormente, se ha desarrollado un subíndice para cada una de ellas basado en un análisis de correspondencias (CA). Este método de ordenación ha permitido elaborar un índice (TADI; TAgus Diatom Index) donde la posición de las estaciones sobre el gradiente de máxima variación (eje horizontal) viene definido estrictamente por la composición de la comunidad de diatomeas. Un valor alto del índice representa lugares poco o nada impactados mientras que valores bajos representan altas perturbaciones. La utilización de una metodología alternativa para el establecimiento de los umbrales entre las distintas clases de calidad y el análisis detallado de las comunidades de referencia encontradas, hacen que la valoración sobre la calidad biológica del agua proporcionada por el TADI sea una fuente de información ecológica especialmente relevante. Además, se han encontrado correlaciones significativas entre el TADI y otros indicadores o variables físico-químicas asociadas a contaminación, por lo que se considera útil su uso como herramienta para la evaluación del estado ecológico de los ríos de esta demarcación.

EEC.01

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THE ROLE OF EPILITHIC BIOFILM IN AN ARSENIC-POLLUTED RIVER

In the arsenic biogeochemical cycle, microorganisms may affect arsenic toxicity by changing its speciation. Gold mining activities in fluvial systems may cause arsenic pollution, as in Anllóns River (Galicia, NW Spain), where high concentrations in surface sediments (up to 270 mg/kg) were found. A 51 days-long biofilm-translocation experiment was done in the Anllóns River, moving from a less to a more polluted site, to explore the effect of epilithic biofilm on arsenic retention and speciation in the water-sediment interface. Eutrophic conditions were detected at both sites. There were identified 41 species of diatoms at the end of the experiment, being *Cocconeis placentula* Ehrenberg var. *placentula* (55.37 %) and *Mayamaea atomus* (Kützing) Lange-Bertalot var. *atomus* (18.34 %) the most abundant species. No significant differences were found between translocated and non-translocated biofilms in diatom diversity indices (S, H and J). However, translocated biofilms accumulated more arsenic and their growth was reduced to half that observed in non-translocated. Methylated As-species (DMA V) were found in intracellular biofilm compartment, what may suggest a detoxification process by biofilm (methylation). Detection of DMA V in water may indicate that biofilm contributes to arsenic speciation in the interface water-epilithic biofilm. Moreover, arsenate (As V) reduction by biofilm may be confirmed by the high amount of arsenite (As III) detected in its extracellular compartment. Our study provides new arguments for the understanding of the key role of microorganisms in the arsenic biogeochemical cycle in freshwater environments.

FEF.12

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COMPARISON OF TOP-DOWN AND BOTTOM-UP TROPHIC INTERACTIONS IN LAKES, AS EVALUATED BY THE SIZE-DENSITY RELATIONSHIPS OF FISH COMMUNITIES

Trophic cascades induced by differing abundances and sizes of planktivorous and omnivorous fish can modify phytoplankton biomass among lakes with similar nutrient concentrations. In turn, fish abundance and size in lakes may reflect the local nutrient supply. Our aim was to compare the intensity of trophic cascades (top-down effect) and the effect of nutrient supply (bottom-up effect) in freshwater food webs from fish to phytoplankton as based on size-density relationships within the fish communities while accounting for a substantial variation in environmental gradients between the lakes. Our hypothesis is that size-density relationships of fish are a sensible metric to evaluate the intensity of food web interactions. We explored body-size structure of fish communities in 75 lakes from five European ecoregions. We tested for the response of linear abundance size spectrum (linear ASS) and Pareto II to chlorophyll a (chl_a) concentration (bottom-up) and the chl_a:total phosphorus (TP) ratio (top-down). We included local temperature and lake morphometry as covariates into the analyses. Overall, there were highly significant negative relationships between the parameters of the linear ASS or the Pareto II distributions and chl_a, indicating a reduction in size of fish in more productive lakes (bottom-up control). In contrast, the effects of fish size distributions on the chl_a:TP ratio were weaker, and were in opposing direction between the parameters of the linear ASS and the Pareto II distributions. These results suggest that phytoplankton biomass is a good predictor of fish size distribution in lakes, whereas the variable fish sizes observed across the lakes were only a poor predictor of the intensity of trophic cascades.

RLW.01

Benassi, Roseli F.; Coelho, Lucia H. G.; Lopes, Tatiane N.; De Jesus, Tatiane A.; Da Costa, Ana C.R.; Freire, Rogério H. F.

Universidade Federal do ABC

FLUXOS DE CH₄ E CO₂ E SUAS RELAÇÕES COM VARIÁVEIS LIMNOLÓGICAS EM ÁREAS ALAGADAS NA REGIÃO METROPOLITANA DE SÃO PAULO, BRASIL

Áreas alagadas desempenham papel essencial na ciclagem de carbono nos continentes e são fontes de gases para a atmosfera, principalmente CO₂ e CH₄. O processo de eutrofização é um dos fatores externos que interferem nos fluxos desses gases. Assim, o objetivo deste estudo foi determinar os fluxos de CO₂ e CH₄ em área alagada localizada em um braço do Reservatório Billings, Região Metropolitana de São Paulo e verificar sua relação com as variáveis limnológicas e a carga poluidora afluente. Foram selecionadas 3 estações (S1, S2 e S3) com diferentes graus de poluição: S1 próxima à captação de água para abastecimento; S2 receptora de esgotos e S3 situada em região protegida. A periodicidade da amostragem foi em escala sazonal (seco e chuvoso). Amostras de água, sedimento, macrófitas aquáticas e gases na interface água-ar (concentrações de CO₂ e CH₄) foram coletadas para determinações físicas e químicas. Na água, in situ, foram determinadas: temperatura, pH e oxigênio dissolvido utilizando sonda multiparamétrica. Em laboratório foram determinados valores de fósforo, nitrogênio e carbono na água, sedimento e macrófitas aquáticas. Dentre os principais resultados, destaca-se que em ambos os períodos as emissões de CO₂ e CH₄ foram superiores na S2 (CO₂ = 42,3 mg.m² min⁻¹; CH₄ = 214 µg.m² min⁻¹, no período seco e 11,3 mg.m² min⁻¹ e 93 µg.m² min⁻¹, no período chuvoso, respectivamente), provavelmente, devido à aportes de matéria orgânica na área. Em S3 foi possível detectar o fluxo de CO₂ (2,3 mg.m² min⁻¹, seco e 2,6 mg.m² min⁻¹, chuvoso), possivelmente proveniente da respiração das plantas aquáticas na superfície da água. O CH₄ não foi detectado, indicando baixa contribuição de degradação anaeróbica da matéria orgânica. As concentrações de sólidos suspensos foram maiores na S2, principalmente, no período seco (34,6 mg.L⁻¹), enquanto que em S1 e S3 foram menores 4,0 mg.L⁻¹ e 1,3 mg.L⁻¹, respectivamente. Conclui-se que o ecossistema estudado mostrou relações entre as variáveis limnológicas com os fluxos dos gases estudados ficando evidente a relação com a estação S2, que apresentou maior carga poluidora, advinda, principalmente, de descarga de esgotos doméstico clandestino, ocasionando uma maior oferta de matéria orgânica, refletindo no enriquecimento das áreas alagadas

FEF.08

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NÍVEIS HIDROMÉTRICOS INTERFEREM NO ESTADO TRÓFICO DO RESERVATÓRIO? ANÁLISE DA RELAÇÃO UTILIZANDO O ÍNDICE DE ESTADO TRÓFICO NO RESERVATÓRIO DA USINA HIDRELÉTRICA DE ITAIPU (BRASIL E PARAGUAI)

Os reservatórios são ecossistemas complexos e dinâmicos, com mudanças longitudinais e verticais nas comunidades biológicas e nas variáveis físico-químicas governadas pela combinação de vários fatores antrópicos e naturais, dentre eles o uso e ocupação da bacia de drenagem, características hidráulicas e operacionais do reservatório. O monitoramento da qualidade da água utilizando o Índice de Estado Trófico (IET) é um dos principais instrumentos de planejamento e gestão de recursos hídricos. Constitui-se em um sensor que possibilita o acompanhamento dos processos de utilização dos cursos d'água, delineando seus efeitos sobre as características qualitativas das águas de forma a subsidiar as ações de controle ambiental. O objetivo deste estudo foi correlacionar os dados dos níveis hidrométricos com o Índice de Estado Trófico (Carlson modificado) - baseado em dados de clorofila a, P-total e Secchi - amostrados trimestralmente, durante o período de 2004 a 2014, para verificar a existência de algum tipo de efeito da variação de nível sobre a variável estudada. Para tanto foram selecionadas 25 estações amostrais, distribuídas nas regiões: fluvial, transição e lacustre. Os dados foram testados utilizando os níveis hidrométricos diários, médias trimestrais anteriores as datas do IET calculado para cada uma das estações do Reservatório e para o agrupamento médio do índice em cada uma das zonas longitudinais. Os resultados obtidos demonstram que os diferentes níveis hidrométricos utilizados durante a operação do reservatório não possuem relação direta com o índice de eutrofização do reservatório como demonstram os resultados da análise de regressão linear ($R^2 = 0,00677$, $N = 176$, $P = 0,282$ e $F = 1,166$) para a análise total, assim como para a análise de cada uma das zonas, indicando que outros fatores interferem para a eutrofização, sobretudo nas estações localizadas na zona de transição.

IDE.01

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BENTHIC FORAMINIFERA AS BIOINDICATORS OF PRESENT AND PAST MEDITERRANEAN DELTAIC HABITATS

Deltas are highly dynamic coastal systems of great ecological and economic importance where changes occur at a human scale and biotic and abiotic interactions are intense and complex. At the same time, the consequences of global change, such as sea-level rise and sediment deficit, put these systems at risk. Sediments beneath deltas are the only archive of data to understand their formation and dynamics through time, and provide scientific knowledge for informing future management strategies. In this study we investigated for the first time the use of benthic foraminifera as indicators of Mediterranean deltaic habitats (Ebro Delta, NE Iberian Peninsula) in order to examine environmental change, in which the modern ecology of the assemblages is used to reconstruct past deltaic habitats.

Results showed that the present-day distribution of benthic foraminiferal assemblages is related to environmental gradients of water depth, salinity and sediment type. A total of four different habitats within the Ebro Delta have been characterized from the deltaic plain to adjacent marine area: salt and brackish marshes, coastal lagoons and inner bays, nearshore and outer bays, and offshore habitats. The use of an integrative approach through Indicator Species Analysis and transfer function provided accurate paleoreconstructions of habitats and water depths at two different temporal scales.

At millennial scale, down-core foraminiferal assemblages revealed: i) the existence of deltaic habitats (i.e. coastal lagoons) for the last c. 7500 years, reinforcing the idea that the Ebro Delta dates to the early Holocene, similar to other Mediterranean deltas; and ii) a differential development of deltaic lobes during the last 2000 years indicated by deltaic-marine habitat successions. At decadal-centennial scale, the benthic foraminiferal record showed clear habitat shifts during the last 150 years, these changes being significantly correlated with organic matter increases. These recent habitat changes very likely show the effect of the intensive human alteration of the Delta due to rice cultivation.

Overall, the use of foraminifera as (paleo)ecological indicators provides a management tool not only for assessing reference conditions in a Mediterranean delta but also for habitat restoration in the context of ongoing climate change impacts (i.e. sea level rise, sediment deficit).

EIC.07

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MÉTODOS AUTOMÁTICOS DE IDENTIFICACIÓN DE DIATOMEAS PARA LA DETERMINACIÓN DE LA CALIDAD DEL AGUA (AQUALITAS)

Se presenta aquí el desarrollo de un sistema de análisis de imágenes para la identificación taxonómica automática de diatomeas y el cálculo de índices bióticos para las redes de control y seguimiento del estado ecológico en los ríos europeos basadas en diatomeas. Estas algas resultan de gran utilidad en la monitorización de la calidad de las aguas, de ahí la importancia que la automatización de los procesos de análisis conlleva. El enfoque convencional ha consistido usualmente en su identificación y cuantificación mediante microscopía óptica; sin embargo existe una necesidad de aplicar técnicas de reconocimiento automatizado para obtener herramientas diagnósticas (redes de vigilancia ambiental, sistemas de alerta temprana) adecuadas para facilitar la gestión de los recursos hídricos y los procesos de toma de decisiones. Sin embargo, el análisis manual de imágenes de tales sistemas es poco práctico; debido a la enorme diversidad de este grupo de microalgas y su gran plasticidad morfológica. Los nuevos sistemas de análisis de imagen ofrecen una solución potencialmente ventajosa en comparación con los métodos manuales de conteo e identificación. Adicionalmente, existe la necesidad de implementar herramientas de software robustas y flexibles para la clasificación de imágenes de diatomeas, que permitan el pos-procesamiento de datos para la evaluación ambiental y otras aplicaciones. La metodología a desarrollar pretende la implementación de una herramienta destinada a la evaluación global de la calidad biológica actual en diversos ecosistemas acuáticos europeos utilizando índices bióticos basados en la estructura de la comunidad de diatomeas y compararla con los resultados proporcionados por otros métodos bióticos y abióticos, recurriendo tanto a colecciones actuales como a re-análisis de imágenes ya obtenidas, explorando igualmente su aplicabilidad en el análisis paleoambiental, diatomología forense, estudios arqueológicos, etc. El objetivo de esta aplicación es la de proporcionar nuevos mecanismos de diagnóstico del estado ecológico en las masas de agua dulce, en cumplimiento de los requisitos establecidos por la Directiva Marco del Agua de la Unión Europea (DMA). Para ello se pretende cubrir de forma realista el flujo de trabajo completo de un sistema bioindicador desde la captura, al análisis, la identificación y la determinación de los índices de calidad.

MRV.03

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University of Barcelona

TOO MUCH AND TOO LITTLE WATER: CONTRIBUTIONS TO THE ECOLOGY OF INTERMITTENT RIVERS.

Last October 15th, Maria Rieradevall passed away leaving a valuable contribution to the field of stream ecology. She was a very versatile researcher who helped to advance Iberian limnology considering fundamental and applied topics. Maria was fascinated by Mediterranean rivers and, in particular, by intermittent rivers (IRs), which are characterized by flow cessation during some period. Among all her contributions, Maria was one of the pioneer researchers to provide insightful contributions to understand the effects of natural drying on aquatic communities. She started her research in IRs in two projects in the Barcelona province that allowed her to develop a classification of IRs based on discharge and geomorphologic characteristics. In addition, she contributed to design the EPT/OCH (Ephemeroptera, Plecoptera and Trichoptera over Odonata, Coleoptera and Heteroptera) index as an indication of flow intermittence. These initial works were followed by others that included other types of disturbances besides natural drying, such as fire and human pressures. Maria provided thus understanding on the effects of pulse, press and ramp disturbances in IRs and, in particular, how all may disrupt aquatic communities and ecological processes. In addition, Maria greatly contributed to provide tools to properly assess IRs by participating in several international projects, such as MIRAGE and the ongoing Life TRivers. Her contribution to IRs has provided the paths to better understand and predict stream ecosystem responses to shifts in disturbance regime. But, above all, she knew the importance of long-term data in ecology and this is part of her legacy that will allow us to continue with IR research.

EEC.04

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ROLE OF SETTLING PARTICLES ON MERCURY METHYLATION IN THE OXIC WATER COLUMN OF FRESHWATER SYSTEMS

The methylation of inorganic divalent mercury (HgII) to the potent neurotoxic methylmercury (MeHg) is carried out by specific groups of anaerobic bacteria as sulphate-reducing bacteria, iron-reducing bacteria, methanogens, Firmicutes and Methanomicrobia. The finding of Hg(II) methylation processes in oxic water column of marine ecosystems was a breakthrough in the conceptual model of Hg biogeochemical cycling. As the formation of MeHg in marine oxic water column was associated with the activity of microbes living on sinking particulate organic matter, we hypothesize that similar processes might occur in water columns of lake ecosystems. By combining field and laboratory based experiments, we evaluated the role of settling particles on Hg methylation in the oxic water column of the largest Lake in Western Europe (Lake Geneva). THg concentrations ranged between 174 ± 4 and 270 ± 58 ng/g and from 73.4 ± 0.4 to 257 ± 9 ng/g in sediments and settling particles, respectively. Differences in THg concentrations between sediments and settling particles were not statistically significant ($p > 0.05$). In contrast, MeHg concentrations were up to ten-fold greater in settling particles than in sediments. MeHg as a percentage of THg was also significantly higher in the collected settling particles (0.4 % – 9.6 %) than in sediments (0.2 % – 0.8 %). Hg methylation rates, determined from spring to late summer in sediments and settling particles, were one order of magnitude greater in settling particles. Furthermore, the amendment of molybdate (an inhibitor of sulphate-reducing bacteria) to settling particles significantly decreased Hg methylation (~80 % inhibition). In this study we therefore demonstrate that MeHg is biologically formed in settling particles of oxic water column of lake systems and we highlight that sulfate reduction is an important metabolic pathway involved in the process. We conclude that MeHg formed in water column has been underestimated but might represent a significant pool of MeHg for aquatic food webs.

FEF.05

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SIZE-BASED INTERACTIONS ACROSS TROPHIC LEVELS OF THE PLANKTONIC FOOD WEB: A LAKE MESOCOSM EXPERIMENT

Most studies on the size distribution of the aquatic community have focused on the variations in size of a single trophic level as a response to certain environmental variables or biotic factors. Few studies, however, have evaluated how individual size structure is altered simultaneously across interacting trophic levels. We studied the size-based trophic cascade induced by fish predation on the plankton food web (zooplankton and phytoplankton) of lakes by performing a 3-months in situ controlled experiment in Lake Myvatn, Iceland. The experiment was conducted in eight circular enclosures with two fish treatments (with fish (*Gasterosteus aculeatus*) and without fish) and four replicates for each treatment. We used the size diversity of zooplankton, phytoplankton and *Anabaena* (which bloomed during the experiment) as dependent variables in each General linear model. As predictors, we included fish, total phosphorus (as an indicator of resource availability), the size diversity and the biomass of the adjacent trophic levels (i.e. zooplankton and phytoplankton) and time. Our results show that the size structure of zooplankton is mainly driven by fish size-selective predation whereas it is less influenced by resource availability, because no relationship was found with phytoplankton size structure or total biomass. The presence of fish led to low size diverse zooplankton communities and dominance by small size individuals. In contrast, zooplankton abundance and size did not drive the variation of phytoplankton size structure, particularly because of the high abundance of non-edible *Anabaena*. When the size diversity of *Anabaena* population was analyzed separately, the results showed that it was strongly positively affected by resource availability. In conclusion, our results indicate that fish predation reduces the size diversity of zooplankton but this effect does not cascade to lower trophic levels in lake Mývatn. In contrast, resource availability increases the size diversity of the phytoplankton community.

AFC.12

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HOW TO DETECT THE RESPONSE OF RIPARIAN COMMUNITIES TO MULTIPLE STRESSORS? TESTING FUNCTIONAL REDUNDANCY VS. FUNCTIONAL DIVERSITY INDICES

The world's ecosystems are experiencing an unprecedented increase in the intensity and variety of impacts. For this reason, it is essential to better understand how biodiversity and ecosystem function may change along multiple stress gradients. In this study, we compared how functional redundancy and functional diversity components (functional richness, evenness and divergence) of riparian vegetation respond to single and multiple environmental filters in a Mediterranean basin in SE Spain. We used the three main stressors for freshwater ecosystems in the study area: natural drought, flow regulation and agricultural intensity. Our results revealed that all functional measures decreased with increasing stress intensity. However, functional redundancy was more sensitive to single and multiple environmental filters compared to the other functional measures. The best-fitting model explained 59 % of the functional redundancy variability and included agriculture, drought and flow regulation and the pairwise interactions of agriculture with drought and flow regulation. Null model analysis of the best-fitting model showed non-random habitat filtering along stress gradients (i.e. model parameters departed from null expectations). In summary, we found non-random detrimental effects along environmental filters for riparian functional redundancy, meaning that increased stress might jeopardise stability, resistance and resilience of these systems. In addition, the response of functional redundancy resulted was predictable from large-scale geographical variables. Modelling functional redundancy for entire basins could assist decision-makers in setting goals and designing strategies for conservation and restoration of riparian ecosystems. Therefore, functional redundancy could provide critical information in the study of how communities respond to stress, which can improve biomonitoring and ecosystem management.

FEF.13

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PATTERNS OF CHANGE IN PHYTOPLANKTON MAIN GROUPS ACROSS HIGH MOUNTAIN LAKES: A PIGMENT BASED APPROACH

Phytoplankton taxonomic composition was estimated in a set of Pyrenean lakes using pigment-based chemotaxonomy. Samples were taken in mid summer at a depth close to the deep chlorophyll maximum. The lake selection was performed to proportionally cover the distribution of lakes along the two main environmental gradients of bedrock types and altitude and to include geographical extremes.

Chrysophytes were the dominant taxonomic group in the deep chlorophyll maxima in a higher number of lakes, followed by cryptophytes and chlorophytes. Diatoms and cyanobacteria dominated in 15 % and 5 % of the lakes respectively, while dinoflagellates dominated in only one lake. The minimum combination of environmental variables explaining most of the variability in phytoplankton taxonomic composition included calcium concentration (Ca), total phosphorus (TP), fish presence (Fish) and macrozooplankton abundances (MZP). Redundancy analysis depicted two main environmental gradients related with trophic state and water chemistry. Cryptophytes and chlorophytes were associated with lakes exhibiting higher TP and fish presence, while chrysophytes and dinoflagellates were more abundant at the opposite extreme of the trophic gradient. Diatoms and cyanobacteria were positively correlated with a second gradient defined by calcium concentration and were independent of the trophic gradient. Chlorophytes were positively correlated with high densities of macrozooplankton and correlated negatively with the gradient defined by calcium concentration. Patterns of change in the relative proportion of taxonomic groups across lakes pointed to chrysophytes as the dominant group in ultraoligotrophic high mountain lakes below a threshold of 5 µg L⁻¹ TP, above that point chrysophytes were substituted by cryptophytes as the dominant group. Regression tree analysis showed that both differences in water chemistry (Ca) among lakes and trophic state (MZP and TP) were significant predictors of the variation among lakes in the relative composition of phytoplankton groups (26 % R^2 ; $n = 74$), but water chemistry (Ca) explained more variation (11.6 % R^2) than MZP (9.4 % R^2) and TP (4.9 % R^2). The chemical and trophic thresholds identified tend to coincide with thresholds found for other organisms, pointing to a robust few classes typology for mountain lakes.

FEF.14

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RIVERINE DIATOMS AND LAND USE CHANGE AT THE EBRO RIVER – CHANGES THROUGH TIME AND SPACE

Aquatic ecosystems suffer under the influence of anthropogenic impacts. These changes bring variations in run-off and concentrations of different nutrients or chemicals, even creating the deviation of water temperature. We have used diatoms sampled throughout the period of 2002 to 2013 in Catalan tributaries of the Ebro River Basin to observe how changes in Land Use act upon diatom diversity and life-forms. A relative increase in forests at the headwaters has affected communities increasing their bioindicator value even further. Nevertheless, epilithic diatoms found at the river axis have not necessarily improved. Other effects such as drought have influenced the outcome on lesser altitudes. Some life-forms have shown to be important pointers to particular land uses.

EEC.03

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DETECCIÓN DE MICROCYSTIS AERUGINOSA EN SEDIMENTOS MEDIANTE TÉCNICAS INMUNOMAGNÉTICAS: EL CASO DEL EMBALSE DE VALMAYOR (MADRID)

Las cianobacterias son organismos procariotas fotoautótrofos de los más antiguos y cosmopolitas en el planeta, capaces de producir toxinas, que pueden suponer un problema para el medio ambiente y la salud pública.

Numerosos estudios apuntan a *Microcystis* como el género de cianobacterias más frecuente formador de blooms en climas templados. Su ciclo anual consiste en una fase pelágica durante la época estival que concluye con la sedimentación de las células y su acumulación en la superficie de los sedimentos, donde pueden permanecer viables varios años. En primavera, cuando las condiciones son propicias, una parte de estas células pueden volver a la columna de agua, suponiendo una importante fuente para el desarrollo de nuevos blooms.

Hasta el momento, la rutina en la identificación de *Microcystis* en los sedimentos se ha basado en la morfología de colonias fotosintéticamente activas, lo que requiere gran especialización. Desde hace varias décadas, las técnicas inmunológicas suponen una fácil y rápida alternativa a la taxonomía microscópica, pero no han sido todavía utilizadas en sedimentos. Las sondas celulares se acoplan a lugares específicos en la superficie de las células para ser visualizados mediante fluorescencia o técnicas colorimétricas de ligamiento de enzimas.

En este experimento se tomaron muestras mensuales del sedimento y la columna de agua del embalse de Valmayor durante un período anual, para analizar la evolución y distribución de *M. aeruginosa*, principal especie del género *Microcystis* en el embalse. Las muestras fueron analizadas en el laboratorio con un inmunoensayo tipo "sándwich", empleando un anticuerpo primario antimicrocystis del embalse y un anticuerpo secundario conjugado a una molécula FITC. Adicionalmente, para determinar la capacidad de germinación de *M. aeruginosa*, se utilizó un anticuerpo secundario adsorbido a dynabeads. Estos dynabeads permiten tanto la identificación como separación de las células en un campo magnético.

Los resultados muestran que esta técnica permite la detección y separación tanto de las colonias como las células individuales de *M. aeruginosa* en los sedimentos. Gracias a la introducción de estas nuevas técnicas de identificación, se consigue mayor fiabilidad en la gestión de riesgos en el abastecimiento, como base para la predicción de posibles blooms de cianobacterias.

AEB.02

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TOWARDS A SUITABLE ECOLOGICAL STATUS ASSESSMENT OF HIGHLY STRATIFIED MEDITERRANEAN ESTUARIES: A COMPARISON OF BENTHIC INVERTEBRATE FAUNA INDICES

We evaluated the performance of most common used biotic indices and community parameters (e.g. Multivariate AZTI's Marine Biotic Index (M-AMBI), BENTIX, Benthic Opportunistic Polychaetes Amphipods index (BOPA), diversity indices, species richness, abundance) that have been proposed in the scope of WFD, using data of macroinvertebrate community coming from a special case of transitional water body, the highly stratified Ebro estuary. Additionally, we tested their ability to respond to the main pressures affecting the Ebro estuary, the hydrological alteration due to regulation and the pollution pressure due to nutrient enrichment. Estimation of hydrological alteration was based on flow historical data (period from 1913 to 1963), that we assumed as 'hydrological reference conditions' for Ebro estuary. Pollution pressure was estimated by means of PCA analysis including organic and nutrient enrichment related variables, expressed as a synthetic index by PCA factor scores extraction. All the community parameters were able to detect changes in macrofauna composition along the estuarine gradients and were able to differentiate between the impoverished stations and the healthier ones. Regarding indices, the ratings were contradictory and only M-AMBI classified the stations in the correct way. Strong significant correlations were found between indices and metrics and the calculated pressures; nevertheless, these correlations showed a paradoxical result, since increasing hydrological alteration benefited the macrofauna, achieving great complexity. Other identified limitations of biotic indices were the opposite classifications, overestimation of ecological status and low resolution ability. We conclude that for transitional water ecosystems, where each water body has particular characteristics, is difficult the use of 'common biological' assessment tools as the results of this study, among others (more details in discussion section), have demonstrated. Nevertheless, M-AMBI seemed to work in the correct way, so further investigation about its use for transitional waters is necessary. The development of new strategies such as the use of historical data, the use of metrics as a complement for the assessment could be a reliable alternative.

GCI.02

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ORGANIC LOAD AND WATER SCARCITY COMBINED EFFECTS ON MEDITERRANEAN STREAM COMMUNITIES: BIOFILM, GRAZERS AND THEIR INTERACTION.

One of the most common anthropogenic impacts on river ecosystems is the discharge of organic effluents from wastewater treatment plants and indirect sources. The effects of this contamination on stream biota may be heighten in Mediterranean rivers due to its typical hydrological regime which comprises a water scarcity period that leads to flow reduction, and ultimately to stagnant pools.

To assess the interaction between those two stressors (flow reduction and organic load), a 5-weeks experiment with artificial channels was performed. The individual and pair-wise combined effects were determined at 3 levels of the community: on benthic grazer invertebrate *Theodoxus fluviatilis* (metabolism - oxygen consumption, and growth rate), on biofilm (total biomass - AFDM, and algae biomass - chlorophyll-a) and on their interaction given by the grazer feeding activity (biofilm consumption rate). Biofilm and grazers, within the channels, were submitted to two flow velocity treatments: no flow (NF; 0.00 m/s) and basal flow (F; 0.05 m/s); and to two levels of organic contamination treatments using artificial sewage: no sewage addition (NS) and sewage addition (S). The flow treatment influenced the grazer's metabolism (Permanova, Pseudo- $F = 4.52$, $p < 0.05$). Biofilm consumption rate was enhanced by the combined effect of flow (F) and sewage (S) treatments (Permanova, Pseudo- $F = 9.38$ preference trend for biofilm developed under S influence. In fact, biofilm biomass in terms of total organic matter (AFDM) was higher under S treatments for both types of flow (Permanova, Pseudo- $F = 98.02$, pon the functional response of primary producers and an indirect effect upon primary consumers, and this effect is influenced by the flow type regime.

RSL.04

Calleja, Felipe F.; **Ondiviela, Bárbara**; **Galván, Cristina**; **Silió-Calzada, Ana**; **Juanes, José A.**

IH Cantabria

METHODOLOGY TO ANALYZE THE TEMPORAL TRENDS OF *NANOZOSTERA NOLTII* (HORNEM.). APPLICATION TO THE BAY OF SANTANDER.

Seagrasses have experimented a worldwide descent in the extension of their meadows, which poses the need of developing tools to understand the dynamic of this vegetation, in order to improve conservation and management policies. The aim of the present contribution is to develop a methodology to identify the presence of *Nanozostera noltii* (dwarf eelgrass) and to analyze retrospectively the changes in the distribution area at the Bay of Santander.

The *N. noltii* meadows were identified using a sequential methodology that recognized systematically the different land cover in the exposed intertidal zone (bare sediment, saltmarsh, seagrasses), in Landsat images between 1984 and 2015. The identification was based in spectral information (spectral signatures, vegetation indexes), and unsupervised classifications. The results were validated using field cartographies from 2004 and 2012.

Three study sites were established to measure the extension and analyze the evolution of *N. noltii* during the period of interest. The sites were located to collect the natural variability of the Bay in terms of hydrodynamics, fluvial influence and anthropic pressure. For every study site, we built a time series of the meadow extension and different physical and chemical variables measured in situ, and applied to each one a LOESS smoothing to extract the long-term trend. Afterwards we compared meadow trends: the extension of the meadows and the physic-chemical variable. The results of the classification showed 94.0 % and 78.7 % accuracy (users and producers, respectively) for the dwarf eelgrass identification. Meadows extension series showed a decreasing trend between the 1980's decade until the early 2000's, when there was a trend change and the extension started to increase. This behavior had the highest cross-correlation with the chlorophyll-a concentration trend at the study sites, highlighting chlorophyll as an important factor controlling the dynamics of *N. noltii* at the Bay of Santander.

IDE.05

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ASSESSING THE EFFECT OF MANAGEMENT MEASURES IN THE RIA FORMOSA COASTAL LAGOON, PORTUGAL

Transitional waters enclose a wide variety of ecosystems (fjords, estuaries, lagoons, deltas, rias) that can be very different from the geomorphological and ecological point of view. Thus, general water quality management and monitoring guidelines are difficult to provide. Here we use long-term water quality data (1987-2012) of the Ria Formosa (one of the largest lagoons of Europe, located in Portugal) to evaluate the impact of different management decisions and to assess the potential effect of rainfall episodes (which might be affected by climate change) and the status of the ecosystem under the light of the Water Framework Directive. The water quality of the lagoon improved after the implementation of a wastewater treatment plant and the artificial opening of different sand barriers. Rainfall had a significant effect on silicate, nitrite and ammonium, suggesting that changes in precipitation associated with climate change could have an influence on eutrophication processes. Finally, most of the Ria Formosa showed a moderate water quality status, although this could be related to the data we used and the way that we set boundaries between water quality classes. The areas of the lagoon with poor water renewal were clearly in a poorer status than the areas that were strongly connected with the ocean. Overall we can conclude that long-term and spatially extent water quality data are needed to guide management decisions in highly dynamic systems like coastal lagoons

RLW.13

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L'ESTANY D'IVARS: UN ECOSISTEMA RESTAURADO CON UNA COMUNIDAD DE PECES INVASORES

L'Estany d'Ivars fue desecado en 1951 y restaurado en 2005. En este momento es uno de los mayores de Catalunya con una superficie de 126 ha y una profundidad máxima de 3,95 m. Se ha realizado el seguimiento de la comunidad íctica durante ocho años (2008 a 2015) mediante un muestreo estratificado al azar con redes multimalla. La comunidad íctica potencial puede considerarse compuesta por seis especies: la anguila europea (*Anguilla anguilla*), el barbo del Ebro (*Lucioarbus graellsii*), la madrilla (*Parachondrostoma miegii*), la bagra (*Squalius laietanus*), la colmilleja (*Cobitis paludica*) y el fraile (*Salaria fluviatilis*). A pesar de ello, la comunidad íctica actual está dominada por dos especies introducidas: la carpa (*Cyprinus carpio*) y la lucioperca (*Sander lucioperca*). Esta nueva estructura de la comunidad es el resultado de la introducción de peces y de la degradación del hábitat (condiciones eutróficas) que favorecen el establecimiento de las especies exóticas. Otras interacciones como la recursos tróficos disponibles en el caso del rutilo (*Rutilus rutilus*), con una población en aumento, o la predación de la lucioperca sobre las especies nativas pueden impactar sobre la comunidad íctica. Para una total recuperación de la comunidad íctica original se precisa una restauración ambiental, relacionada con la mejora de la calidad del agua, y la repoblación de las especies nativas para la recuperación de sus poblaciones. En el caso de las especies amenazadas también se precisa el establecimiento de programas de cría en cautividad.

MRV.04

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STABILITY OF LOTIC CHIRONOMID ASSEMBLAGES IN RESPONSE TO HYDROLOGICAL DISTURBANCE

Community stability in response to hydrological disturbance has long been a topic of debate in stream ecology. At present, this subject has gained renewed strength given the forecasted increase in the frequency of extreme climatic events —droughts and floods— under future climate change scenarios, particularly in the Mediterranean region. Here we address this issue by studying temporal turnover of chironomid assemblages from a permanent and a temporary headwater streams located in the same basin (Southern Spain). The study lasted four years (1996-2000), a period characterized by intense rainfall that was preceded by the long lasting drought occurred between 1991 and 1995, during which the temporary stream remained dry. During the study period, the temporary stream was continuously flooded except during summer 1999, when the aquatic habitat was restricted to a few pools. Base-flow and the magnitude of flow peaks causing substrate disturbance were higher in the permanent than in the temporary stream.

In both streams, assemblages were sampled approximately at biweekly intervals by means of the chironomid pupal exuvial technique (CPET), which allows taxonomic resolution to species. We calculated the relationship between assemblage similarity (Sorensen index) and distance in time between pairs of samples. Temporal turnover of chironomid assemblages was estimated as the slope of the linear regression of sample similarities against time. Steeper slopes indicate faster temporal turnover, whereas a slope = 0 indicates no turnover in time. To avoid the influence of seasonal phenological changes in sample similarities, we focused on inter-annual similarities among samples taken in a given month.

Turnover of chironomid assemblage in the temporary stream almost doubled that of the permanent stream, in spite of the higher magnitude of flow spates in the second. This suggests that flow recession causing stream drying up may have stronger effects on assemblage stability than a peaking flow. Certainly, the relationship between average sample similarity and time since last spate revealed high assemblage resilience against this disturbance in both streams. The bimodal shape of this relationship also suggests that a long time (between 400-600 days) of substrate stability appear to promote species turnover.

ICC.01

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A TALE OF PIPES AND REACTORS: CONTROLS ON THE IN-STREAM DYNAMICS OF DISSOLVED ORGANIC MATTER IN RIVERS

The potential for river networks to process dissolved organic matter (DOM) is widely recognized. However, the hydrological and biogeochemical factors that promote active processing of DOM (i.e. net removal or generation) over its passive transport downstream remain unclear. To gain insight into the role of in-stream processes on shaping river DOM fluxes, we measured the spatial changes in DOM concentration and composition along several river reaches across a medium-sized river network. We found water residence time, initial DOM properties, and nitrate availability to be the most influential factors determining when and where reaches were either active reactors or passive conduits of DOM. Protein-like DOM showed the highest reactivity along the reaches, driving bulk DOM patterns. We also found that net rates of DOM removal and generation declined symmetrically with increasing residence time. Our results suggest that, under regular flow conditions, longer residence times enhance the opportunity for catabolic and anabolic processes to balance each other, resulting in relatively low net variations of DOM and a replacement of terrestrial by autochthonous DOM.

EEC.07

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TESTING THE ACUTE TOXICITY OF HUMAN PHARMACEUTICAL COMPOUNDS ON GROUNDWATER (*DIACYCLOPS CRASSICAUDIS CRASSICAUDIS* SARS, 1863) AND SURFACE CRUSTACEAN SPECIES (*DAPHNIA MAGNA* MÜLLER, 1785)

Human pharmaceutical compounds (HPCs) have been extensively used in medicine and currently detected in trace concentrations (ranging from ng/L to mg/L) in environmental matrices in the last decades. So far, HPCs are the most emerging contaminants posing aquatic ecosystems significantly at risk. Few data are available about the HPC toxicity on standard surface aquatic taxa, such as Cladocera, and almost none concerning groundwater-dweller species. In ecotoxicological bioassays with HPCs, the use of two or more target species, belonging to distinct trophic levels and with distinct ecological valences, is encouraged to assess the real toxicity of HPCs in a large spectrum of aquatic environments. The aim of the present study was to compare the acute toxicity (LC50) of three pharmaceutical compounds (propranolol, caffeine and lincomycin) on a surface (*Daphnia magna* Müller, 1785) and a groundwater-dweller crustacean species (*Diacyclops crassicaudis crassicaudis* Sars 1863). Our preliminary results indicated that propranolol was more toxic to *D. magna* (LC50: 1.46 mg/L at 48 h) than to copepodids of *Diacyclops* (LC50 >> 1 mg/L at 96 h). For both species, lincomycin was poorly toxic (*D. magna*, LC50: 67.27 mg/L at 48 h; *D. crassicaudis crassicaudis*, LC50 > 80 mg/L at 96 h). Caffeine was highly toxic to *D. magna* (LC50: 3.85 mg/L at 48 h) and non-toxic to *D. crassicaudis crassicaudis* (LC50 > 100 mg/L at 96 h). Our preliminary tests indicated a higher sensitivity of the surface species with respect to the groundwater-dweller one to the three HPCs. The higher resistance of the groundwater species to the selected HPCs might be related to the low metabolism characterizing groundwater biota, enabling them to accumulate the contaminants and potentially to degrade them to a non-toxic level. We assume that, under a chronic exposure, the groundwater species may show effects at lower concentrations than those tested in this study. However, further long-term toxicity tests on more species with similar ecological features are required. In addition, since aquatic species are exposed to a mixture of HPCs, further tests should include a multiple combination of chemicals that are frequently occurring in conjunction.

AFC.03

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DISENTANGLING ENVIRONMENTAL, SPATIAL AND HISTORICAL EFFECTS ON OSTRACOD COMMUNITIES IN SHALLOW LAKES

Community structure is determined by a variety of ecological mechanisms, including environmental control, dispersal and historical contingency. Recently, many studies have focused on the relative relevance of environment and dispersal in shaping metacommunities. Historical contingency (i.e. priority effects) rarely has been considered, although it could have a key role. In this context, the use of palaeoecological methods could help assess the influence of past events on present-day communities. In this survey, we compare living ostracod assemblages (i.e. biocoenoses) and subfossil assemblages (i.e. taphocoenoses) from 22 steppic shallow lakes, using Procrustes analysis, and determine the relative contribution of environmental and spatial components on both assemblages. In addition, we estimate the role of putative priority effects on contemporary assemblages, by using the two first axes of the taphocoenoses PCA as historical explanatory variables. Our results indicate a high concordance between both assemblages ($r = 0.877$; $P = 0.001$). However, environment (explaining a 17.5 % of the species table variance) was similar to space (17.3 %) in explaining the biocoenoses, whereas in taphocoenoses space (27.9 %) dominates over environment (7.6 %). Furthermore, the contemporary metacommunity structure was related to species sorting (10.1 %), dispersal (7.6 %) and pure historical effects (10.3 %), suggesting the importance of earlier habitat occupation in these ecosystems. This work was supported by the project ECOLAKE (CGL2012-38909).

QUANTITATIVE ENVIRONMENTAL RECONSTRUCTION IN MOUNTAIN LAKES USING SEDIMENT BIOLOGICAL REMAINS: AN ANALYSIS OF PROS AND LIMITATIONS

The current situation of global change demands more than ever the understanding of long-term environmental and ecological dynamics. Available ecological time-series are generally restricted to a few decades and to some variables perhaps selected based on other criteria than today required. Therefore, the understanding of long-term ecological dynamics primarily relies on natural registers. Among them, lake sediments provide one of the richest multi-varied records. During the last decades, remote lakes - those with limited direct human influence in their catchments - have been used to assess atmospherically-driven environmental changes over large geographic areas. The interpretation of the sediment record is not straightforward and requires expert knowledge about each of the myriad of proxies that may indicate changes in the lake ecosystem, the catchment dynamics or direct atmospheric forcing. Biological remains that can be determined to low taxonomic levels (i.e., species, genera, family) are particularly informative and merge paleolimnology with the traditional use in limnology of the organisms as environmental indicators. In mountain areas, the indicative value of different groups of organisms has been related to the changing environmental conditions with altitude and bedrock. The variation in space among sites is applied to understand the variation in time in one place. For some environmental variables, the space-for-time transposition has been made quantitatively and with amazing precision. However, these quantitative environmental reconstructions have limitations. Some of them are related to the statistical procedure and apply to any kind of lakes. Some other constraints are related to the specific nature of the lake set used for calibration. In the case of high mountains, an important limitation is the multivariate character of the altitudinal gradient, which causes spatial correlations between environmental variables that then locally can vary more independently. At this respect, this presentation will consider the pros and limitations of the biological remains most commonly used for environmental reconstruction in mountain sediment records (i.e., pollen, diatoms, chironomids, chrysophyte cysts, and cladocerans).

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SUMMER IS COMING: EFFECTS OF TREE-LINE CHANGES ON LAKE DOM COMPOSITION AND BIODEGRADATION

Climate change leads to a global shift in the location of the vegetation tree-line, towards higher altitudes and latitudes. This shift is accompanied by alterations in soil organic matter concentration and composition, which, when flushed into lakes, might change the dissolved organic matter (DOM) composition and the functioning of bacterial communities in these aquatic systems. In this study, we tested the effects of the addition of soil extracts from above (S-Above) and below (S-Below) the tree-line on the DOM composition and reactivity of a sub-arctic and an alpine lake located above the current tree-line. We performed in-situ incubations during 72h in which we tracked the changes in DOM composition using ultra-high resolution mass spectrometry (FT-ICR-MS) and optical spectroscopy. We also evaluated the changes in the bacterial community functioning. Furthermore, we assessed the long-term effects of soil carbon addition by measuring DOM degradation in laboratory incubations (up to 80 days) and fitting the bulk DOM decay patterns to a reactivity continuum model. Soil additions triggered mass-dependent alterations in DOM composition as a function of the soil origin. The addition of S-below in the sub-arctic gradient lead to lower DOM chemodiversity than the addition of S-Above, while DOM chemodiversity increased upon the addition of both soils in the alpine gradient. In both cases, S-Below increased the fraction of polyphenols and highly unsaturated compounds. In turn, S-Above, rose the proportion of unsaturated aliphatics and peptides in the lake water. Accordingly, the S-Above treatment presented a more extensive degradation, higher reactivity and sustains higher bacterial production than the S-Below. Moreover, the fit of exponential decay models to single compounds, allowed the identification of compounds bio-degraded or -produced during the incubation. In both gradients, the addition of S-Below prompted the degradation of a core or highly unsaturated phenolic compounds, while the degradation of the samples receiving S-Above affected a higher number of compounds covering different chemical classes. We conclude that the tree-line advancement will modify DOM composition and most likely negatively impact its biodegradation and the bacterial community function, altering the biogeochemical cycles of high latitude and altitude aquatic ecosystems.

EEF.01

Cid, Núria¹; Vinyoles, Dolors¹; Rodríguez-Lozano, Pablo¹; Fortuño, Pau¹; Acosta, Raúl¹; Bonada, Núria¹; Latron, Jérôme²; Llorens, Pilar²; Gallart, Francesc²; Prat, Narcís¹

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BIOASSESSMENT OF TEMPORARY RIVERS IN THE MEDITERRANEAN BASIN: ARE CURRENT METHODS ADEQUATE?

In Europe, the implementation of the Water Framework Directive has been unable to provide a solution to determine the ecological status of IRES. The lack of adequate methods (developed exclusively for perennial streams), hydrological data, and limited recognition in environmental policies have posed a major bottleneck in their management. The TRIVERS project aims at providing new tools to improve the understanding on how IRES need to be assessed, preserved and managed in the Mediterranean region, where severe stream flow deficits are predicted in the face of global change. From April-December 2015, macroinvertebrates and fish were sampled bi-monthly in 20 reaches located in Eastern Spain (including perennial, intermittent, and ephemeral streams), to assess responses of aquatic communities and biological indexes to flow intermittence. Results showed that reaches where at least isolated pools were maintained, ecological status could be assessed using traditional methods if sampling takes place when flow is still present. With an increasing degree of intermittence, methods would need to be adapted due to the high variability observed in biological indexes.

EIC.02

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EFFECTS OF ENVIRONMENTAL VARIABLES AND METAL CONTAMINATION ON THE ABUNDANCE AND COMPOSITION OF ARCHAEOAL COMMUNITIES IN SEDIMENTS FROM PYRENEAN LAKES

Archaea are widespread in sediments from both marine and freshwater systems and recent studies indicate that they have an important role in carbon cycle and organic matter mineralization in sediments from mountain lakes. These systems are threatened by metal pollution from atmospheric depositions and mining activities. Because of their critical role in geochemical cycles, the impact of metals on these communities may have consequences for ecosystem functioning at both local and global scale. Unfortunately, few studies have been undertaken to determine the effects of such contaminations on sediment-dwelling archaea. The present work aimed to assess the differences on the abundance and composition of archaeal communities from sediments of 18 Pyrenean lakes with varying levels of metal contamination. For that, the concentration of 24 metals as well as ancillary physicochemical data of sediments was determined, together with the geomorphological data of all studied lakes. The composition of archaeal communities, which was analyzed by high-throughput sequencing the 16S rRNA gene using Illumina chemistry, was dominated by Bathyarchaeota (formerly known as Miscellaneous Crenarchaeotic Group) agreeing with their widespread distribution in sediments worldwide. Interestingly, the richness and phylogenetic diversity of all studied communities were inversely related to altitude. Redundancy analysis (RDA), of community variation in relation to metal abundances showed that Arsenic and Tin significantly affected the relative abundances of three out of the four main OTUs, two of them affiliated to Bathyarchaeota and the third to South African Gold Mine Group 1 (SAGMCG1). These OTUs accounted for 13.8, 12.7 and 6.0 % of total reads.

Besides, absolute abundances (n° copies \times g sediment⁻¹) of total archaea and archaeal lineages Bathyarchaeota, Thermoplasmata, Marine Benthic Group B and D (MBG-B, MBG-D), and Methanomassiliococcales, were quantified by qPCR using group specific primers. For all lineages absolute abundances were negatively affected by metals, with phosphate and sulphate as the main environmental drivers, explaining between 40 and 60 % of the variation. Only Cadmium appeared as an important descriptor for MBG-B and MBG-D.

AFC.11

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WILDFIRE IMPACT ON MEDITERRANEAN TEMPORARY PONDS

Wildfires are frequent disturbances in Mediterranean regions and their consequences on terrestrial ecosystems have been widely analysed. However, wildfire effects on aquatic ecosystems have been less studied. Temporary streams and ponds are specially threatened since they dry during summer letting their basin completely exposed to the fire action. In addition, in Mediterranean areas an increase of temperatures and a decrease in summer precipitation are expected, according to climate change predictions. Thus, an increase of wildfire recurrence is also expected in this area. To understand how wildfires can affect Mediterranean temporary ponds (priority habitats following European Directive), will help future management to cope with this perturbation effects. In this study we analysed macroinvertebrate response to wildfire in ten Mediterranean temporary ponds located in the NE of Iberian Peninsula, where a wildfire burned 10,476 Ha in July 2012. The burned area included the Albera site, where more than thirty well preserved temporary ponds are known. Almost all ponds were dry during the wildfire, but some of them were not affected. Macroinvertebrates were sampled before the wildfire and during the following hydroperiod in order to detect changes in assemblage structure and composition. Our results show that before the wildfire, ponds presented similar values of abundance and biomass, while after fire burned ponds showed a decrease in both variables. Moreover, organisms were differently affected according to their biological traits. Passive dispersers were affected by fire, being less abundant in burned ponds, whereas active dispersers were not affected. Similarly, abundance of deposit feeders decreased after the fire, while abundance of piercers increased. Moreover, abundance of other functional feeding groups (i.e., scrapers and shredders) did not change after fire. These patterns can be related, at least in part, to changes in pond resources and habitat structure due to wildfire.

EEC.08

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EVIDENCE OF LOW DOSE EFFECTS OF THE ANTIDEPRESSANT FLUOXETINE AND THE FUNGICIDE PROCHLORAZ ON THE BEHAVIOR OF THE FRESHWATER KEY SHREDDER *GAMMARUS PULEX*

In recent years, behavior-related endpoints have been proposed as rapid and reliable ecotoxicological tools for risk assessment. In particular, the use of detritivores to detect specific effects of pollutants through feeding is currently becoming a well-known method. Experiments combining feeding with other behavioral endpoints can provide relevant information about direct and indirect toxicological effects of chemicals. We carried out a feeding experiment with a key freshwater shredder, *Gammarus pulex*, in order to detect indirect (leaf conditioning) and direct effects (water exposure) of two pollutants at environmentally relevant concentrations: the fungicide prochloraz (6 µg/L) and the antidepressant fluoxetine (0.1 µg/L). The experiment consisted in two different phases: the leaves conditioning phase (14 days) and the *G. pulex* feeding phase (14 days). After the feeding phase the amphipods were exposed to a light-darkness treatment and their locomotive behavior was studied with the DanionVision™ observation chamber and its software EthoVision® XT.

As we expected, prochloraz inhibited fungal growth on leaves, but it did not affect the breakdown rates either the CN ratio of the leaves. *G. pulex* individuals fed on treated leaves presented lower consumption rates, not only those fed with prochloraz-treated leaves, but also those fed with fluoxetine-treated leaves and those fed with the mixture-treated leaves (6 µg/L of prochloraz + 0.1 µg/L of fluoxetine). Mixed-effects models revealed that the swimming velocity of the amphipods after the 14 days of exposure was modulated by the direct exposure to fluoxetine (feeding phase), and also by the indirect exposure to fluoxetine and/or prochloraz (leaves conditioning phase). With this experiment we demonstrate that both the antidepressant and the fungicide cause significant sublethal effects at low concentrations. The combination of different direct and indirect endpoints provided a useful tool for early detection of toxicity mixtures in freshwater ecosystems.

ICC.03

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THE EFFECT OF THE DRY PERIOD ON DOM QUALITY OF VEGETAL ORGANIC MATTER AND RIVERBED SEDIMENTS DEPENDS ON THE LOCAL ENVIRONMENTAL CONDITIONS OF THE TEMPORAL RIVERS

During the dry period of temporal streams there are different organic substrates, both vegetal or sediments, remaining in the dry riverbed which can leach a great amount of DOM when the flow returns. During the dry period, vegetal substrates, such as dead macrophytes or predecomposed leaf litter, and riverbed sediments can undergo significant changes in their chemical quality due to their exposure to environmental factors as solar radiation and rains. In this way, all the transformations suffered by organic substrates in this period would have important effects on the quantity, quality and bioavailability of DOM leached from them when flow is reestablished, affecting significantly to C processing in temporal streams.

This study aims to examine how different environmental conditions during the dry phase of temporal streams affect to the quality and quantity of DOM leached from vegetal substrates and sediments. To approach this question, a mesocosms experiment was deployed. Three different kinds of vegetal substrates and riverbed sediments were exposed for a 60 days period to two different simulated dry stream reaches conditions, one open and high irradiated and the other one, shaded with a close vegetation canopy. Nutrients, DOC and optical properties of DOM leached from substrates were measured periodically during the experiment. In addition, a final bioavailability assay was carried out to analyse changes in the bioavailable DOM after the dry period.

The results showed a strong effect of the different environmental conditions of open and close canopy stream reaches on DOM properties. Abiotic factors as solar radiation and rains had an important effect on DOM quality, especially in the open stream reach. Rains caused a significant leaching of DOC and nutrients in all the substrates, whereas the solar radiation promoted a general increase of the recalcitrance and the aromaticity of DOM. The combination of both effects caused a strong drop of DOM bioavailability in the vegetal substrates of the open stream reach. These results suggest that C processing in open and high irradiated temporal streams can be less effective than in more humid and vegetated streams due to chemical transformations of DOM during the dry period.

RLW.03

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DO SIMILAR CLIMATIC PATTERNS IN DIFFERENT CONTINENTS LEAD TO SIMILAR BENTHIC DIATOM ASSEMBLAGES?

Climate is one of the main factors controlling large-scale ecosystems' distribution. As climatic regime changes, so does the hydrologic cycle and consequently the biota that live in different climatic regimes. Therefore, we hypothesized that macroclimatic patterns result in similar aquatic communities across large-scale distances (continents), independently of mesoscale differences. To test this hypothesis we compared diatom assemblages from 227 rivers, located in Europe, North America and Australia belonging to the Csb Mediterranean climate (updated world Köppen-Geiger climate map), at different taxonomic levels.

At all taxonomical levels (species, genus and order), the diatom assemblages of each continent were more similar to each other than with those of other continents (PERMANOVA tests; Pseudo-Fs: 23.0, 32.3, 29.0; p??t any specific species for this continent.

Our results show that the climate was not enough to shape similar communities among different continents. Therefore, other than climate large-scale factors should have contributed to shape the diatom communities within each continent, leading to the inter-continental variability found in our data. The patterns of similarities between communities of the three continents and the higher similarities between sites of the same continent, indicate that it might have been the geographical factor, more than the climate, influencing the communities' distribution.

MFE.01

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MULTIPLE STRESSORS IN FRESHWATER ECOSYSTEMS: REDEFINING THE SUBSIDY-STRESS HYPOTHESIS

The subsidy-stress hypothesis (Odum et al. 1979) states that some stressors always produce detrimental effects on the biota, whereas others can subsidize biological activity at low to moderate intensities, but suppress it at high intensities. This hypothesis has been tested with single stressors, but there is little information on multi-stress situations as those currently faced by most freshwater ecosystems as a consequence of global environmental change. We present a theoretical framework to characterize the subsidy or stress effect by defining the peak subsidy effect (PSE) and the scope for subsidy (SFS) of single stressors and by analysing the interactions between stressors, some of which can alleviate or exacerbate the effects of others. It is, thus, necessary to define clearly which factors subsidize biological activity and which only stress it, which are the PSE and SFS for each factor, what groups of organisms or ecological processes are more responsive to different stressors, and which is the overall effect of complex mixtures such as urban effluents. We address these questions by comparing reaches upstream and downstream from 13 urban effluents in the Ebro River basin (Spain) under a gradient of temporality. The combined effect of hydrological alteration (expressed as its deviation with respect to basal water regime) and the chemical impact caused by the urban sewage inputs (quantity and relevance of urban effluents) on the stream biological structure show that effects were not uniform on the different biological variables. As an example, benthic organic matter did not remarkably increase at the impact but the individual body size of invertebrates was higher downstream. Hydrological alterations and chemical impact were producing contrasting subsidy and stress on the stream biological structure.

RLW.06

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CATCHMENT LAND COVER EFFECTS ON STREAM FOOD WEBS VIA ENERGY SOURCE ALTERATION

River food webs are predominantly powered by two energy sources: autochthonous organic matter, which is produced in-stream in the form of biofilm or macroalgae and allochthonous organic matter, which is terrestrially derived material, such as leaf litter. These energy sources differ in quality (chemical characteristics: i.e. carbon to nutrient ratios, structure and lability or recalcitrance of the carbon molecules) and therefore fuel different energy pathways that determine food web structure. The amount of terrestrially derived organic matter is highly dependent on the catchment vegetation land cover and is especially meaningful in mountain streams, as these ecosystems are strongly connected to their watersheds. Therefore, we can expect catchment land cover to determine stream energy sources availability and highly influence stream ecosystem structure and functioning. In order to explore the effects of catchment land cover on stream food webs, we selected 10 streams within a gradient of natural land cover in their catchments (from grasslands to densely forested catchments) in the Cordillera Cantábrica, northern Spain. We determined autochthonous vs allochthonous resource availability and analyzed food web structure and its dependence on these energy sources based on stable isotope analysis (2H & 15N). Additionally, we analyzed how the trophic position of an organism is governed by the body size and whether it is affected by different energy source availability. Our preliminary results show that streams in more forested catchments had a higher abundance of terrestrially derived subsidies as leaves or coarse particulate organic matter what modified the structure of the food webs. This suggests that catchment land cover can define the organization of food webs by altering the resource quality and availability.

FEF.15

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MACRO-SCALE (BIOMES) DIFFERENCES AND ANTHROPOGENIC DISTURBANCE DISCRIMINATE ECOSYSTEM FUNCTIONING AND STRUCTURE OF SMALL NEOTROPICAL STREAMS

Aquatic ecosystems are defined by their structure and function. Therefore, assessing and recovering the ecological integrity of rivers and streams requires the analysis of both structural and functional components and the determination of patterns of variation. Thus, here we investigated the existence of macro-scale differences in the ecosystem functioning and structure of neotropical streams from Brazil. Streams (n=69) belonged to three different biomes (Amazonia, Atlantic Rainforest and Cerrado- Brazilian Savannah) and covered a large range of latitudes (2 -27° South), altitudes (16 - 1218 m), and mean annual precipitation (126-2438 mm). In addition we investigated the effect of anthropogenic disturbance over the communities' structure and ecosystem functioning.

Streams of the different biomes were functionally distinct based on total and microbial and decomposition of wood, and biofilms growth and chlorophyll a (PERMANOVA: Pseudo-F: 3.835, $p = 0.009$; Euclidean distance, standardized and log (x+1) transformation). Total and microbial decomposition was lower in Cerrado, followed by Atlantic rainforest and larger in Amazonia. The growth rate of biofilms was higher in Cerrado streams and the lowest in Amazonia. Primary production (chlorophyll a) was low in all streams but higher in Atlantic rainforest, and the lowest in Cerrado. Invertebrate communities were also different between biomes (PERMANOVA global test: Pseudo-F: 1.900, $p = 0.01$; Bray-Curtis similarity, log x+1 transformation) but while Amazonia was significantly different from the other two ($t = 1.488$ and $t = 1.303$; $p < 0.05$), Cerrado was marginally non-significantly different from the Atlantic rainforest ($t = 1.308$, $p = 0.058$).

Functional variables indicated also anthropogenic disturbance. Compared to reference streams, anthropogenic disturbance led to an increase in total and microbial decomposition rates in Atlantic Rainforest (ca. 12 % and 7 %, respectively) and Cerrado streams (4 % and 3 %). Yet, the sediments metabolism (given by oxygen consumption) was highly variable and similar in reference and disturbed streams of Cerrado. Both primary and secondary production (biomass growth and chlorophyll a) increased in disturbed sites in Cerrado and Atlantic rainforest. The inputs of allochthonous organic matter (CPOM) to streams didn't vary significantly between reference and disturbed sites but benthic stocks of CPOM decreased from reference to disturbed sites.

The patterns of functioning and structure found in our study give good promise to the construction of holistic models to assess the ecological integrity of neotropical streams.

GCI.01

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HISTORICAL BIOGEOLOGICAL EVOLUTION OF TAGUS RIVER. COMBINED INFLUENCE OF LAND-USE AND HYDROLOGICAL CHANGES IN DISTINCT RIVER ZONES

Biogeomorphologic patterns in large rivers result from interactions between hydrogeomorphology, vegetation dynamics and a long history of human interventions. In this study we analyzed the multi-stressor effects in the biogeomorphological evolution of two distinct river zones (upland valley zone vs floodplain valley zone) in Tagus River, Portugal. We hypothesized that hydrological alterations and Land Use Land Cover (LULC) changes have significant effects on the diverse biogeomorphological features at the distinct river zones. An image-based approach was used to extract the biogeomorphologic features, namely vegetated and non-vegetated islands and banks, main aquatic and lateral channels, channel dimensions, channel and streambank sinuosity and riparian wood connectivity. We performed a spatial analysis and a temporal comparison using historical (1860) and contemporary military maps; the later combined with Google Earth imagery (2000). A GIS was used to georeference the historical images and to store and organize all the spatial data. Each river zone was partitioned into 2500m long river stretches in a total of 51 Sampling Units. LULC changes of the river basin were obtained from the History Database of the Global Environment (HYDE) and proximal LULC changes were mapped in a 200m-buffer, by visual interpretation of the historical maps and using CORINE Land Cover (CLC 2000) for the contemporary situation. Hydrological data were compiled from old books and military reports (historical data), and using the Portuguese Water Information System (contemporary data). We used paired t-test and multivariate statistical analysis to assess the influence of the main stressors and the significance of the differences between the historical and the contemporary periods. We observed an overall reduction in the channel and streambank sinuosity, although only significant in the floodplain valley zone. The riparian wood connectivity increased in the floodplain valley while changes in the upland segments were not significant likely due to diverse LULC changes and hydrogeomorphological disturbances coupled with distinct resilience of ecosystems. The results obtained contribute to understand the evolutionary trajectories of large river ecosystems in Iberia and support a more accurate and spatially explicit management and restoration solutions.

FEF.16

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EFFECTS OF ANTHROPOGENIC HEAVY METAL CONTAMINATION ON LITTER DECOMPOSITION IN STREAMS: A META-ANALYSIS

Many streams worldwide are affected by heavy metal contamination, mostly due to past and present mining activities. Here we present a meta-analysis of 37 studies published between 1978 and 2014 that reported the effects of heavy metal contamination on the decomposition of terrestrial derived litter in running waters. When considering the entire database (133 effect sizes; Hedges' g), heavy metal contamination significantly inhibited litter decomposition. The effect was stronger for laboratory than for field studies, likely due to better control of confounding variables in laboratory studies. For laboratory studies, only Cu+Zn mixtures significantly inhibited litter decomposition, while no significant effect was found for Ag, Al, Cd or Zn considered individually, but individual metals had low sample size. For field studies, coal and metal mine drainage strongly inhibited litter decomposition, while drainage from motorways had no significant effects. The effect of coal mine drainage did not depend on drainage pH. Coal mine drainage negatively affected leaf litter decomposition, independently of leaf litter identity; no significant effect was found for woody litter decomposition but sample size was low. Considering metal mine drainage, arsenic mines had a stronger negative effect on leaf litter decomposition than gold or pyrite mines, but all inhibited litter decomposition. Metal mine drainage significantly inhibited leaf litter decomposition driven by both microbes and invertebrates, independently of leaf litter identity; no significant effect was found for microbial-driven decomposition but sample size was low. Overall, mine drainage negatively affects leaf litter decomposition, likely through negative effects on invertebrates

MRM.06

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AN APPROACH TO THE STUDY OF THE EFFECTS OF EUTROPHICATION IN SHALLOW LAKES BY THE USE OF NUTRIENT AND BIOMASS RATIOS

An approach to the study of the effects of the addition of external loads of N and P on food webs of shallow lakes can be done through the use of ratios involving nutrients and biological variables such as chlorophyll a and zooplankton biomass. These ratios would change and show trends along the time as a response to the eutrophication process. Nutrient ratios are commonly used to assess resource limitation by a particular nutrient, for example the DIN:TP ratio. CHL-a:TP ratio can indicate the influence of P on phytoplakton growth and the analysis of ZOO:CHL-a ratio (ZOO in biomass) can show the potential consumption of zooplankton on phytoplankton biomass. In this study these three ratios are applied in two experiments performed during two consecutive summers. In both experiments, 36 mesocosms were installed in a shallow lake in Xeresa wetlands (East Spain) and fertilized with external loads of N:P (mg. L⁻¹). In the first experiment, running over a 8-week period from June to August, four nutrients levels (0:0, 1:0.1, 5:0.5 and 10:1) were used, whereas in the second experiment six levels of nutrients (0:0, 0.3:0.03, 0.6:0.06, 0.9:0.09, 1.5:0.15 and 3.0:0.3) were applied over a 6-week period from June to July. The studied wetland was covered by dense characean meadows. The results showed that DIN:TP ratio remained more or less constant or even decreased with low nutrient additions, but with higher additions, i.e. between 1.5:0.15 and 3.0:0.3 mg. L⁻¹ of N:P, the ratio increased, which shows nitrogen excess as eutrophication increases. Conversely, CHL-a:TP increased with the additions of nutrients but there were lower values of this ratio in the highest fertilization level (10:1 mg. L⁻¹). This shows that CHL-a is mostly an indicator of "living" phytoplankton biomass whereas TP composition is highly variable and covers the entire organic matter of seston. Finally, the ZOO:CHL-a ratio decreased with increasing TP in both experiments, therefore this ratio is a good proxy to estimate the trophic level of shallow lakes.

ISR.04

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ACCOUNTING FOR STREAM PATHWAYS IMPROVES SPECIES DISTRIBUTION MODELS OF INVASIVE CRAYFISHES

Species distribution modeling (SDMs) has been used to predict and understand the distribution of species. Although many advances were made to model biota inhabiting freshwaters, the influence of stream spatial networks on SDMs' performance has been so far overlooked. Accounting for stream spatial networks may be of particular importance for modelling invasive species because distributions may be strongly driven by dispersal pathways and invasion establishment. Here we investigate the effect of including stream spatial network structure when building SDMs for invasive crayfishes. Here we hypothesize that: (i) including the stream spatial structure improves the accuracy of SDMs, especially for more recently introduced species; and (ii) the hydrological distances are more relevant in explaining distributions than the Euclidean distances, particularly downstream.

We focused on two non-native crayfish species in the Sabor river watershed, the now well-established *Procambarus clarkii* and the recently introduced *Pacifastacus leniusculus*. We sampled both species for their occurrences using electrofishing, gathered environmental GIS predictors (i.e. total annual precipitation, elevation and stream order), and built spatial hydrological predictors (i.e. upstream and downstream hydrological and Euclidean components). We built three sets of SDMs for each species, including (i) environmental, ii) spatial, and iii) environmental and spatial predictors.

Both species distributions displayed strong spatial dependence, with models accounting for the spatial structure performing better than models based on environmental predictors only. Hydrological distances accounting downstream effects were the most relevant for *P. leniusculus*, whereas Euclidian distances were most relevant for *P. clarkii*. Our approach allowed to achieve higher SDMs' accuracy, and to better understand spatial patterns and processes of crayfish invasions, as dispersal and establishment. We recommend including spatial network predictors when building SDMs for freshwater invaders.

EEC.09

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SPATIO-TEMPORAL DYNAMICS OF ANTIBIOTIC POLLUTION AND ITS IMPACT ON THE MICROBIAL RESISTOME IN AN ALLUVIAL AQUIFER

The accumulation and spread of antibiotic resistance genes (ARGs) in the environment represent a major and growing concern for public health. Although many studies have addressed the links between antibiotic pollution and resistant bacteria in surface waters, less is known about their occurrence and distribution in groundwater systems. Here we investigated the prevalence and abundance of eight ARGs encoding resistance to the main antibiotic families used to treat human and animal infections (e.g. beta-lactams, fluoroquinolones, tetracyclines, sulphonamides, and macrolides) in eight wells and two river water samples collected seasonally in the Fluvià River basin (Catalonia, NE Spain). The composition of bacterial communities has been studied by 16S rRNA gene sequencing to determine the effect of antibiotic pollution on groundwater microbiota. The hydrogeological setting was described by fieldwork and the analysis of major chemical components and distinct environmental isotopes ($\delta^{34}\text{S}$, $\delta^{15}\text{N}$, water isotopes: $\delta^{18}\text{O}$, $\delta^2\text{H}$, and tritium). The most detected antibiotics in groundwater were Ciprofloxacin, Danofloxacin, Enrofloxacin, Norfloxacin, Ofloxacin, and Orbifloxacin (Fluoroquinolones), Azithromycin (Macrolides), Flumequine, Oxolinic Acid, and Pipemidic Acid (Quinolones) and Sulfamethoxazole (Sulfonamides). Among all ARGs analyzed, sul(I), encoding resistance to sulfonamides, and blaTEM, encoding resistance to beta-lactams, were the most abundant. Sulfonamides are the most widely antibacterial agent used in veterinary and human medicine. Therefore, results suggest a major influence of surface water as a source of pollutants coming from urban wastewater and lixiviates from agricultural fields fertilized with animal manure to groundwater. The consistent prevalence of gene int11 in all wells, which have been proposed as a proxy for anthropogenic pollution, agrees with the urban wastewater influence. Further work is needed to ascertain if the seasonal differences in the abundance of ARGs observed in most wells are related to flow alterations caused by distinct groundwater withdrawal regimes, by antibiotic behavior in soils and aquifers (i.e., adsorption), or by the natural dynamics of bacterial communities related to environmental drivers such as temperature, salinity or nutrient concentrations. The detection of ARGs for all antibiotic families in most of the wells points to a substantial impact of antibiotic pollution on groundwater microbial communities. Ack: This study is part of the Persist Project funded by the EU Water JPI (JPIW2013-118)

RLW.18

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SOURCE-SINK DYNAMICS OF *NETTA RUFINA* METAPOPOPULATION IN CAMPO DE CALATRAVA LIMNOLOGICALLY LITTLE KNOWN VOLCANIC LAGUNAS

Around 65 maars of the Campo de Calatrava volcanic field (SW Ciudad Real Province, Spain) encompass temporary, shallow lakes (lagunas). Although these are limnologically little known, they have international importance because of their habitats and plant, zoomeiobenthos, and waterfowl communities. For example, recent works have showed that Campo de Calatrava is a source area for the red-crested pochard *Netta rufina* (Pallas, 1773), that is a rare species in both the EU and Spain. Strikingly, its population has declined since 2011 in the nearby Tablas de Daimiel National Park, a core area of the Mancha Húmeda Biosphere Reserve and Ramsar Site, despite its much better known limnology and high availability of conservation resources. Does it mean that limnologic knowledge is of limited use in cases like this? We hypothesize that some lagunas traits actually control red-crested pochard population dynamics, but that they operate at scales other than those presently applied in conservation. For that purpose, a metapopulation spatially explicit model was used to relate the dynamics of Campo de Calatrava red-crested pochard population to functional groups of wetland vegetation, hydroperiod, surface area, water level, interlake distance, landscape position, water salinity, and primary productivity, when available. The model, constructed in the STELLA modelling environment, was specifically used to identify the most significant source-sink scenarios along time. Simulation results were verified and calibrated against seasonal bird censuses performed since 1997 and limnologic data occasionally available. The results illustrate 1) The importance of multiple interacting limnologic factors in influencing metapopulation dynamics, and 2) Which shifting patterns of certain parameters can significantly alter the source-sink patterns of metapopulations. Implications for management and conservation, as well as future model improvements, are briefly discussed.

These results are a part of projects ECOLAKE (CGL2012-38909) and MAT (PEI-2014-005-P) funded by the Spanish Ministry of Economy and Competitiveness, and the Regional Government of Castilla la Mancha and the European Regional Development Fund, respectively.

EIC.02

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PHRAGMITES AUSTRALIS AS A BIPOLAR (AIR AND WATER) INDICATOR OF METAL POLLUTION

Reed beds cover areas in sheltered reservoirs and meanders of the lower Ebro river. In the Flix reservoir (Ribera d'Ebre, Tarragona), there use to be an accumulation of industrial wastes of toxic metals and organochlorines, which have been recently removed. Previously to this action, a dense reed bed was growing on top of the wastes and other nearby areas indirectly impacted. We aimed to evaluate the reed features as an indicator of metal contamination by (1) assessing metal accumulation in different parts of the plants and (2) at locations with different exposure to the contaminants: top of the wastes (Waste), across the reservoir in a Natural Reserve (Reserve) and after the dam at the meander (Meander). Samples were collected in May 2006 (5 sites at Waste, 3 at Reserve and 3 at Meander), sorted according to plant organs and analyzed for metal content with ICP mass spectrophotometry, after wet acid digestion. We encountered significant differences in metal content both among plant tissues and sites (PERMANOVA analysis, $R^2=0.59$, $p < 0.05$).

AEB.01

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BIOREGIONS AND TYPOLOGIES OF ATLANTIC EUROPEAN TRANSITIONAL WATERS: A CHALLENGE FOR UNDERSTANDING SCALE-DEPENDENT MACROECOLOGICAL PATTERNS OF SPECIES

Transitional waters are among the most valuable ecosystems with a great biodiversity threatened by natural and anthropogenic pressures. Their management and conservation, promoted by several European legislations, require the establishment of homogeneous units from a bio-physical viewpoint. Although the scientific community has dedicated a great effort to reach a global division of both continental and marine systems, this has not happened in the case of transitional waters. Therefore, the aim of this research is determining whether the physical attributes of transitional waters allow recognizing biogeographical patterns of species distribution at two different scales, regions and typologies within regions, in order to establish a global ecologically-significant classification based on abiotic characteristics. Environmental variables relevant for species distribution at regional scale were selected: i) climatic (temperature); ii) hydrological (wave, tidal range, river input); iii) morphological (estuary, intertidal and watershed area). Different data sources were used to obtain homogeneous information along Europe. A classification based on non-supervised statistical techniques was applied to clustering transitional waters according to the similarity of their abiotic properties. In order to biologically validate the obtained regions and typologies, they were linked to fish species distribution and the scale-dependent macroecological patterns were analyzed. A total of 161 transitional waters were classified in four bioregions and five typologies. The first region covers transitional waters located in the coasts of the North Sea, English Channel and Irish Sea, while the other three regions follow a gradient from North to South along the West coast of Europe. These regions are representative of the macroecological patterns of fish species turnover related to climate conditions and geographic distances. At a lower scale, typologies allow explaining the species richness and diversity patterns as consequence of driving mechanisms mainly related to hydro-morphological factors (e.g., the size of the transitional waters is closely linked to alpha diversity of fishes). This classification at different scales is a powerful tool to get predictive models of the potential distribution of species and ecosystem functioning, providing valuable information for the ecological assessment and integrative management of transitional waters.

BEB.02

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EL PROCESO DE PROTECCIÓN LEGAL DE GRANDES BRANQUIÓPODOS, EN LA PRÁCTICA: EL CASO DE *LINDERIELLA BAETICA*

La provincia de Cádiz (sur de España) alberga la única localidad conocida en el mundo de *Lindერიella baetica* Alonso & García-de-Lomas 2009 (Anostraca). Los datos de ocurrencia de *L. baetica* sugieren que se trata de una especie rara y, según los criterios de la IUCN, se trata de una especie seriamente amenazada, “en peligro crítico” de extinción. La rareza de esta especie, agravada por la alteración de su hábitat desde 2010 y los proyectos actuales de urbanización, han motivado la solicitud de inclusión en los catálogos español y andaluz de especies amenazadas, de cara a su protección legal. En este trabajo se describen los pasos necesarios para la catalogación y se ponen de manifiesto las dificultades reales de conservación, como consecuencia de promover la protección de un hábitat periurbano (donde el clásico dilema entre conservación y desarrollo se hace especialmente perceptible) y de la escasa percepción y valoración de este grupo taxonómico y sus hábitats por parte del público en general. Esta experiencia puede servir de guía para plantear propuestas similares en el futuro.

AFC.07

García, Aina; **Viza, Aida**; **Múrria, Cesc**

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SOUTHERN BUT ALSO CRYPTIC TEMPERATE REFUGIA EXPLAIN CURRENT DIVERSITY OF TRICHOPTERA ACROSS A LATITUDINAL GRADIENT IN EUROPE

A fundamental question in macroecology is how current and historical environment, species interactions, physiological constraints and evolutionary processes merge to determine community structure and shape the current distribution of taxa. To elucidate the role that these factors have been playing in establishing patterns of regional diversity, we assessed how taxonomical, functional traits and phylogenetic composition of *Trichoptera* (Insecta) changed among 10 communities within 6 regions located along a latitudinal gradient from Morocco to Sweden.

We found a unimodal distribution of α - and γ -diversity being the highest diversity at the Carpathians but also North Iberian Peninsula, which is against the main expectation of decrease of diversity as latitude increases. On the other hand, the partition of β -diversity showed low contribution of the nestedness component, whereas the β -diversity pattern across latitude was driven by turnover, with little differences along latitude. The phylogenetic tree, which includes more than 80% of all European *Trichoptera* genera, revealed that the phylogenetic structure of northern communities was clustered (i.e., genera phylogenetically closer than expected), whereas southern communities were overdispersed (i.e., genera phylogenetically more distantly related than expected). Finally, traits were found phylogenetically conserved (i.e., strong phylogenetic signal), which means that closer lineages share similar ecological traits and niche preferences.

The discovery of high levels of diversity and endemism in South but also central Europe and different phylogenetic community structure across the latitude suggest the existence of Pleistocene cryptic refuges also in temperate regions. This finding supports Dinodal's hypothesis which predicts the persistence of suitable habitat for survival within the periglacial area in central Europe throughout the cyclic Pleistocene glaciations. This result contradicts the theories that locate glacial refuges exclusively in southern areas that are expected to act as centres of speciation and sources of recolonization that originated northern regions. Herein, the integration of ecology and evolution at the community level explain how *Trichoptera* lineages have been originally assembled in Europe. Overall, the latitudinal pattern of phylogenetic diversity and structure of communities can be explained by historical environmental constraints that together with phylogenetic niche conservatism are the key factors that promote current diversity distribution of *Trichoptera* across Europe.

MRV.06

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METACOMMUNITY STRUCTURE AND ENVIRONMENTAL FILTERS IN WETLAND MICROCRUSTACEANS

Metacommunity approaches are becoming popular when analyzing factors driving species distribution at regional scale. However, until the popularization of the variation partitioning technic it was difficult to assess the main drivers of the observed patterns (spatial or environmental). Here we propose a new framework linking the emergence of different metacommunity structures (e.g. nested, gleasonian, clementsian) to spatial and environmental filters. This is a novel approach that provides a more profound analysis on how both drivers could lead to similar metacommunity structures. We test this framework on 110 sites covering a strong environmental gradient (i.e. microcrustacean assemblages organized along a salinity gradient, from freshwater to brackish water wetlands). First we identified the metacommunity structure that better fitted these microcrustacean assemblages. Then, we used hierarchical variation partitioning to quantify the relative influences of environmental filters and the distance among wetlands on the identified structure. Our results showed that under strong environmental filtering metacommunity structures were non-random. We also noticed that even passive dispersers, that are supposed to be poorly spatially filtered, showed spatial signals at a large geographical scale. However, some difficulties arose when inferring biotic interactions at finer-scale spatial signals. Overall, our study shows the potential of EMS combined with variation partition techniques to detect environmental drivers and broad-scale patterns of metacommunity structure, and that some caution is needed when interpreting finer-scale spatial signals.

IDE.04

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MODELING ADAPTATION MEASURES TO MITIGATE IMPACTS OF SEA LEVEL RISE IN A MEDITERRANEAN DELTA

Among coastal systems, deltas are particularly sensitive to relative sea-level rise (RSLR) where the risk is exacerbated because of land subsidence and anthropogenic pressures (e.g. land uses, levees or dikes). RSLR threatens deltaic areas with flooding, salt stress, wetland loss and decreased agricultural production. The Ebro Delta (320 km²) is one of the largest deltas in the western Mediterranean Sea. It is currently subject to significant erosion, mainly caused by flow regulation and sediment retention (up to 99 %) in the lower basin reservoirs. Rice fields occupy most of delta plain (ca. 65 % of the total surface), being the main economic activity. Rice production is negatively affected by salt intrusion and through elevation loss, so it is going to decrease under a RSLR scenario. Thus, rice production might not be feasible in some areas of the delta plain if appropriate adaptation measures are not taken.

GIS-based statistical models were developed to forecast the dynamics of rice production under future RSLR scenarios according to IPCC predictions, with and without adaptation measures. One of the simulated measures is the rise of dikes as a function of the demand for safety in terms of protecting rice fields. This implies running flood models, to determine the suitable height to avoid flooding risks. Other modeled measure consists of rising grounds to increase land elevation of rice fields by supplying sediment inputs from the Ebro River to the delta plain via irrigation canals.

Through the calculation of the sediment deficit generated for each scenario needed to maintain elevation, results showed that the amount of requested sediment ranges at most from 1 to 7 million Tonnes/year (for an extreme sea level rise scenario of 1.8 m). Management measures in terms of costs and feasibility are discussed as well as the model utility for decision makers.

ICC.04

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LIMNOLOGY WITHOUT WATER: RELEVANCE OF CARBON EMISSIONS FROM DRY WATERCOURSES

Most fluvial networks worldwide include watercourses that recurrently cease to flow and run dry. The spatial and temporal extent of these temporary watercourses is expected to increase as a result of altered land-use, climate change, and increased water extraction. Yet, current estimates of carbon emissions from fluvial networks do not consider temporary watercourses when they are dry. We characterized the magnitude and variability of the carbon dioxide (CO₂) flux from 10 dry streambeds of the Fluvià river network (NE Iberian Peninsula) during two consecutive dry periods (i.e. end summer). We then compared it to the CO₂ flux from the same streambeds during the flowing period (i.e. early spring) and to the CO₂ flux from their adjacent upland soils. Our results demonstrate that the CO₂ efflux from dry watercourses was highly relevant, doubling that from the same watercourses during the flowing period and being comparable to that from adjacent terrestrial soils. Despite similar CO₂ efflux magnitudes, dry streambed sediments and upland soils were physico-chemically distinct and differed in the variables regulating their CO₂ efflux. With an up-scaling approach, we show that including emissions from dry watercourses could increase the annual estimate of CO₂ emissions from fluvial networks in semiarid regions like that studied here by 0.6–15 %. Moreover, our results illustrate that emissions from dry watercourses could be especially important in arid regions, increasing the estimate of global CO₂ emissions from aquatic systems by 0.4–9 %. Therefore, omitting CO₂ emissions from temporary watercourses when they are dry may overlook the role of a key component of the carbon balance at different spatial scales, from local to global.

EIC.05

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DIFFERENTIAL RESPONSES TO ENVIRONMENTAL GRADIENTS OF TAXONOMICAL AND GUILD COMPOSITION OF DIATOM ASSEMBLAGES IN LAKES

Diatoms are frequently used as indicators of lake pollution and ecological integrity because they respond to environmental changes across several scales. Broad-scales factors, such as, climatic or dispersal processes are important factors determining the composition of diatom communities, but local factors, such as ionic composition, alkalinity, nutrients, metal and pesticide contamination seems to be more important for a successful colonization, settlement and shaping of diatoms communities. Contrarily to taxonomical composition assessment, the use of life-forms and ecological guilds is much simple and became widely accepted in both biomonitoring applications and ecological studies. Using guilds instead of species has great advantages in remote islands where biogeographic filters can strongly shape the freshwater communities' composition. However, the use of these metrics in lakes is still poorly understood. Here, we present a study that explores the patterns of benthic diatom community and guilds structure in North-Atlantic oceanic insular deep lakes, and their relation to environmental variables. The diatom assemblages in 194 samples from the littoral zones of 11 lakes (6 in São Miguel and 5 in Flores islands), collected seasonally between 2003 and 2012, were studied and their distribution tested against 20 environmental variables. A total of 301 diatom taxa were identified belonging to *Nitzschia* (10.6 %), *Navicula* s.l. (10.0 %), *Pinnularia* (6.6 %), and *Eunotia* (5.7 %). The motile guild was the most frequent, followed by the high profile and low profile diatoms, which is in accordance with the dominance of *Nitzschia* and *Navicula* genera. Taxonomical composition of diatom assemblages differed significantly between islands and lakes but not across seasons. Contrarily, diatom guilds differed significantly between lakes and seasons but not between islands. As expected, water variables were the most important drivers of taxonomical composition and guilds of diatom assemblages' variability, but geographical variables also contribute for a significant variability explanation. Diatom guilds were more sensitive to track local environmental variables (e.g. water temperature and electric conductivity), while diatoms composition were more sensitive to track the spatial variables (longitude). Our results show that diatoms guilds can be used in environmental quality assessment in oceanic island lakes with advantages over traditional taxonomic assessments.

MODELLING METAPOPOPULATION DYNAMICS FOR SALMO TRUTTA ON RIVER NETWORKS

Salmo trutta (Linnaeus, 1758) has a great cultural, economic and environmental importance in many river systems all throughout the world. Identifying the main factors influencing brown trout distribution and spatial patterns in river networks is essential for its conservation and management. The purpose of this study was to develop and apply a metapopulation model for *Salmo trutta* for its different stages of development (fry, juvenile and adult) and analysing the spatial patterns of this specie in the Deva-Cares river network. The study area (1188 Km²) is located in northern Spain and a large part of the catchment is located within the Picos de Europa National Park. The continuous model was calibrated with different population parameters including fecundity, mortality and dispersal among other population parameters. The spawning migration probability or the attraction for a certain destination was defined using a gravity model. Natural and artificial barriers were also included in the model with different permeability depending on their own characteristics and the fish stage of development. Background fish densities, biomass, and confidence limits were defined using data from fish surveys. Data were collected in six consecutive years (2010-2015) during the low-flow season (August to October) in more than 15 reaches distributed along the river network. Our results show the influence of the different population parameters on the density and biomass modeled for each stage of development in every reach of the river network and also allows assessing the effect of removing or adding barriers present in the river network. Barrier effects on local and global population dynamics variate in relation to the position of the affected river reach within the river network and its connectivity to the other river reaches.

AVALIAÇÃO SIMPLIFICADA DE IMPACTOS AMBIENTAIS EM PRAIAS FLUVIAIS NO BRASIL.

O crescimento do uso de ambientes aquáticos continentais para recreação tem causado preocupação pela ausência de planejamento e gestão adequados voltados para a conservação da qualidade das águas e do entorno. Neste âmbito, o objetivo deste trabalho foi realizar uma avaliação simplificada de impactos ambientais em duas praias localizadas no Rio Paraná no interior do Estado de São Paulo. Os instrumentos aplicados utilizam indicadores antrópicos para estimar as condições do meio, assim como parâmetros biofísicos relacionados à diversidade de habitats. Os trechos fluviais analisados encontram-se em dois municípios diferentes, numa área de transição rio-represa. Tais trechos compõem com o entorno, espaços públicos de lazer denominados balneários, os quais são bastante comuns em cidades da região do noroeste paulista. Os resultados da aplicação dos instrumentos demonstraram alterações antrópicas que comprometeram a qualidade ambiental e a diversidade de habitats nas duas praias estudadas. As somas dos parâmetros avaliados permitiram a classificação dos balneários como áreas com elevado impacto ambiental. Em ambos os casos, os parâmetros que mais contribuíram para esta condição foram ausência de cobertura vegetal nas margens e alterações nas características naturais do rio, principalmente, no substrato do fundo e pela ausência de plantas aquáticas no leito. Tais alterações estão diretamente relacionadas ao uso existente na área, pois foram promovidas para adequar ao uso para recreação. Indicadores antrópicos como presença de resíduos sólidos, som alto e ausência de animais nativos também contribuíram para a condição de impacto existente, que além da relação com o uso do local estão também associados ao período da amostragem, caracterizado pelo intenso fluxo de visitação. Conclui-se que a adequação dos ambientes aquáticos para recreação alterara as condições ambientais, especialmente, por reduzir a diversidade de habitats. Em longo prazo, essas alterações podem ocasionar consequências a qualidade da água pela remoção da vegetação, erosão, assoreamento e acúmulo de resíduos sólidos. Assim, os instrumentos de avaliação simplificada podem ser ferramentas úteis para a gestão das condições ambientais dos balneários, pois geram respostas rápidas que permitem a atuação necessária para a recuperação e conservação dos ambientes aquáticos e seus espaços associados.

AFC.13

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FUNCTIONAL ROLE IS MORE IMPORTANT THAN DIVERSITY IN MULTIPLE ECOSYSTEM SERVICES

Wales (UK). A standardised mean of these four was considered as indicator of multiple ES. We characterised invertebrate prey biodiversity using functional identity (dominance of single or combined functional characteristics) and functional and taxonomic diversity metrics (variety of traits or taxa). Biodiversity – ES relationships were generally positive. Functional metrics predicted ES better than taxonomic measures in four out of five cases. Diversity appeared to enhance bird-related ES, while functional identity variables were better predictors of fish-related ES and multiple ES. Our study highlights the importance of specific key traits and functional groups to multiple ES in rivers, but illustrates also the relevance of diversity for some individual ES. From both theoretical and applied perspectives, these results provide a robust analytical framework that may be generalisable to other areas of Biodiversity – ES research and ecosystem management.

RWL.05

Hermoso, Virgilio

Centre Tecnològic Forestal de Catalunya

CATCHMENT ZONING TO UNLOCK FRESHWATER CONSERVATION OPPORTUNITIES IN THE IBERIAN PENINSULA

Freshwater ecosystems and biodiversity are among the most threatened at global scale, but efforts for their conservation have been mostly peripheral to terrestrial conservation. For example, despite the large extent of the European Natura 2000 (the world's largest network of protected areas), it fails to cover adequately the distribution of rare and endangered aquatic species, and lacks of appropriate spatial design to make conservation for freshwater biodiversity effective. Recent advances in freshwater conservation planning allow addressing some of the specific needs of these systems, such as spatial connectivity or propagation of threats along streams. However, conservation recommendations in freshwaters often require considering large areas that cannot be managed under traditional schemes (e.g., strict protection).

To address this issue, we propose using a multi-zoning approach with management zones subject to different management regimes. So far, this approach has only been used in ad-hoc exercises where zones were allocated using expert criteria. Here, we demonstrate how to create a catchment multi-zone plan by applying a decision support tool used in other realms. We also demonstrate how to address common conservation planning issues, such as accounting for threats or species-specific connectivity needs.

We found that by prioritizing the allocation of zones subject to different management regimes we could minimise the total area in need of strict conservation by a two-fold factor. This reduction can be further reduced (three-fold) when considering species' connectivity needs. The integration of threats helped reduce the average threats of areas selected by a two-fold factor. Catchment zoning can help refine conservation recommendations and enhance cost-effectiveness by prescribing different management regimes informed by ecological needs or distribution of threats

FEF.04

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AMMONIA OXIDIZERS ON PLANT ROOT SURFACES ARE DRIVEN BY OXYGEN LEAKAGE

Ammonium is a common nitrogen contaminant in freshwater systems. Removal of ammonia from water is highly dependent on the availability oxygen regulating the activity of ammonia and nitrite oxidizing microorganisms. To some extent, emergent macrophytes increase oxygen concentrations in the rhizosphere environment due to continuous oxygen leakage through root tissues; however its impact on abundance and activity of nitrifiers has not been extensively quantified. Nevertheless, vegetation coverage and plant species selection are essential aspects to be considered for an effective oxidation of ammonium in constructed wetlands (CW).

The aim of this study was to quantify if oxygen permeability at the root surface affects the spatial distribution of ammonia oxidizing Archaea (AOA) and Bacteria (AOB). Experiments were conducted on *Typha latifolia* roots obtained from a Free Water Surface CW. Oxygen diffusion was measured as potential rates along the surface of a root hair using selective microelectrodes. 16S rRNA barcode amplicon based Illumina sequencing was used to study the diversity of AOA and AOB at different root sections, root tip (0 to 2 cm from the root tip), middle section (2 to 5 cm), and basal section (>5 cm). Ammonia oxidizers abundance was inferred by qPCR.

AOA and AOB were found in all samples but were poorly represented (<0.3 %) according to quantifications and to the relative number of sequences identified within this functional group. In the middle sections of the root (2 to 5 cm from the tip) higher densities of ammonia oxidizers were found. This accumulation coincided with a lower diversity of the community, thus suggesting a selection of ammonia oxidizing species. Moreover, oxygen diffusion was higher in the middle section compared to the other sections. In the sediment, AOA and AOB communities were similar to those found at the root tips but differed from the middle part. Overall, we were able to show that plant roots exerted a selection effect on ammonia oxidizers, although this effect may be limited to small portions of the root surface due to changes on oxygen leakage. Oxygen diffusion depends on apoplastic diffusion barriers that may be significantly modified as root grows and suberizes.

EEC.05

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EFFECTS OF BEAVER DAMMING ON THE FORMATION OF THE TOXIC METHYLMERCURY

Eurasian beavers (*Castor fiber*) are important ecosystem engineers. They modify the structure of river reaches and lead to changes in ecosystem function and biogeochemical processes of riverine ecosystems. Beaver populations are now recovering from near extirpation and spreading rapidly throughout Europe. Previous studies have shown that the concentration of the potent neurotoxic methylmercury typically increases in surface waters downstream beaver systems, and that the severity of this is associated with the age of the systems and/or the colonization history. Specifically, it has been shown that beaver impoundments cause increases in methylmercury concentrations during the first years after the initial flooding. The aim of this study goes beyond previous work by studying whether the increase in MeHg concentrations in newly created impoundments is a consequence of enhanced local Hg methylation in the ponds. Furthermore, we specifically address the role of organic matter composition on the process in 9 beaver ponds of different ages from across Sweden. Therefore, we studied dissolved organic matter (DOM) composition by means of fluorescence spectroscopy and Hg methylation rates by using mercury isotope tracers. Our results show that beaver damming causes a transient increase in Hg in recently established ponds, where DOM seemed to be more humic and less processed compared to older ponds. The presence of fresh humic substances and nutrients, most likely leached from surrounding soils, boosted Hg methylation rates in recently established beaver impoundments. We conclude that the increase in MeHg concentrations of surface waters downstream beaver systems during the first years after the initial flooding is a consequence of enhanced Hg methylation in the pond sediments and that the presence of fresh humic substances control the process. The role of fresh humic substances on Hg methylation rates is also likely to be relevant for other aquatic systems such as lakes, estuaries and manmade reservoirs.

CULTURAL OLIGOTROPHICATION OF WESTERN RIVERS AND ESTUARIES

Based on a bibliographical review and some case studies the hypothesis that cultural oligotrophication is a general trend in Western rivers and estuaries is presented and discussed. The decrease in P in many Western rivers and estuaries during the last two decades is well documented, but in most of cases the biotic variables responding to oligotrophication have not been sufficiently monitored. Thus, there are a scarce (but growing) number of cases in which chlorophyll (or phytoplankton) has been shown to decrease as a consequence of riverine or estuarine oligotrophication (i.e., Rhine and San Joaquín rivers, some Japanese estuaries, the Northern Adriatic sea), and a few cases in which existing data has allowed to show a regime shift from phytoplankton to macrophytes (i.e., Ebro and Spree rivers). Thus, an important question is why this type of regime shift is apparently so exceptional in rivers whereas in shallow lakes is very common. The main reason is that, besides the lack of data, factors such as river depth, pulsing flow regime, high suspended sediment or substrate type prevent a general spread of submerged macrophytes in most of rivers. Then, the consequences of cultural oligotrophication on fluvial ecosystems may be different as a function of river type. The hypothesis is that the regime shift to macrophytes may occur in mid-size rivers with a relatively regular flow, but the response of primary producers (and the effects at whole-ecosystem level) can be different in streams, large rivers and estuaries. As conclusion, the paradigm that cultural eutrophication is the dominant trend in Western rivers has to be abandoned and the biological effects of oligotrophication have to be investigated in order to understand the present ecological functioning of our rivers.

CHANGES IN RIVERINE FOOD WEBS PRODUCED BY MASSIVE GROWTHS OF *DIDYMOSPHENIA GEMINATA*

Didymosphenia geminata is an invasive diatom capable to produce large amount of extracellular stalks, creating the so-called massive growths, which are able to cover the river bed for several kilometres. This obvious alteration of environmental conditions has pointed *D. geminata* as one of the most harmful invasive organisms in aquatic ecosystems that shall deeply alter the host community. However, there are few studies focused on this topic and they are mostly based on taxonomic data of one kind of organisms. With the aim of deepening on *D. geminata* effects in the food web of fluvial ecosystem, the taxonomic composition and functional structure of macroinvertebrates and diatoms were studied in the Lumbreras River (La Rioja, Ebro basin) at dates and sites differently affected by *D. geminata*. Massive growths reduced diatoms and macroinvertebrates taxonomic diversity. They forced a change in diatom assemblages in two ways: exerting direct pressure on large, attached species, either stalked or adnate ones (as *Cocconeis placentula*, *Gomphonema sp.* and *Fragilaria capucina*) and by creating new habitat for epiphytic species, taken over by pioneer fast growing small ones (as *Achnantheidium minutissimum* and *Sellaphora stroemii*). Additionally a third effect on diatom assemblage is through altering the food web. The new environmental conditions favour small invertebrates, especially the orthoclads *Cricotopus spp.* and *Eukiefferiella spp.*, which can move freely inside the filamentous mats and contributes to the decline of relative abundance of greater diatoms, consumed by these midges. Small predators as *Hydra sp.* was also favoured due to its ability to attach to filaments and the increase of chironomids. Finally, *D. geminata* reduced the density of crawlers, scrapers and taxa adapted to live in coarse substrate (as *Epeorus sp.*, *Ecdyonurus sp.* and *Simuliini sp.*), since filamentous mats completely cover the hard substrate, displacing taxa that were attached or moved and/or feed on it. All these results evidence that *D. geminata* massive growths involve an intense alteration of diatoms and macroinvertebrates assemblages towards a lower diverse community dominated by smaller, pioneer and generalist taxa

MRM.07

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Universidad de Valencia

FROM BIOLOGY TO GEOCHEMISTRY: UNRAVELING THE HISTORY OF LAKE EL TOBAR THROUGHOUT ITS SEDIMENTS

We present a multiproxy study carried out in Lake El Tobar (Spain) to reconstruct the past of the lake during the last 350 years. Cladoceran sub-fossils were analysed from central cores while plant macrofossils and stable isotopes from authigenic carbonates were used in littoral cores. Our data suggest five episodes of advance and regression of the shoreline coupled with changes in water retention in the lake. A low lake level and high water renewal episode at ca. AD 1650-1715 is indicated by oxidized facies with abundant remains from terrestrial/ marsh plant macrofossils and low $\delta^{18}O$ and $\delta^{13}C$ values. A fluctuating lake level episode at ca. AD 1715-1772 during changing climatic conditions in the LIA caused periods of erosion and sediment deposition that intermittently blocked the lake outlet, resulting in more positive $\delta^{18}O$ and $\delta^{13}C$ values. The lake became progressively more closed with increased level in the wet years at the end of LIA (ca. AD 1772-1850). During the Dalton Minimum, $\delta^{13}C$ values reached a minimum, indicating low productivity, but increased after this with development of submerged *Chara*. From ca. AD 1850-1960 lake levels were high but are marked by changes in marsh communities, mainly the shift from *Juncus* to *Typha* (ca. AD 1850-1960) predominance, which indicates low and high levels respectively. From ca. AD 1960, the construction of a canal for hydrological purposes led to the invasion of the cladoceran *Bosmina longirostris* and the increase of the trophic state.

RSL.03

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CARTOGRAFÍA Y EVALUACIÓN DE LOS SERVICIOS DE LOS ECOSISTEMAS EN LA CUENCA HIDROGRÁFICA DEL NOGUERA PALLARESA ¿PUEDE LA CARTOGRAFÍA DE LOS ECOSISTEMAS SER UN INSTRUMENTO ÚTIL PARA LA PLANIFICACIÓN Y LA GESTIÓN DE LA ENERGÍA HIDROELÉCTRICA?

El marco europeo de conservación de la biodiversidad se concreta a través de la Estrategia de la UE sobre la biodiversidad hasta el 2020. La Acción 5 pide a los 'Estados Miembros cartografiar y evaluar el estado de los ecosistemas y sus servicios en sus respectivos territorios, calcular el valor económico de dichos servicios y promover la integración de ese valor en los sistemas de contabilidad e información, a nivel nacional y europeo y no más tarde del 2020'.

ENDESA ha manifestado su interés en estimar los servicios de los ecosistemas en un ámbito territorial en el que la generación de energía se viene produciendo desde hace aproximadamente un siglo. El río Noguera Pallaresa cuenta con los sistemas de explotación hidroeléctrica más importantes de la Cuenca del Ebro. Existen 34 centrales en servicio con una potencia instalada de 1.048.182 kW. La mayor parte de la demanda de agua es para uso industrial de producción de energía (98 %). Los usos consuntivos suponen 16 hm³/año. La evaluación de los servicios de los ecosistemas en esta cuenca sirve como estudio piloto en materia de cuantificación de los impactos y dependencias de la compañía respecto a la biodiversidad y los servicios ecosistémicos.

Las instalaciones asociadas al aprovechamiento hidroeléctrico afectan al ecosistema ríos y lagos, y han propiciado la creación de nuevos humedales, sobre todo en las colas de los embalses.

Este trabajo se plantea con un enfoque territorial, cartografiando aquellos servicios de los ecosistemas para los que se dispone de información. El esquema metodológico adoptado es el desarrollado por el grupo de trabajo MAES en su informe de 2015 y se aplican los modelos desarrollados por InVEST.

La cartografía elaborada se presenta también mediante un visor interactivo con finalidad divulgativa. Este soporte muestra información relativa a: situación geográfica, datos generales de la cuenca del Noguera Pallaresa, infraestructuras hidráulicas, ecosistemas, estado de los ríos y lagos, y servicios de los ecosistemas (rendimiento de agua, retención de sedimentos, culturales).

RLW.16

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Fundación Centro de las Nuevas Tecnologías del Agua (CENTA).

LOS HUMEDALES ARTIFICIALES COMO INFRAESTRUCTURA PARA LA RECUPERACIÓN DE ZONAS DEGRADADAS

A nivel mundial y, de forma más significativa, en el área Mediterránea, los ecosistemas de humedales han sufrido importantes pérdidas en número y superficie. A pesar de su régimen de protección, su biodiversidad se encuentra afectada tanto por la disminución del número de especies como de hábitats debido, sobre todo, al incremento en la demanda de recursos y a la intensificación de los usos del suelo.

Uno de los aspectos que más afecta a estos humedales es la insuficiencia de cantidad y calidad de las aguas que reciben, siendo de vital importancia la búsqueda de recursos hídricos que garanticen la existencia y conservación de los mismos. En este contexto, el uso ambiental sostenible del agua residual regenerada mediante Humedales Artificiales puede suponer un recurso hídrico sumamente valioso para contribuir a la preservación de su biodiversidad.

Existen numerosas experiencias sobre el uso de estas infraestructuras en la recuperación de zonas húmedas, pero no son tantos los trabajos que profundizan en la conexión entre ambos sistemas. Conocer factores como su funcionamiento, mantenimiento, calidad del efluente y biodiversidad existente, pueden suponer una garantía para la correcta gestión y preservación de los humedales naturales.

El objetivo del presente trabajo es mostrar los resultados de más de 10 años de investigación sobre Humedales Artificiales así como las lecciones aprendidas y recomendaciones para su correcto funcionamiento.

Para ello, se incluirán resultados sobre la calidad físico-química y microbiológica del agua tratada, biodiversidad existente, así como criterios de operatividad y mantenimiento, de interés para el correcto funcionamiento de los Humedales Artificiales. En base a nuestras experiencias, podemos afirmar que este tipo de infraestructuras sostenibles proporcionan servicios hidrológicos sumamente valiosos, desempeñando un papel significativo en la recuperación de los humedales naturales degradados o mermados en sus capacidades ecológicas y la preservación de su biodiversidad.

EEF.03

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HABITAT SUITABILITY MODELLING FOR BROWN TROUT SPAWNING AND EVALUATION OF THE POTENTIAL HABITAT IN AN INTENSIVELY REGULATED RIVER REACH (PALANCIA RIVER, SPAIN)

During the last two decades, some studies of brown trout habitat selection have been performed in the Iberian Peninsula. The subsequent habitat suitability models in different forms allowed the application of the physical habitat simulation (or habitat evaluation) in various studies of environmental flow assessment. Although the fundamental activity of spawning has been studied, nowadays there are no regional habitat suitability models readily available. The present study encompassed eight Mediterranean rivers where the suitable hydraulics (depth and velocity) and substrates for brown trout spawning were characterized at the microhabitat scale, based on measurements at three points on the redd (i.e. presence), and at four points around the redd (i.e. absence).

The microhabitat suitability was modelled with a multivariate fuzzy rule base model (based on fuzzy logic). The fuzzy model proved proficient (Sensitivity=0.67 and Specificity=0.61) indicating that the optimal habitats for spawning (suitability index > 0.8) comprise gravel and fine gravel, low to medium flow velocity (0.2 - 0.6 m/s) and small depth (0.1 - 0.4 m).

A reach of the Palancia River (eastern Iberian Peninsula) below the weir of the Acequia Mayor de Sagunto (an irrigation canal), which suffers year-round water diversion of approximately 100 % of the river flow, was sampled and evaluated with the fuzzy model as the preliminary step for environmental flow assessments. Ninety-one percent (0.253 m³/s) of the available flow was diverted to the irrigation canal in February 2016 (out of the irrigation season) suggesting a relevant loss of fish habitat for spawning. Nevertheless, under those conditions 18 % of the length in the sampled aquatic area was suitable for spawning; the recovery of some habitats after years of intensive abstraction and river bed crust formation can be related to the large floods occurring in November 2015. The release of an adequate environmental flow regime in the bypassed river reach would permit the restoration of the brown trout population; the reach length is relevant, approximately 25% of the length of the trout zone. These results highlight the need of sustainable water management actions, especially by the owners and managers of the water rights.

GCI.06

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SEASONAL PATTERN OF METHANE EMISSIONS IN EBRE DELTA RICE FIELDS

Paddy rice fields are an important source of greenhouse gas emissions (GHG), in particular methane (CH₄). In the Ebre Delta (Catalonia, NE Spain) they are crucial for sustaining economic activity of the area and for preserving biodiversity of the surrounding natural wetlands. A study is being conducted aiming at assessing GHG emissions in Ebre Delta rice fields and the influence of environmental and agronomic factors on its seasonal pattern, with the final objective of providing measures to reduce GHG emissions while preserving crop productivity.

Fifteen fields in Ebre Delta, covering agri-environmental variability, were selected for GHG sampling and soil and water physic-chemical traits. GHG were monthly sampled, from May to December 2015, using closed chambers, and analysed by gas chromatography. Data analyses were performed using Multivariate analyses and Generalized Linear Models (IT-selection tools).

The study reveals a bi-modal pattern of CH₄ emissions with peaks in August and October. Emissions rates ranged from 0.9±1.0 to 5.0±2.5 mg C-CH₄ m⁻² h⁻¹ during the growing season (June to September) and from 2.7±7.3 to 18.8±14.5 mg C-CH₄ m⁻² h⁻¹ at post-harvest. Globally, ca. 314 kg C-CH₄ ha⁻¹ are annually emitted from Ebre Delta rice fields, of which ca. 70% during post-harvest. Larger off-season emissions were likely induced by straw incorporation. During the growing season soil redox followed by temperature were the most explanatory variables to CH₄ fluxes, following a negative and positive correlation, respectively. Interestingly, at post-harvest pH was negatively correlated to CH₄ emissions whereas a positive correlation was observed during the growing cycle, and it the most explanatory variable. We recommend the inclusion of post-harvest season in the estimation of global GHG emissions from paddy rice, usually neglected, to avoid underestimations.

EIC.09

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RELATIONSHIP BETWEEN DECOMPOSITION RATE AND ECOLOGICAL INDICATORS IN MEDITERRANEAN COASTAL LAGOONS

Coastal lagoons are subjected to great instability due to their location in the transitional zone between land and sea. This highly variable environment poses problems in their conservation and monitoring: it has been described that the characteristics of natural stress in coastal lagoons and estuaries are similar to those for anthropogenic stress. Thus functional indicators either as well as or rather as structural ones has been suggested to be used for assessing health in these transitional water ecosystems. The aim of this study is to verify whether plant litter decomposition in coastal lagoons has the potential to be used as a functional indicator of the ecosystem health. We conducted a field experiment testing the decomposition rate by using R. maritime litterbags of different mesh size, in ten Mediterranean coastal lagoons along a gradient of trophic status produced by anthropogenic impacts determined by a structural quality index (QAELSe2010). Differences in decomposition rates between coarse and fine mesh litterbags were more evident in lagoons with lower TSI-TP water quality index. Microbial decomposition rate in the fine mesh litter bags increased linearly with the trophic status suggesting that decomposition rates could be useful as a functional indicator of ecological status. However, this relationship was not observed in overall decomposition rate (coarse mesh). Decomposition rate in coarse mesh bags was negatively related to macroinvertebrate diversity indicating that in transitional habitats, such coastal lagoons, a high biodiversity is not a prerequisite for successful ecosystem functioning. These results confirm that functional indicators in addition to structural ones should be used in detecting anthropogenic environmental perturbations in coastal lagoons.

SR.01

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MULTIPLE STRESSOR IMPACTS ON NATIVE HIGH MOUNTAIN LAKE FAUNA: THE ROLE OF TROUT, MINNOWS AND WATER-LEVEL FLUCTUATION

Introduced trout have been reported to be a major local stressor of high mountain lake fauna during recent decades. Two more human-mediated disturbances affecting these ecosystems, exotic minnows and habitat alteration by artificial water-level fluctuation, may co-occur with trout but remain poorly studied. Detailed knowledge of the local stressors that affect high mountain lake fauna can help to inform environmental policies and effective natural habitat management efforts in mountain areas. We tested the role and the relative importance of trout, minnows, level fluctuation and habitat characteristics on the amphibian, conspicuous macroinvertebrate and planktonic crustacean assemblages in the high mountain lakes of the Pyrenees. Through performing redundancy analyses, variation partitioning and log-linear models, we worked on faunal presence/absence data from 471 lakes >0.5ha: 245 were sampled for planktonic crustaceans and 338 for amphibians and conspicuous macroinvertebrates. Our results showed that trout, minnows and water-level fluctuation had a cumulative and antagonistic impact on high mountain lake fauna. At assemblage level, trout and minnows were the factors that most determined the presence or absence of amphibians and conspicuous macroinvertebrates as well as their taxonomic richness. Trout and minnows together as a stressor fraction explained approximately a third of the exclusive explained variance for amphibian and conspicuous macroinvertebrate assemblages. At taxon level, trout and minnows presence was linked to a lower occurrence of most amphibian species and conspicuous macroinvertebrates taxa, while minnows alone reduced the occurrence of some planktonic crustaceans. The largest impact of minnows on these crustaceans was seen when minnows were found as the only fish in the lake. Artificial water-level fluctuation also reduced the occurrence of some planktonic crustaceans that appeared unaffected by trout and minnows. There have been some successful trout eradication initiatives in high mountain lakes during the past decades, however generate knowledge on removing minnows or restoring natural water-level fluctuation in dammed high mountain lakes is becoming a great challenge for the future.

FEF.01

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LEAF-LITTER FUNCTIONAL DIVERSITY AND DECOMPOSITION IN CALCAREOUS MEDITERRANEAN STREAMS

Functional diversity (e.g. diversity of traits) has been suggested by recent studies to be an important driver of leaf-litter decomposition patterns. Therefore, changes in plant functional diversity can affect freshwater ecosystem processes, what could have consequences for food webs, as well as for the global carbon cycling. The effects of plant functional diversity on decomposition rates in streams are still poorly understood, particularly so in Mediterranean streams, which are subject to recurrent water stress. We tested the effect of leaf-litter functional trait diversity on breakdown process in five Mediterranean calcareous streams by means of 3 *Quercus* species with contrasting C allocation strategies: *Q. robur* (deciduous), *Q. faginea* (marcescent) and *Q. rotundifolia* (evergreen). Leaves were incubated in the streams in coarse-mesh bags alone and in all possible species combinations. We hypothesized increasing functional diversity to promote overall breakdown rate. We found no clear relationship between litter functional diversity and breakdown rate, which rather depended on species mixtures and stream. Thus, our results suggest that functional diversity effects and environmental context might affect in different ways the functioning of calcareous streams in Mediterranean areas.

MFE.03

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STREAM FOOD-WEB CHANGES ACCORDING TO ALTERED HYDROLOGICAL CONDITIONS

River flow is the main determinant of composition and structure in riverine communities. Mediterranean-river biotas are adapted to a strong flow seasonality, with regulation by dams inducing artificially-stable flow regimes. The effects of flow regulation by dams on populations and communities have long been studied, but there is still a poor understanding of impacts at higher levels of organization (e.g., food-web level). We hypothesized that dam-induced hydrological alteration in a highly-seasonal Mediterranean river would alter the main food-web interactions, and we tested this hypothesis by comparing an unregulated reach with several reaches downstream of a dam. The dam favored hydrological and sedimentological stability, and the terrestriality of the streambed (i.e. encroachment of sediments and development of riparian vegetation). In these sections, autochthonous production prevailed over allochthonous inputs. These influences prompted the change from a detritus-based to an algal-based food web, boosting the richness and abundance of herbivorous primary consumers instead of detritivorous taxa. Invertebrate body size was reduced, and food webs became wider and longer. Interestingly, downstream of the dam (14 km) we observed only a partial recovery of the food-web metrics. Our results exemplify how flow regulation by dams in highly-variable Mediterranean rivers may not only affect riverine community composition and structure, but also food-web interactions and the main energy flows increasing food-web instability and vulnerability to trophic cascades mainly at sites where the reduction of water variability is more significant.

ICC.05

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SEVERITY OF FLOW INTERMITTENCY DRIVES CHANGES IN SEDIMENT ORGANIC MATTER AND MICROBIAL FUNCTIONING: A STREAM MESOCOSM STUDY

Climatic models predict a greater frequency of extreme events, including longer, more severe droughts and an intensification of the hydrological cycle. These predictions translate into changes in the magnitude, frequency, intensity, and timing of precipitation. Pulses of water (wetting events) in temporary systems directly and indirectly influence many ecosystem processes, for instance, they may serve as transport vectors, dissolve compounds and erode surfaces, alter physical and chemical conditions or create disturbances in biological activity. Refining current understanding of flow pulse dynamics is particularly relevant to predicting how future changes in the amount, seasonality, and intensity of precipitation will affect freshwater ecosystems in semi-arid and arid areas.

We used experimental stream mesocosms to simulate the drying process in streams. In particular, we tested the effect of the severity of flow intermittency on the stream ecosystem by measuring several functional indicators both in the water column and in the exposed stream sediment (i.e. exchange of CO₂, algal and bacterial activities) across different simulated hydrological situations: continuous flow, flow cessation, partially intermittent flow, and partially intermittent flow with a short rewetting event (simulating a sudden rainfall event). We hypothesized that drying and rewetting events would generate hot moments for carbon processing mainly in those treatments that were more hydrologically heterogeneous along the drying period.

The rewetting event and the flow recovery after drying determined: i) a decrease in the concentration of sediment water extractable organic matter and in its humic and old character; ii) significant increase in the Yeff (indicative of photosynthetic activity) and in the microbial activity (LAP, leucine aminopeptidase extracellular activity) but not in the microbial structural descriptors (e.g. algal biomass, bacterial number); and iii) a significant increase of the CO₂ efflux.

Overall, our study shows that flow recovery after dry periods, and more interestingly relatively small wetting events (e.g. small rainfalls), can alter both the quantity and composition of available organic matter in stream sediments and affect more the functioning than the structure of the microbial community.

RISK OF INVASION PREDICTED WITH SUPPORT VECTOR MACHINES: A CASE STUDY ON NORTHERN PIKE (*ESOX LUCIUS*, L.) AND BLEAK (*ALBURNUS ALBURNUS*, L.)

The impacts of invasive species are recognised as a major threat to global freshwater biodiversity. The risk of invasion (probability of presence) of two avowed invasive species, the northern pike (*Esox Lucius*, L.) and bleak (*Alburnus alburnus*, L.), was evaluated in the upper part of the Cabriel River (eastern Iberian Peninsula) with habitat suitability models developed with Support Vector Machines (SVMs), which were trained with data collected downstream the Contreras dam (the last barrier impeding the invasion). Although SVMs gained visibility in habitat suitability modelling, they cannot be considered widespread in ecology. Thus, there is certain controversy about the necessity of performing variable selection procedures. The parameters tuning and the variable selection for the SVMs was simultaneously performed with a genetic algorithm and, contradicting previous studies in freshwater ecology, the variable selection proved necessary to achieve almost perfect accuracy. Further, the development of partial dependence plots allowed unveiling the relationship between the selected input variables and the probability of presence. Therefore, the northern pike selected preferably large and wide mesohabitats with vegetated shores and abundant prey whereas bleak selected deep and slightly fast flow mesohabitats with fine substrate. Both species proved able to colonize the upper part of the Cabriel River but the habitat suitability for bleak indicated a slightly higher risk of invasion. Altogether may threaten the endemic species that actually inhabit that stretch, especially the Júcar nase (*Parachondrostoma arrigonis*, Steindachner), which is one of the most critically endangered Iberian freshwater fish species.

INTEGRATING THE TEMPORAL CONTINUUM IN ECOLOGY: DETERMINANTS OF SPECIES AND GENETIC DIVERSITY

Biodiversity varies across space and time. This variation is thought to be driven by a set of local and large-scale environmental factors that have been acting upon individuals and species over evolutionary time leaving an imprint on current composition and distribution of populations and communities. However, the drivers of diversification that have generated and structured communities and populations, still remain unanswered. Separately, studies in community ecology (species composition and distribution, SD) and population genetics (intraspecific genetic composition and structure, GD) have revealed the importance of traits of organisms (dispersion) and habitat characteristics (disturbance regimes, primary productivity, topography) on diversity patterns and the underlying processes that drive these patterns. Assuming that the action of similar processes may generate similar patterns at both levels of organization, recent studies have incorporated both levels and test the correlation between SD and GD (SGDC). Sometimes SGDC show correlated patterns indicating similar responses to underlying causal factors; however, sometimes they are uncorrelated indicating no possibility for using one as a surrogate for the other. The Cytochrome Oxidase C subunit I gene ("DNA-barcode" or *cox1*) shows strong genetic subdivision at the interspecific but also at the intraspecific level providing well-resolved species delimitation as well as an estimate of intraspecific genetic diversity and turnover among populations. The massive DNA barcoding for multiple lineages across communities provides a cohesive explanation of processes that drives community assembly because integrates the genetic record from the deepest levels of lineages splits to the population dynamics, and therefore linking together ecological (short-temporal scale) and evolutionary (long-temporal scale) processes. I used this approach to infer evolutionary processes and assess large-scale biodiversity patterns from local genetic inventories. This perspective develops a new conceptual framework on how biodiversity can be assessed, and it will contribute to the understanding of what determines patterns of species diversity, as haplotypes comprise the most basal level where diversity can be measured.

ICC.06

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TOWARDS A UNIVERSAL MICROBIAL INOCULUM FOR DISSOLVED ORGANIC MATTER DEGRADATION EXPERIMENTS

Carbon (C) cycling in freshwaters makes up an active compartment of the global C cycle. It is now well accepted that the inland waters not only transport C from land to the oceans but C also can be mineralized, transformed or buried on its way to the ocean. An important constituent of this freshwater C source is Dissolved Organic Matter (DOM), which is one of the largest biologically available sources of organic C in aquatic ecosystems and its dynamics have implications for C cycling on local to global scales. Usually, DOM degradation has been assessed using laboratory incubations that use native bacterial communities as an inoculum. However, this procedure makes difficult to disentangle the effects of intrinsic DOM properties and the metabolic capacities of the bacterial community on the observed DOM degradation patterns. Here, we want to develop a universal/standard bacterial inoculum and test its DOM degradation potential. Candidate microbes to be included in the universal inoculum were carefully selected on the basis of: 1) their capacity to grow in co-culture, 2) its physiological versatility under a wide range of environmental conditions; and 3) its metabolic versatility to degrade a wide range of organic compounds (from simple organic matter to complex macromolecules). These candidate species included seven species of bacteria and two species of fungi, which are widespread in nature. To build this standard inoculum, we first tested the DOM degradation potential of each individual species vs. the mixed inoculum, and thereby selected the final group of microbes to be included.

We performed a series of batch tests with a variety of C sources ranging from low to high degradability: glucose, tryptophan, ferulic acid, lignin, and humic sample from Suwannee River. We used both fluorescence spectroscopy and DOC analysis to track C degradation. This experimental microcosm setup allowed us to identify a group of microbes that can mimic the microbial DOM degradation in nature, providing a strong basis for the use of the standard inoculum in future DOM degradation experiments

FEF.03

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ANALYSIS OF FUNCTIONAL GENES INVOLVED IN S CYCLE UNVEILS THE DISTRIBUTION AND DIVERSITY OF SULFUR-OXIDIZERS AND SULFATE-REDUCERS IN A MEROMICTIC LAKE

Karstic lakes exhibit contrasting physicochemical gradients along depth where microbial populations distribute according to their metabolic and physiological requirements. In these environments, sulfidic redoxclines offer a suitable niche for the development of photo- and chemotrophic populations that obtain energy from the oxidation of reduced sulfur compounds. Among the latter, members of the class Epsilonproteobacteria are key players in biogeochemical cycling of C and S in marine sulfidic redoxclines and hydrothermal vent systems but less information is available on their abundance and activity in freshwater habitats.

We have conducted a seasonal survey in a crenogenic, meromictic basin C-III of Lake Banyoles where a freshwater member of the genus *Arcobacter* dominates the planktonic community of sulfide-oxidizing chemolithotrophs. To gain insight on the planktonic sulfur-oxidizing community and the main metabolic pathways involved in cycling S in the system, we studied the diversity of three functional genes: the adenosine-5'-phosphosulfate reductase subunit A (*aprA*), the dissimilatory sulfite reductase subunit B (*dsrB*) and the hydrolytic enzyme *soxB* from the sulfur-oxidizing multienzyme Sox system (*soxB*) using Illumina high throughput sequencing. Phylogenies of each gene have been compared with those obtained using 16S rRNA genes and multivariate analyses have been run to identify the main environmental drivers that better predict the functional structure of the planktonic microbial assemblage. Our results agree with those previously obtained using CARD-FISH and pyrotag libraries, indicating a clear seasonality of both sulfur-oxidizing (SOB) and sulfate-reducing bacteria (SRB). Whereas SOB (i.e. *Arcobacter spp.*) predominate at the redoxcline in winter, the summer redoxcline harbors a more diverse community composed of photo- and chemolithotrophic SOB and SRB. Besides, our data corroborate that *Arcobacter* oxidizes reduced sulfur compounds via the multienzyme Sox system. Our results shed light on the identity of the microorganisms involved in C and S cycling in Lake Banyoles thus solving an intriguing question that has been a matter of debate in recent years.

MRM.04

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A BIOGEOCHEMICAL MODELING APPROACH TO ADDRESS THE EUTROPHICATION PROBLEMS IN THE SHALLOW HYPERTROPHIC LAGOON ALBUFERA DE VALENCIA

Shallow lakes are widespread ecosystems that provide multiple economical and recreational benefits. Nonetheless, many of these lakes have undergone an eutrophication processes and require restoration measures to improve their ecological status. La Albufera de Valencia is a representative case for such ecosystems. Ecological models constitute a valuable tool to gain knowledge on the physical and biogeochemical processes driving local eutrophication problems and to design management effective plans that satisfy environmental and local socioeconomic concerns. We developed a biogeochemical model that represents the ecological interactions defining phytoplankton dynamics in the shallow hypertrophic lagoon of Albufera de Valencia (Spain). The model simulates the dynamics of the nitrogen and phosphorus cycles, two phytoplankton groups (cyanobacteria and non-cyanobacteria) and heterotrophic bacteria. We assessed the ability of the model to mimic observed dynamics of the state variables and estimated the uncertainty associated to the model external forcing. A sensitivity analyses was performed to identify the parameters having a strongest influence on phytoplankton predictions. Finally, we explore the phytoplankton response to potential restoration actions comprising combined modifications of external nitrogen and phosphorus loadings with varying flushing rates. The model effectively reproduces the dynamics of number of water quality relevant variables in the lagoon, including total chlorophyll a, cyanobacteria, non-cyanobacteria, nitrate, ammonia, total nitrogen and total phosphorus. The parameters related to phytoplankton growth and settling rates were found to be the most relevant for achieving a model that can be used as a reliable management tool. External nutrient loadings were identified as the most important factor shaping ecosystem dynamics and should therefore be considered as the main priority for the local management actions. In addition, increased flushing rates lead to a decrease in cyanobacteria biomass during late winter, pointing to a dilution effect and inviting to consider hydrological manipulations as a further management tool.

FEF.19

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MODELING NUTRIENT, PHYTOPLANKTON AND FLOATING MACROPHYTES DYNAMICS IN KETTLE HOLES IN NORTHEAST GERMANY

Kettle holes in Northern Europe, synonymous with prairie potholes in North America, are small (t of the ice by the delayed melting of dead ice blocks at the end of the last glaciation. These depressional wetlands represent hotspots for biodiversity and biogeochemical cycling and they are often impaired by enhanced matter accumulation and subsequent eutrophication in regions dominated by agricultural practices. This is the case in the Uckermark region in Northeast Germany, where kettle holes are widespread and intensive agricultural land use dominates, thus posing a threat to ecosystem function. In order to design effective conservation and management measures for kettle holes, comprehensive knowledge on their ecological functioning is desirable. However, studies regarding the biogeochemistry of kettle holes are only recent and small in number in comparison with those for larger and deeper water bodies.

Aiming to expand the knowledge on kettle holes ecological functioning, we developed an innovative biogeochemical model that simulates the dynamics of four elemental cycles (C, O, N and P), phytoplankton and floating macrophytes (specifically duckweeds). The model targets the reproduction of the ecological processes determining the seasonal dynamics of biological and chemical components in kettle holes. The model was manually calibrated based on observations of a kettle hole located near Rittgarten village (Uckemmark) from 2013 to 2014. Subsequently, model performance was assessed and a sensitivity analysis was performed. The nutrient mass fluxes derived from the ecological processes considered by the model were quantified. We report the capacity of the model to simulate the observed state variables seasonal dynamics and identified the most relevant parameters. Finally, based on our simulations, we discuss the relative contribution of the ecological processes to nutrient mass fluxes and the challenges involved in the modelling of such kind of ecosystems.

RLW.12

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MIGRATORY FISH RECOVERY AND IMPROVED MANAGEMENT IN THE FINAL STRETCH OF THE EBRE RIVER (CATALONIA, NE IBERIAN PENINSULA; LIFE MIGRATOEBRE)

The aim of this project is to promote the recovery of ecological connectivity within 10-20 years in the lower Ebre River and Delta (in a stretch of 115 km from the Mediterranean Sea), and a healthy and sustainable population of migrating fish: European sturgeon (*Acipenser sturio*), European eel (*Anguilla anguilla*), twaite shad (*Alosa fallax*) and sea lamprey (*Petromizon marinus*), among others aquatic native species.

It is focused on long-term sustainable investments adapting all present river obstacles to allow fish migration (upstream and downstream); increasing twice the river spawning habitat availability, and the distribution and growth areas of migrating fish.

Main activities of the LIFE MIGRATOEBRE project (LIFE13 NAT/ES/000237) are:

1. Apply ship locks fish-friendly improved management at Xerta's weir (located at 58 km from the sea) and at Flix dam (located at 115 km from the sea), and to monitor it regularly.
2. Install a fish lock at Xerta's weir, and a fish ramp at Ascó's weir (located at 104 km from the sea), and to monitor it regularly.
3. Undertake a pilot project of European sturgeon restocking through an experimental release in the lower Ebre (downstream and upstream Xerta's weir).
4. Develop a communication campaign and a community involvement plan for students, general public, farmers, fishermen, anglers, electric companies, tourism stakeholders, regional and local authorities. It will include the production of a great temporary exhibition and a network of volunteers.

This LIFE project started in 1/07/2014 and will finish in 30/06/2018.

More information in: www.migratoebre.eu

RLW.15

Ortiz, Jesús; **Piera, Eduard**

Associació CEN

CHALLENGES AND CONSTRAINTS OF LAND STEWARDSHIP AND VOLUNTEERING FOR STREAM CONSERVATION

Given the amount and diversity of alterations affecting stream ecosystems, many conservation projects cannot be implemented because of economic restrictions. In addition, the present economic context makes this situation much worse.

Therefore, few NGOs have taken the responsibility of preserving stream ecosystems as their own and face the challenge of finding innovative strategies to commit to their mission under extremely restrictive conditions. Within this context, land stewardship and volunteering are set as conservation tools that may allow the implementation of most conservation measures that minimize impact. Both strategies require the involvement of citizens and are compatible. Some examples of successful actions are control of exotic invasive species, restoration of riparian vegetation, assessment of ecological status, biodiversity surveys or even specific research studies. In addition, the implementation of such actions also becomes an effective awareness tool, and dissemination can encourage private funding. However, some conservation measures are still unachievable because of high economic costs and technical complexity, such as water purification or removal of large barriers. Furthermore, the efforts of those NGOs are often dimmed by administrations because, compared to water supply and natural hazards, conservation will hardly ever become a priority and authorizations are often restrictive.

ISR.03

Osorio, Víctor¹; Pérez, Berta¹; Buchaca, Teresa¹; Miró, Alexandre¹; Pou-Rovira, Quim²; Sabás, Ibor¹; Puig, Mariàngels¹; Ventura, Marc¹

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EFFECTS OF INTRODUCED FISH ON LITORAL MACROINVERTEBRATE COMMUNITIES OF HIGH MOUNTAIN LAKES

Pyrenean high mountain lakes are naturally fishless. However, many of them have suffered from salmonids and European minnow (*Phoxinus sp.*) introductions. Previous studies in other mountain ranges have identified these fish introductions as having negative effects on ecosystems and their communities. In order to assess the effects of fish introduction on macroinvertebrate communities, we have studied the littoral composition of 32 lakes in the Catalan Pyrenees differing mainly on having salmonids, minnow, presence of both, or being fishless. Taxa abundance was firstly analysed with redundancy analysis (RDA) to select those environmental variables best explaining the taxa variability. Secondly non-parametric tests such as PERMANOVA or Kruskal-Wallis were used to test for differences between the four fish status at the community, taxonomic group or functional group level, diversity and richness. Most important environmental variables of RDA were total phosphorus, fish abundance, the presence of macrophytes. The community of minnow lakes was significantly different from the rest according to PERMANOVA. Richness in natural lakes was higher than in the other categories, with a 35% of the taxa found only in these lakes. Populations of the most conspicuous groups, including those of bigger size, clingers, and swimmers, had a lower abundance in lakes with minnow. Swimmers abundance was also reduced in salmonid lakes. The community of minnow lakes was dominated by burrowers and detritivores. In contrast, lakes with salmonids had a community more similar to natural lakes. Life+ LimnoPirineus has removed most of the minnows in Lake Closell. A comparison of the macroinvertebrate community between before and after minnow removal showed that the macroinvertebrate community is recovering very quickly, with bivalvia and megaloptera appearing for the first time after removal.

FEF.11

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¹ICBAS & CIIMAR, University of Porto

EFFECTS OF EMERGENT CONTAMINANTS ON *DAPHNIA MAGNA* REPRODUCTION: GOLD NANOPARTICLES AND MICROPLASTICS

The effects of emergent contaminants on environmental and human health raise a high concern and more knowledge is urgently needed to improve the risk assessment of these substances and the safety of their use. Among emergent contaminants, gold nanoparticles (AuNP) and microplastics (MP) are under special focus due to their wide and intensive use in several applications, including in goods, equipment and technology used every day by millions of persons. The knowledge on the environmental fate, behaviour and effects of these substances in freshwater ecosystems is still limited, and even more regarding potential interactions between the two types of substances. Thus, the goal of this study was to investigate the effects of AuNP and MP, alone and in mixture, on the crustacean cladoceran *Daphnia magna*.

A 21-day *D. magna* bioassay was performed, following a factorial experimental design. Effect criteria were mortality and reproduction, assessed through the total number of juveniles, viable and non-viable juveniles, aborted eggs produced, the time of first brood release, and the total number of broods released. AuNP and MP, alone and in mixture caused significant adverse effects on *D. magna* reproduction. The potential toxicological interactions are discussed, as well as the implications for environmental risk assessment and safety.

GCI.03

Palacín, Carlos¹; Hallin, Sara²; Camarero, Lluís¹; Casamayor, Emilio O.¹; Catalán, Jordi¹

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DENITRIFICATION IN MOUNTAIN LAKES FROM THE PYRENEES: ACTIVITY RATES & GENETIC POTENTIALS.

Increased nitrogen (N) deposition is affecting biogeochemical cycling and biota in high-altitude oligotrophic lakes in mountain areas on the northern hemisphere. In the Pyrenees, the amount of reactive N has been increasing since the 1980's, but the potential for N transformations and return of N to the atmosphere via denitrification in these mountain lakes are poorly understood. Ten lakes covering the environmental variability among the Pyrenean lakes were investigated to determine actual and potential denitrification activity in intact core sediments using the acetylene inhibition technique combined with microsensors for nitrous oxide. The genetic potentials for different processes of the N cycle in the sediments and epilithic biofilms were assessed by quantifying the gene pools of specific functional genes: for denitrification *nirS* and *nirK*, two structurally dissimilar nitrite reductases, and nitrous oxide reductase *nosZ*, including the two phylogenetically distinct clades *nosZI* and *nosZII*; for ammonia oxidation the bacterial and archaeal *amoA* genes, for anammox *hzd* hydrazine oxidoreductase; and for dissimilatory nitrate reduction to ammonium (DNRA) nitrite reductase *nrfA*. The actual denitrification rates varied greatly both within a single lake and among lakes, with a mean actual rate of $2.4 \pm 2.3 \mu\text{mols N}_2\text{O m}^{-2} \text{h}^{-1}$. Denitrification was nitrate limited. *NirS* was the most abundant gene in all the habitats. The gen copies ratio *nirS*/16S showed the strongest relationship with potential denitrification rates, being the most informative genetic index. These findings suggest that lake capacity to remove nitrate has not been saturated under conditions of increased N deposition.

EEF.02

Peñas, Francisco J.; Belmar, Oscar; Barquín, José;

Environmental Hydraulics Institute, Universidad de Cantabria

DO RESERVOIRS WITH A SIMILAR OPERATION RULE PRODUCE ALWAYS THE SAME EFFECT? PATTERNS OF HYDROLOGICAL ALTERATION IN THE IBERIAN PENINSULA

Hydrological variability is a first order driver on river ecosystems. At the same time, rivers provide critical services, essential to human societies. In this regard, the promotion of certain services to maximize economic goods (e.g. water supply for agriculture, hydropower) or reducing environmental risks (e.g. flood control) have resulted in a widespread hydrological alteration (HA) of river ecosystems, which has caused a considerable ecological damage and the loss of other important ecosystem services. In this context, new tools and knowledge are required to guide resource managers through complex decisions to meet multiple objectives. The definition of environmental flows (EF) is critical to maintain river processes and functions, and the first step through its definition is identifying the extent to which flow regime deviates from the natural condition. In this sense, most of the HA assessments carried out to date are case by case studies. Such approaches are valuable to define EF recommendations for specific river reaches but provide little guidance at the regional, or national scale. In this study we carried out a large spatial scale assessment of the HA aiming to infer general insights of the HA to allow future predictions in reservoirs lacking proper hydrological data. This study covered the northern half of the Iberian Peninsula where data from 551 gauge stations (249 natural vs 272 altered) were available. We selected a set of reservoirs with appropriate data and applied a novel protocol to assess the HA. This protocol is based in the Index of Hydrologic Alteration which has been widely applied but provide five alternative approaches according to the data availability: (1) Paired-Before-After-Control-Impact, (2) Before-After, (3) Control-Impact, (4) Hydrologic Classification and (5) Predicted Hydrologic Indices. Results revealed that the magnitude, direction and the specific altered flow components highly varied according to the reservoir size and its main use (e.g. irrigation, hydropower or flood protection). In addition, they highlighted that the natural hydrological behaviour (i.e. hydrological class) of the river where the reservoir was built strongly influenced HA patterns.

MFE.04

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INTERACTIVE EFFECTS OF POLLUTION AND WATER SCARCITY ON RIVER ECOSYSTEM PROCESSES

During the last decades, the use of resources by humans has increased exponentially, and the pollution generated in urban areas has become one of the most important stress factors for river ecosystems. Although many waste water treatment plants (WWTP) have been implemented to reduce the pollution, they do not eliminate it completely, thus affecting the receiving river ecosystems. Simultaneously, water scarcity increases the concentration of pollutants as it reduces the dilution capacity of rivers. The objective of the present study was to evaluate the effects of the interaction between pollution and water scarcity on river ecosystem functioning. Therefore, we examined the response of different processes (organic matter decomposition, nutrient uptake and whole-stream metabolism) in 26 stream reaches, located upstream (control) and downstream (impact) from sewage inputs into 13 streams in a gradient of water scarcity in the Ebro River basin. Preliminary results show diverging responses among the measured ecosystem processes. For instance, sewage inputs, either treated or untreated, tended to subsidize the decomposition of organic matter, although at the most polluted sites there are evidences of a stress effect. On the contrary, a strong decrease of phosphorus uptake by biofilms occurred in all impact reaches. Overall, the results point to major difficulties in forecasting the effects of further increases in pollution rate and water scarcity in rivers.

GCI.07

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A METHODOLOGICAL APPROACH TO SIMULATE CLIMATE CHANGE EFFECTS IN ATLANTIC RIPARIAN FORESTS

Riparian vegetation is usually considered as an azonal vegetation formation; however, the structure and composition of these biological communities change considerably at large spatial scales, depending strongly on climate conditions. Thus, the development of approaches that are able to simulate temperature and precipitation variation according to actual climate change scenarios and translate the effects of these changes to the distribution of riparian vegetation, is a well needed resource for riparian management. In this study, we propose a methodology with the ability to map current distribution patterns of riparian vegetation to whole river networks and model distributional changes according to future climatic projections. Our study area comprises river networks from the Cantabrian Cordillera. This area is of special interest, as it comprises the confluence between two biogeographic domains: the mediterranean and the eurosiberian, and it is a very sensible area to detect future changes on vegetation structure and composition. The distribution of current riparian vegetation was achieved combining virtual watersheds and species distribution models (SDMs) based on remote sensing (Landsat and LiDAR) and topoclimatic variables. Afterwards, we used Random Forest to factor out the role of different environmental factors on the observed vegetation patterns. Finally, in order to predict the general trends, and the possible expansion or regression of the different riparian vegetation formations we used the previous SDMs models but using future scenarios of temperature and precipitation. Our results show that models focusing on current distributions allow representing the general and accepted variation in riparian vegetation structure and compositional patterns observed by botanist in this region. Climate and land uses are the two most relevant drivers determining the distribution of the actual riparian vegetation, with a clear separation between mediterranean and eurosiberian forests. Future climate change scenarios produced an expansion of thermophiles riparian formations over eurosiberian forests. This later ones moved to river reaches with higher altitude and/or with less changes on annual rainfall.

MRM.10

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BIOMASS AND AUTOTROPHIC ACTIVITY PATTERNS IN A MEROMICTIC KARSTIC LAKE

The small, karstic Lake La Cruz has been studied in different periods since the 80s by the research limnology team at the University of Valencia led by María Rosa Miracle. Its meromictic character and the seasonal thermocline development allow two maximum of stability ("Brunt Väissälä frequency") in the vertical profile, located, in the permanent pycnocline, and in the seasonal thermocline, respectively. During the period of stratification metalimnion and hypolimnion are isolated, allowing a stable micro-stratification of microbial populations and restricting the fluxes of materials and energy in the vertical profile. In this work the relative importance and dynamics of the main microorganisms is discussed both in terms of biomass and autotrophic activity. The main microorganisms in the lake are autotrophic picocyanobacteria (Pcy), nanophytoplankton, photosynthetic sulfur bacteria (GSB and PSB), picoeukaryotes (Ape) and non photosynthetic (mostly heterotrophic) bacteria (NPB). Despite the diversity of photosynthetic microorganisms Pcy are the dominant microorganisms in terms of abundance, biomass and inorganic carbon assimilation. In abundance Pcy 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 % of total, where Pcy account for 80 % of this assimilation. Integrated biomass of all primary producers Pcy, Ape, GSB, PSB and nanophytoplankton increases as the stratification develops from spring until autumn. Biomass of "NPB" in this period is coupled to primary production. However, winter vertical mixing produces a very significant gap in the coupling; photosynthetic biomass decays, mainly due to nanofitoplacton, part of this biomass, settles to the monimolimnion or is mineralized in the mixolimnion, which has also been fertilized with hypolimnetic nutrients after mixing. This keeps the bacterial biomass "NPB" in high values without relying on "fresh" primary production, which is very low in that period. Dissolved oxygen demand rises, causing low oxygen concentrations in winter mixolimnion. This winter mineralization process, together with the vertical mixing, are responsible of a higher nutrient availability, especially phosphorus, that Pcy accumulate efficiently, allowing its fast spring development.

MRV.05

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WILDFIRES ON MEDITERRANEAN BASINS: NEW SMALL BANGS AFTER DE VERY OLD BIG BANG

Maximum Wildfires occurs after a big concentration of combustible materials ready to expand to any ignition. A process similar to the big bang but, younger, with a local dimension and occurring inside the space and the time created by the ancestral big bang. This expansion interferes with the pre-existent space and time, being trapped by it or disrupting it. A set of spatial and temporal contractions and expansions on ecological gradients occurs through the four dimensions of the aquatic ecosystems, originating a complex mosaic of temporal and spatial scales. Concerning Mediterranean rivers, this complexity increases due to the seasonality. Just after the wildfires (short temporal dimension) a set of outputs were produced, covering a gradient of sizes (soluble components, fine particulate organic and inorganic material, coarse particulate organic material and large woody debris diverse on sizes and shapes). The expansion of these materials to the rivers depends on rainfalls intensity (medium temporal dimension), but its export, by flow pulses, depends on their sizes: smaller sizes arrive quickly (short temporal scale) while bigger ones spend much more time (long temporal scale), a set of temporal scales that also depends on landscape barriers to the flow as well as on use of the soil. Once inside the rivers, another complexity arrives, because they are going to influence in a direct way biological communities (soluble and particulate materials – shorter spatial scale) or indirectly producing habitats (large woody debris – bigger temporal scale). The expansion of wildfires impacts downstream is also a complex dynamic among time (short to big temporal scales), space (local to distant), transport energy (different size and shapes) and river morphology and slope (different trapping efficiencies). Concerning Mediterranean rivers, the accentuated seasonal fluctuations tend to increase the recovery of the communities after wildfires, but a continuous dynamic footprint is still detectable by burned large woody debris (large spatial scale) and charcoal morpholytes inside fine sediment (small spatial scale). In fact, wildfires on Mediterranean rivers are a very long story, not yet totally told, merging sizes and forms (from soluble to tree trunks), space (from site/reach to basin) and time (few minutes to decades).

AFC.04

Pla-Rabés, Sergi; Catalán, Jordi

CREAF

UNDERSTANDING THE TEMPORAL AND THE SPATIAL PARTITIONING OF SILICEOUS ALGAE AND THEIR USE IN PALEOLIMNOLOGICAL RECORDS

Siliceous algae (Bacillariophyceae and Chrysophyceae) are an important component of communities from freshwater ecosystems that have been extensively used in palaeolimnology to reconstruct past environments. However, sediment samples are a composite taphonomic assemblage of diatom frustules and chrysophyte cysts remains from different lake habitats. Chrysophytes are mainly planktonic, but they show high seasonal replacement (turnover) through the growing season. Understanding this temporal partitioning allows the interpretation of sediment records in terms of seasonal variability. Diatoms can be planktonic and benthonic. Lake ecosystems show a diversity of benthic habitats characterized by the variation in substrate, light and nutrients, and seasonal stability. This spatial differentiation and the environmental differences associated to them are apparently lost in the taphonomic assemblage of the sediment record. However, understanding the fine relationship between species and habitat can significantly enrich the paleorecords interpretation.

ISR.02

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¹*Sorelló, Estudis al Medi Aquàtic*

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GROWTH AND DEMOGRAPHY OF MINNOW (*PHOXINUS PHOXINUS*) IN HIGH MOUNTAIN LAKES OF THE PYRENEES: INITIAL RESULTS OF THE PROJECT LIFE LIMNOPIRINEUS

Nowadays, more than half of Pyrenean high mountain lakes are occupied by fish, as a result of a historical process of introductions dating back to centuries ago, and that has been accelerated during the last 60 years. Minnow (*Phoxinus phoxinus*) has been stocked in many lakes since the late 70s due to its use as live bait or forage fish for salmonids previously introduced. The specific impacts of the introduction of fish include, among others, the transformation of the ecosystem structure and trophic relations, and the reduction and extirpation of native species.

The project LIFE LimnoPirineus (LIFE13 NAT/ES/001210), started in 2014 and includes among its main objectives the restoration of eight high mountain lakes with fish (trout or minnow) and the recovery of native species of European interest, either by eradication or intensive control of introduced fish, depending on the size of the lake.

We have carried out surveys to assess fish populations in lakes in the area. We also have begun minnow removal operations in four of the planned lakes. Sampling was based on the combined use of nets, traps, and occasionally electrofishing. Catches have been measured, weighed and sexed, on site. Individual age has been determined by otolith reading. Initial results on individual growth and demography are presented for eight of the lakes surveyed. Minnow had a high longevity in all lakes, which exceeds or equals the maximum for the species described so far. Natural mortality is generally low, but strongly dependent on the specific conditions of each lake. In Lake Closell, where the eradication of minnow has been practically completed, there has been a progressive increase in the growth rate, clearly attributable to the dramatic reduction of intraspecific competition.

EBC.04

Prado, Patricia; Caiola, Nuno; Ibáñez, Carles

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WATER MANAGEMENT CAUSES PERVASIVE IMPACTS ON AQUATIC COMMUNITIES AND DISRUPT FUNCTIONAL PROCESSES IN MEDITERRANEAN COASTAL LAGOONS.

Coastal lagoons of the Ebro Delta (Catalonia, Spain) have been subjected to historical reductions of their hydrological connections with the sea and to freshwater discharges from rice agriculture, with a more recent switch to freshwater inputs from the Ebro River to improve their trophic state. As a result, the seasonal salinity regime in three formerly connected coastal lagoons varies from polyhaline to oligohaline from May to November, whereas in winter all the systems are polyhaline. We adopted a multiple community-level structure (macrophytes, fish, macrofauna, zooplankton, and zooplankton) and functional approach (fish feeding relationships using stable isotope analyses (SIA) and overall food-web properties using ecological network analysis (ENA)) to evaluate potential alterations resulting from the implementation of the current water management. Our results showed important structural and compositional differences across lagoons at all community levels, particularly in between the Tancada and the Clot lagoon, subjected to more contrasting seasonal fluctuations in salinity. For the entire food-web, SIA showed more depleted $\delta^{13}\text{C}$ signatures in the Clot lagoon, followed by the Encanyissada lagoon, indicative of higher supply of freshwater C. For $\delta^{15}\text{N}$, particularly high values were detected in the submersed vegetation together with more enriched sediment values at lower salinities, suggesting that historical loadings of agricultural fertilizers are still retained by the systems and transmitted across trophic levels. Variability in stable isotope composition across the food web resulted on important differences in the fish dietary contributions, presumably due to changes in the abundance of food resources among lagoons. In addition, results from ENA showed that seasonal variability in the fluxes of the entire ecosystem was both controlled by the influence of salinity on plant species and by fluctuations in the abundance of phytoplankton. Overall, we conclude that freshwater discharges results on pervasive impacts on aquatic producers and consumers, deeply altering the productivity and the C fluxes within ecosystems, and we advise the implementation of management actions based on the natural functioning of ecosystems.

MRV.02

Prat, Narcís

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MARIA RIERADEVALL (1960-2015): GENEROSIDAD, AUTO-EXIGENCIA, PERSISTENCIA Y CREATIVIDAD

Las científicas son personas que como tales tienen sus virtudes, manías y fobias que marcan su camino. De otra parte las circunstancias que rodean su vida pueden marcar de forma inesperada su trayectoria. Maria Rieradevall fue una científica generosa con su tiempo para los demás, autoexigente en el trabajo, persistente para lograr sus metas y muy creativa. Maria quería ser bióloga marina pero el destino se le cruzó en un pasillo de un departamento universitario y acabó siendo limnóloga y una de las mejores especialistas en quironómidos de Europa. Maria era muy inquieta, preguntona y muy generosa con su tiempo para los demás. Tenía un gran sentido de la responsabilidad y era una gran organizadora. Nunca regateaba un minuto a los alumnos ni parecía tener prisa en los encuentros con sus estudiantes. Fue Maria una persona muy autoexigente y exigente con los demás lo cual enriqueció mucho el trabajo de muchos y retrasó el suyo. Le tocó ser muy persistente para poder llegar a sus metas, no tuvo beca para realizar su tesis, siempre quedaba en segundo lugar en los concursos de ayudante (siempre ganaba un hombre), y le tocó conquistar su plaza de titular en otra universidad para poder volver a la suya. Se lo pusieron difícil pero ella persistió hasta llegar. Fue una mujer muy creativa, una verdadera artista que supo plasmar en dibujos y esquemas detallados y claros muchas de las ideas y resultados de los demás. Su falta de egoísmo en el uso del tiempo explica que algunos de sus índices de impacto sean menores de lo que podrían haber sido. La vida no le ha regalado los años de madurez que ella necesitaba para disfrutar de los frutos de su trabajo. Para los que la conocimos su recuerdo será imperecedero. A través de los trabajos de biomonitorio del grupo de investigación F.E.M. haremos un recorrido por estas facetas de la vida de Maria.

GCI.05

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CHAROPHYTES AND CLIMATE CHANGE: FORESEEABLE RESPONSES TO SEVERAL STRESSORS

The projections of the Intergovernmental Panel on Climate Change for future climate foresee an intensification of the hydrological cycle in regions such as the Mediterranean. This would culminate in an increase in temperatures, a decrease in precipitation, with a likely water level decrease in shallow waterbodies and with the consequence of higher UV-radiation penetrating to deeper layers, reaching macrophyte beds. Moreover, the increased evaporation will increase the water salinity and will result in the concentration of nutrients in the water column. Therefore, knowledge of the relationships between the effect of climatic stressors and biotic processes is needed to better understand the impact of future climatic changes on submerged vegetation structure, dynamics and functioning. Charophytes are an important component of submerged vegetation communities. Here we explore, through four laboratory experiments, how increases in temperature, salinity, nitrate concentrations and UV radiation affect some functional traits of several charophyte species (such as the investment in vegetative growth, architectural morphology, metabolism, etc.). The model species were *Chara hispida*, *C. vulgaris* and *C. aspera* from different origins. Responses occurred (i) when facing relative small increases of stressors, (ii) in the short-term, (iii) and they were species specific (for example, only *C. vulgaris* developed more nodes and increased branches per nodes, causing a more horizontal distribution of biomass due to a rise in temperature). Tolerance to temperature increase depended on the origin of populations (significant effects of the temperature \times population-origin interaction for biomass, length and branch production in *C. vulgaris* populations from two differentiated altitudes). Thus, these different intraspecific responses to warming might impact the ecotype distribution and diversity. *C. aspera* growth was favoured by a 4°C rise in temperature and a 10-fold increase in salinity when considered separately, but was hampered when these changes co-occur; *C. hispida* growth did not change with the temperature increase but was negatively affected by the salinity; *C. vulgaris* growth was enhanced by the temperature and clearly damaged when salinity increased. Therefore, in order to develop realistic predictions on expected ecosystem shifts, we stress the need to focus on charophyte ecological responses to multiple, simultaneous drivers of climate change.

EIC.10

Pujante, Ana M.; Rodríguez, Sara; Torrijos, Luís; Gracia, Raúl

Laboratorios Tecnológicos de Levante, S.L.

REVISIÓN DEL LISTADO DE TAXONES PARA EL CÁLCULO DEL ÍNDICE IBMWP

Para el cálculo del índice IBMWP hay que utilizar el protocolo IBMWP-2013 elaborado por el Ministerio de Agricultura, Alimentación y Medio Ambiente (MAGRAMA). En el anexo I de dicho protocolo se presenta la puntuación de las 125 familias (incluyendo el superorden Acariformes, la clase Ostracoda y la clase Oligochaeta). Para la correcta clasificación del estado/potencial ecológico mediante el índice IBMWP es imprescindible que dichas familias y sus puntuaciones reflejen la diversidad de la fauna bentónica de invertebrados en España. El Real Decreto 817/2015, de 11 de septiembre, señala que los protocolos oficiales elaborados por el MAGRAMA requieran de una actualización periódica, por ello es conveniente que los anexos I del protocolo IBMWP-2013 y II del protocolo MI-Rv-I-2013 sean revisados y actualizados. La presente comunicación propone la inclusión o eliminación de familias de invertebrados y la corrección de errores en ambos anexos.

En primer lugar se propone la posible inclusión de las siguientes familias: Hydroscaphidae, Sphaeriusidae, Anthuridae, Niphargidae, Sphaeromatidae, Muscidae, Chaoboridae, Pediciidae, Isonychiidae, Hebridae, Semiscolicidae, Osmylidae, Sisyridae, Acroloxidae, Margaritiferidae, Melanopsidae, Moitessieriidae, Macromiidae, Apataniidae, Helicopsychidae, Pseudoneureclipsidae y Ptilocolepidae. En todos los casos la propuesta incluye una puntuación provisional para el cálculo del índice IBMWP.

En segundo lugar se propone la eliminación de las familias: Thiaridae, que tiene como único representante en la Península Ibérica a la especie *Melanoides tuberculatus* que está incluida en el catálogo de especies exóticas invasoras (Real Decreto 630/2013); Viviparidae también con una única especie citada, *Viviparus viviparus*, que es introducida y Molannidae, cuya presencia en la Península Ibérica esta cuestionada.

Por último se proponen las siguientes correcciones: cambiar el nombre de la familia Scatophagidae por Scathophagidae, el de la familia Polymitarciidae por Polymitarciidae, el de la familia Cordulegasteridae por Cordulegasteridae; asignar la familia Sialidae al Orden Megaloptera (no al Orden Neuroptera); eliminar Pyralidae (todas las larvas de Lepidópteros acuáticos pertenecen a la familia Crambidae) y cambiar la familia Ancylidae por el género *Ancylus*.

AEB.03

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EFFECTOS DE LA DEPREDACIÓN Y DE LA COMPETENCIA SOBRE LA DIVERSIDAD DE TAMAÑOS EN ECOSISTEMAS ACUÁTICOS

Se han analizado los efectos de la presión de depredación y la competencia por los recursos en la diversidad de tamaños de asociaciones de fitoplancton, zooplancton y peces de diferentes ecosistemas acuáticos de agua dulce, de transición y marinos. Sólo se han encontrado relaciones débiles, lo que indica que la depredación y la competencia no son los únicos determinantes en la distribución de tamaños. Sin embargo, se han observado ciertas regularidades. La diversidad de tamaños disminuye cuando aumenta la presión de depredación. Por el contrario, los efectos de la competencia dependen del nivel trófico considerado. En los niveles tróficos superiores (zooplancton y peces), la distribución de tamaños son más diversas cuando la disponibilidad de recursos es baja, lo que sugiere que las interacciones competitivas promueven una diversificación de las comunidades acuáticas por el tamaño corporal. Este patrón no se observa en las distribuciones de tamaños de fitoplancton donde la diversidad de tamaños aumenta con el aumento de la disponibilidad de nutrientes. También, en determinados ecosistemas se ha observado un efecto de cascada trófica basada en el tamaño corporal. Nuestros resultados sugieren que la presión de depredación lleva a una acumulación de organismos en las clases de tamaño menor depredadas, mientras que la competencia tiende a favorecer una distribución de tamaños más amplia.

EIC.13

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THE EFFECT OF LUNAR PHASE ON THE DISTRIBUTION OF CATCHES OF EUROPEAN EEL, *ANGUILLA ANGUILLA* (L.), IN SOUTHERN SPAIN

The European eel (*Anguilla anguilla*) is an extraordinary migratory species, still widely distributed in Europe. Since the 1970s, eels have been in decline at all life stages throughout the entire European continental range, and since 2008 the species has been listed on the IUCN Red List as critically endangered. In this context it is basic to understand the factors related to eel behaviour, mostly if the abundance estimates of *A. anguilla* may be affected. There are indications that the onset of the eel spawning migration is affected by lunar periodicity. In addition, some studies have shown that catches of eels increased during the last quarter of the lunar cycle and decreased during full moon. In this study we report the quantitative influence of lunar phase and general illumination at night on eel catches at their southernmost distribution area. This information will be of great importance to the future design of surveillance campaigns of this species to examine its current status. A total of 116 sites, in 37 river basins, were sampled during 2013 throughout the coasts of Andalucía. Eels were captured with a combination of two type of fyke nets set at each site during the night. We explored the influence of river discharge, lunar illumination, water temperature, and cloud cover on eel catches, usually more abundant with lower illumination and/or lunar phases near to new moon. In addition, a relationship between the percentage of illumination and the average length of eels was observed. These results highlight the importance of temporal sampling design to establish the eel distribution and status.

RLW.09

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THE ECOLOGICAL IMPACTS ON CHIRONOMID ASSEMBLAGES OF THE HUMAN COLONIZATION AND CLIMATE FLUCTUATIONS INTERPLAY ON OCEANIC ISLANDS – THE AZORES ARCHIPELAGO CASE STUDY

In the Azores archipelago, the most remote archipelago of the North Atlantic region, both climate changes and human colonization have significantly modified the ecosystems of islands. A 270 cm long sediment core from Empadadas Norte Lake in São Miguel island (Azores) was studied to assess the impact of environmental and climate changes on chironomid assemblages for the last ca 660 yr. Changes in the chironomid community were recorded by studying the chitinized head capsules of the larvae present in the sedimentary sequence. The results show shifts in community assemblage coinciding with the time of first water extraction (1526 AD). Another shift was detected in (1646 AD), it is reflected by the increase of some chironomid taxa associated with aquatic macrophytes, such as the *Psectrocladius sordidellus* group. At the same time, an increase of TOC and TN content with similar TOC/TN values would point to a primary algal origin of the organic matter probably as a consequence of the deforestation that started previously. Chironomid associations are particularly sensible to the fish introductions in the lakes. Consequently, the major shift detected in chironomid assemblages was coincident with the time of introduction of goldfish (around 1791 AD); the abundance of chironomids was about 70 % greater in the fishless lake period compared to the period in the presence of predator. Coinciding with the introduction of *Carassius auratus* an increase in TOC and TN content was observed, which might be probably related to goldfish detritivorous bottom feeding strategy, amplified by: major climate oscillations (precipitation regime) and anthropogenic activities in the catchment. In fact, the chironomid assemblages' fluctuations also coincide with major climate oscillations. Both the warm and arid period of the Medieval Climate Anomaly (1000 - 1300 AD) and the current Global Warming (1965 AD - onwards) favoured the occurrence of warmer taxa, which were absent during the Little Ice Age (ca. 1450 - 1850 AD) cold period. The results highlights the interplay that human and climate forcing's might have in the environmental evolution of the islands' ecosystems.

EBC.01

Rasines, Rubén; Meffe, Raffaella; Carreño, Francisco; Mostaza, David; Sundberg, Anna; Iepure, Sanda

Instituto IMDEA-AGUA.

PATTERNS OF GROUNDWATER COPEPODS AND OSTRACODS BIODIVERSITY AND DISTRIBUTION IN RELATION TO AQUIFER TYPES IN CENTRAL SPAIN. HYDROGEOLOGY VS. ENVIRONMENTAL FACTORS

One of the current issues in groundwater ecology is to predict the groundwater biodiversity and to determine the causalities of species distribution patterns at different spatial scales. There have been considerable progresses in systematic mapping of biodiversity and distribution belowground ecosystems. Nevertheless, there are still highly incomplete records from distinct aquifers types (karstic vs porous) in the Southern Europe, that hindrance our attempts in understanding the local and regional variations in subterranean biodiversity and community structures and to develop evolutionary models to explain the differences in biodiversity among remote aquifers at continental level. We here aim to provide a qualitative record of groundwater copepods and ostracods community's biodiversity and distribution across distinct types of aquifers from central Spain and discuss the influence of environmental and hydrogeological factors. The underlying hypothesis is that the current diversity and distribution patterns of groundwater species are reflected by the aquifers typologies, hydrogeological conditions, on-site environmental attributes and past and present regional climate.

The groundwater samples originate from 30 boreholes from three types of aquifers: Quaternary alluvial and Tertiary detrial aquifers (porous); the Moor Limestone Mesozoic and Tertiary aquifers (fractured); and Carbonate Jurassic aquifer. Boreholes were seasonally monitored for physicochemical and stygofauna analyses between 2012 and 2014. The groundwater crustacean communities were highly heterogeneous and patchily distributed, influenced by aquifer's water geochemical properties and heterogeneity in the habitat structure). The highest biodiversity with stygobites and non-stygobites species was detected in the alluvial aquifers, as a result of the active water exchanges; whereas the deep Tertiary aquifers were less diverse but contained a significant fraction of stygobite species. All types of aquifers could be clearly distinguished based on crustacean communities structural patterns, indicating their effectiveness proxies to delineate the aquifers boundaries, in analogy with the physicochemical water signature criteria. Therefore we target to provide a first attempt in scrutinizing the pattern of groundwater biodiversity assessment in aquifers from central Spain and to help advance the understanding of regional biodiversity and distribution patterns in Southern Europe. We also aim to contribute to the global efforts for an integrated management of groundwater bodies.

RLW.02

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EVALUATION OF TEMPORAL TRENDS OF MICROBIAL MATS IN LA SALADA GRANDE DE CHIPRANA (RIVER EBRO BASIN, NE SPAIN) OVER THE LAST 20 YEARS

La Salada Grande de Chiprana is the only permanent hypersaline inland lake in Western Europe and was included in the Ramsar Convention in 1994 because of its singular ecological value.

Data collected over the last 20 years by the river Ebro Water Authority and the regional government of Aragón have been analysed to detect temporal trends in the microbial mats, which cover the shallow sediments of the lagoon. These unique communities are dependent on changes on salinity, water level and nutrient loadings. Different types of mats were identified and classified according to their microorganism composition. Resulting types had different macroscopic structure, compactness and colour, depending on their distinct aggregations of algae and bacteria, which form these laminated systems. These different types range from non-compacted and very young mats to very structured and compacted mature microbial mats. Initial studies described eight different types of microbial mats: type A = young mat; types B1 to B5 = mature mats; and types C6 to C7 = altered mats. Since 1995, microbial mats (types and cover) have been monitored as well as phytoplankton and benthic communities along with hydromorphological and physicochemical parameters. Over this period, total microbial mat cover has significantly decreased as well as the number of different types of mats whereas conductivity has significantly increased (from a minimum of 48.6 mS/cm in 1995 to maximum of 95.6 in 2012). Macrophytes have also disappeared, including the endemic charophyte *Lamprothamnion papulosum* var. *papulosum* f. *aragonense*.

Total cover of six dominant microbial mat types has been related to those selected factors that might affect their development, such as water depth, conductivity, and nutrient concentration. Mature mats whose cover has decreased or disappeared over this period (i.e. types B4 and B5) significantly correlates with conductivity ($r = -0.86$) and/or water level ($r = -0.881$). Each type presents its optimum according to conductivity and water depth.

Upon yearly assessment of the ecological status of the lagoon, management measures are proposed and corrective measures are applied for the sustainability and biodiversity preservation of this lagoon and its unique ecological communities.

RLW.04

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DISTRIBUCIÓN DE ALGAS EPILÍTICAS EN CUENCAS DE LA VERTIENTE ATLÁNTICA DE ANDALUCÍA

Las algas epilíticas de las cuencas del Guadalquivir y Guadalete se estudiaron durante las primaveras de 2004 y 2005. Esta flora es muy variada, dada la diversidad de ecosistemas acuáticos y de las perturbaciones que sufren. Se han analizado los datos de 33 tramos distribuidos en las tres unidades hidrogeológicas de la zona: Sierra Morena (SM), Montañas Béticas (MB) y Valle del Guadalquivir (VG), identificando 463 taxones. Hay pocos taxones presentes en todas las unidades hidrogeológicas (*Heteroleibleinia leptoneima*, *Leptolyngbya foveolarum*, *Achnantheidium saphophilum*, *Achnantheidium minutissimum*, *Cocconeis placentula*, *Amphora pediculus* y *Amphora veneta*). Se han identificado taxones exclusivos en SM: *Calotrix* sp., *Lyngbya* aff. *hieronymussi*, *Rhopalosolen saccatus*, *Cymbella leptoceros*, *Karayevia clevei*. En las MB los taxones exclusivos han sido *Heteroleibleinia kuetzingii*, *Jaaginema angustissimum*, *Heteroleibleinia kossinskajae*, *Navicula subalpina*, *Nitzschia communis* y *Amphora normanii*. En el VG no se han registrado taxones exclusivos. Pero si se han registrado taxones que aparecen también en algunos tramos bajos de las MB: *Chamaesiphon minutus*, *Phormidium* aff. *aerugineo-caeruleum*, *Phormidium inundatum* y *Phormidium kuetzingianum*. Sólo un 4 % de los taxones tienen una frecuencia de aparición en más del 30 % de los tramos, mientras que más del 50 % de los taxones tienen una frecuencia de aparición menor al 5 %.

Se ha realizado un MDS con los biovolúmenes de los datos cuantitativos observando una tendencia de agrupación según estas unidades pero, realmente, el factor más discriminante es la localización en las subcuencas (ANOSIM $R = 0,670$). Un análisis SIMPER ha determinado los taxones más representativos de cada subcuenca. Los taxones con mayor contribución son *Cladophora* spp. (en Guadalquivir y Retortillo), *Nitzschia fonticola* (en Bembezar), *Cocconeis placentula* (en Rivera de Huelva, Rivera de Húeznar, Retortillo, Guadiato), *Gomphonema pumilum* (en Rivera de Huelva), *Navicula cryptotenella* (en Rivera de Húeznar), *Nitzschia frustulum*, *Nitzschia dissipata*, *Nitzschia capitellata* (en Genil), *Oedogonium* sp. (en Guadiato), *Cocconeis pediculus* (en Retortillo), *Navicula cryptocephala*, *Nitzschia palea*, *Phormidium* aff. *aerugineo-caeruleum* (en Guadalete), *Lyngbya* aff. *borgeti*, *Surirella angusta* y *Achnantheidium minutissimum* (en Guadiamar, con fuerte impacto minero). Los resultados de taxones exclusivos se han avalado con un muestreo multihábitat de 109 tramos de las cuencas estudiadas.

FEF.02

Rezende, Renan S.^{1,5}; Graça, Manuel²; Santos, Anderson M.³; Medeiros, Adriana O.⁴; Santos, Paola F.³; Nunes, Yule R.F.³; Júnior, José F.G.¹

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ORGANIC MATTER DYNAMICS IN A TROPICAL GALLERY FOREST IN A GRASSLAND LANDSCAPE

We assessed litterfall, leaf litter breakdown, density and biomass of aquatic invertebrates and the microbial biomass and sporulation of aquatic hyphomycetes in a South American grassland “Vereda” landscape for a year. Litter production in the riparian area was low (365 g m⁻² year⁻¹ falling onto the riparian area and 181 g m⁻² year⁻¹ falling directly into the stream), but leaf litter breakdown was high compared with other South American systems ($k = 0.033$; range 0.013 – 0.084), with maximum values coinciding with the rainy season. Fungal biomass in decomposing leaves was high compared with other South American studies (mean 549 µg ergosterol g⁻¹; range 290 – 1,183), but spore densities in the water were very low and the same applied to sporulation rates (mean 1.48 spores AFDM⁻¹ day⁻¹, range 0 – 6.42). Invertebrates were not abundant in litter bags, suggesting a minor role in leaf litter decomposition. Chironomids accounted for ~70 % of all invertebrates; only 10% of non-Chironomidae invertebrates were shredders. Therefore, fungi seem to be the drivers of leaf litter decomposition. Our results show that despite low productivity and relatively fast litter decomposition, organic matter accumulated in the stream and riparian area. This pattern was attributed to the wet / dry cycles in which leaves falling in the flat riparian zone remain undecomposed (during the dry period) and are massively transported to the riverbed (rainy season).

EEC.06

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BIOACCUMULATION OF CONTAMINANTS IN FISHES FROM A STREAM IN THE OLD MERCURY MINING AREA OF ALMADÉN, SPAIN.

The world’s largest mercury mine area was placed at Almadén, Spain, during more than 2000 years. Currently the mining activity is paralyzed. There is some works on the Hg concentration in water and sediments of rivers in the area. However, data on accumulation of heavy metals in aquatic biota are scarce. The concentration of heavy metals and metalloids were analyzed in the muscle of 7 fish species in the river Valdeazogues, downstream of the main mercury mines. Fishes analyzed are 5 native species (*Luciobarbus comizo*, *Squalius alburnoides*, *Squalius pyrenaicus*, *Pseudochondrostoma willkommii*, *Cobitis paludica*) and 2 alien species (*Cyprinus carpio*, *Lepomis gibbosus*). After a first semiquantitative analytical has been detected a significant bioaccumulation of Hg, methyl-Hg, Cu, Zn, As, Ba, and Pb. Other dangerous metals, such as Cd, have been below detection levels. Most individuals of species *L. comizo* (90 %), *S. alburnoides* (100 %), *S. pyrenaicus* (100 %) and *L. gibbosus* (80 %) have Hg levels above recommended. Special attention must be given to the levels of methyl-Hg because it represents between 91 and 97% of total Hg in all species. Moreover, Pb levels above the recommended also occur in the species *C. paludica*. *S. alburnoides* reaches maximum values for Cu (2.52 ppm dw), Zn (184.03 ppm dw) and Ba (16.02 ppm dw); *S. pyrenaicus* for Hg (9.05 ppm dw), metil-Hg (8.12 ppm dw) and As (0.58 ppm dw), and *C. paludica* for Pb (1.45 ppm dw) and V (0.16 ppm dw). Statistical analysis was performed between metal concentrations, and between them and the size and trophic position.

MRV.10

Ríos-Touma, Blanca

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MARÍA RIERADEVALL Y SU LEGADO EN AMÉRICA LATINA

María fue muy activa en sus colaboraciones en América Latina. Sus trabajos en Chironomidae de esta región van desde reportes de géneros en los Andes, descripción de especies y trabajos a nivel molecular a trabajos detallados de relaciones foréticas entre Chironomidae y caracoles. Sus aportes fueron de mucha importancia en la generación de protocolos de medición de calidad ecológica de ríos (Protocolo CERA) e índices de calidad ecológica de ríos (IMEERA). Su entusiasmo por fortalecer procesos de educación ambiental y ciencia ciudadana fue fundamental en la creación del Protocolo CERA-S en donde diseñó la estructura sencilla, didáctica y efectiva de las fichas de establecimiento de la calidad ecológica de ríos. Participó en capacitaciones para guarda parques comunitarios en los Andes de Ecuador. Fue una colaboradora entusiasta y tuvo participó en cursos y congresos en: Ecuador, México, Bolivia, Colombia, Perú, Chile, Argentina y Uruguay. Es recordada con mucho reconocimiento y cariño por sus colegas y alumnos latinoamericanos.

FEF.20

Ríos-Touma, Blanca; Morabowen, Andrés; Ibarra, Cristina

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DIVERSIDAD ALTITUDINAL DE MACROINVERTEBRADOS ACUÁTICOS DEL CHOCÓ ECUATORIANO

El Chocó es considerado un hotspot de biodiversidad, debido a su alto endemismo y sus altas tasas de deforestación. En Ecuador es una de las regiones más modificadas, con altas presiones como la agroindustria y la minería. Las pocas exploraciones de los organismos acuáticos que se han realizado en esta región demuestran que hay una gran cantidad de especies no conocidas para la ciencia. La relación de los taxones con el ambiente no está bien entendida ni descrita, lo cuál es fundamental tanto para evaluar el estado ecológico de los ríos afectados por las actividades humanas, así como para entender los procesos geomorfológicos y ecológicos que sostienen esta diversidad con el fin de proteger las zonas aún conservadas. Nuestro objetivo es conocer la diversidad de macroinvertebrados acuáticos en ríos del Chocó y cuál es su relación con las variables ambientales. Para esto, realizamos muestreos de macroinvertebrados acuáticos en ríos del Bosque protector Mashpi, en el Chocó de Ecuador. Escogimos 3 ríos en cada una de tres altitudes: 1200, 800 y 600 msnm. Realizamos un muestreo de todos los hábitats del cada río, muestreando al menos 90 cm² por cada hábitat, usando red Surber y con toma de datos ambientales. Hemos identificado 100 géneros de macroinvertebrados en toda la gradiente altitudinal de los ríos de Mashpi. Los géneros más abundantes encontrados fueron: *Metrichia*, *Heterelmis*, *Neoelmis*, *Chimarra*, *Polycentropus*, *Atanatolica* y *Nectopsyche*. Existe una fuerte relación entre el hábitat y la composición de la comunidad, así como una variación de la diversidad y abundancia de algunos géneros en la gradiente altitudinal. Los ríos de Chocó, presentan una alta diversidad y recambio de especies en la gradiente altitudinal relativamente corta. Los ríos de las zonas bajas del Chocó son los más afectados por las actividades humanas. La protección de la cabecera de los ríos, sí bien protege la calidad del agua, no protege toda la diversidad del área, porque hay géneros exclusivos de zonas bajas. El conocimiento de la diversidad de los ríos tropicales sigue siendo escaso y es determinante para la protección efectiva de la biodiversidad dulceacuícola.

MFE.02

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EFFECT OF MAIN ENVIRONMENTAL STRESSORS IN THE CARBON RELATED METABOLISMS OF WETLANDS FROM TWO LOCATIONS OF THE MEDITERRANEAN REGION

Wetlands management plans require the understanding of relationships between multiple stressors and ecosystems function. We focus here in how metabolisms related to carbon fluxes respond to some key environmental factors (i.e., temperature, salinity, flood level, nutrients). Several manipulative experiments were conducted in both inland saline and coastal wetlands from the Mediterranean region, in the context of research projects funded by Fundación Biodiversidad (i.e., CarbonPractic and CarbonNat projects), in which photosynthesis, aerobic respiration, and methane emission were measured after water and sediment exposure to different magnitudes of such factors. Responsiveness to stressors varied among metabolic activities, wetland typology and lake compartment (i.e., planktonic and benthic). In all cases, methane emissions showed a strong positive response to temperature increases and negative to increased salinity, suggesting the occurrence of a subsidy-stressor relationship as temperature increment is also expected to enhance evaporative concentration. Photosynthesis and aerobic respiration usually responded similarly, particularly in the plankton, where physiological acclimation was higher compared to the benthic compartment. Although respiration usually exceeded photosynthesis in these cases, a coupling was observed among these activities to temperature and salinity shifts, at least with regards to the planktonic compartment. Under such conditions, methane production appears to be the major process regulating carbon fluxes. Our results demonstrate how these environmental factors might interplay in determining the carbon budget of these Mediterranean wetlands, with synergistic and antagonistic effects, considering that predicted temperature increases and rainfall decreases in the Iberian Peninsula in the wake of climate warming would drive to shorter flooding periods and likely increasing water salinity.

RLW.14

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THE USEFULNESS OF A DECISION MAKING BASED ON A GIS APPROACH FOR MANAGING POND NETWORK CONSERVATION: A CASE STUDY IN DOÑANA NATIONAL PARK

In this communication we will illustrate and discuss the possibilities of the use of Geographic Information Systems through a multi-criteria analysis, based on parameters for the prioritizing and selecting potential areas for conservation.

Degradation and loss of aquatic ecosystems are increasing; it is therefore that the Water Framework Directive has designated preferred conservation. Wetlands represent a shelter for a great number of specialized species, and their conservation is crucial for keeping their survival. The case study selected is a pond network located at Doñana National Park (DNP, SW of Spain). It is one of the most important protected natural areas in Europe, in terms of biodiversity conservation, due mainly to the habitat heterogeneity of the ecosystems presented.

We have applied a hierarchical methodology in order to identify local conservation priorities in Doñana pond network. The vulnerability of habitat, the species diversity and the connectivity among water bodies were the criteria selected. The result of our study discriminates two priority areas for which would be necessary to propose or improve some conservation and management measures. The first one corresponds to the peridune ponds, harboring more species richness and higher density of ponds. It is in these areas where the ponds have higher hydroperiod; being the only that remain flooded during the driest periods. In addition, the high density of water bodies promotes both connectivity and heterogeneity, a key factor for the reproduction and spread of organisms. The second one is the north of the sandy area, which is more exposed to different human activities. This has as consequence the destruction and degradation of habitats, due to, for instance, the over-exploitation of the groundwater, the intensive agriculture and the proximity of urban centers.

One of the main advantages of the proposed methodology is the ease by which we identify the localities (in our case study, water bodies) that need a special attention, using only territorial variables based in spatial aspects. This will allow maximizing your time and reducing the cost that would assess in situ, being this the first step in the establishment of management priorities. The proposed method provides a simple, economical and effective tool to manage any other study area.

MRM.08

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FLUCTUACIONES DE NIVEL EN RESPUESTA A LA VARIABILIDAD HIDROCLIMÁTICA REGIONAL; LAGUNILLO DEL TEJO (CUENCA) MODELO BASADO EN INDICADORES PALEOLIMNOLÓGICOS INDEPENDIENTES

Los sedimentos lacustres registran una valiosa información sobre la variabilidad climática. A partir de parámetros físicos, compuestos químicos y restos biológicos se puede inferir la rapidez, la magnitud y la dirección de cambios ambientales naturales o bien, debidos al impacto antrópico. No obstante, interpretar la señal sedimentaria precisa de un amplio conocimiento previo del sistema lacustre en cuestión. Nuestro estudio paleolimnológico en una pequeña laguna en el centro de la Península Ibérica, el Lagunillo del Tejo, pretende servir de modelo para inferir fluctuaciones hidroclimáticas en otros sistemas de características similares. El análisis de pigmentos, diatomeas y restos de cladóceros presentes en una secuencia sedimentaria recuperada en la zona más profunda del Lagunillo del Tejo indicaba con una alta coherencia la alternancia de dos comunidades biológicas diferentes durante los últimos dos siglos; una vinculada al litoral y la otra de carácter planctónico. La prevalencia de una u otra se debe a las drásticas fluctuaciones interanuales de nivel de agua en respuesta a la variabilidad hidroclimática regional. Los datos recopilados durante los últimos treinta años por el grupo de Limnología de la Universidad de Valencia fueron clave para entender e integrar la señal climática registrada por los diferentes indicadores. Los resultados de este estudio junto con nuevos datos paleolimnológicos obtenidos en otros registros lacustres recientemente en la Península Ibérica han contribuido a la caracterización de la variabilidad hidroclimática en la cuenca Mediterránea. Comprender las características de la variabilidad natural mas allá del registro instrumental resulta clave para entender el complejo sistema climático y estimar escenarios de cambio futuros que permitan la planificación de medidas de adaptación para reducir la vulnerabilidad de zonas especialmente sensibles como la cuenca Mediterránea.

IDE.02

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EFFECTS OF PLANT ARCHITECTURE AND WATER VELOCITY ON SEDIMENT RETENTION BY SUBMERGED MACROPHYTES

Macrophytes play a key role in the structure and function of aquatic ecosystems and can be regarded as 'biological engineers', reducing local flow velocities, altering turbulence structure and increasing habitat complexity and heterogeneity. Macrophytes also act as retentive structures by modifying sediment dynamics through the accumulation and stabilisation of fine-grained cohesive sediments around the bases of the plants and by trapping suspended organic detritus and inorganic particles in and around their leaves and stems. However, little is known about the effect of macrophyte architecture on the retention of fine organic and inorganic particulate matter. In this study, we quantified the amount of organic and inorganic fine particulate matter retained by three different macrophyte species (*Potamogeton pectinatus*, *Ceratophyllum demersum* and *Myriophyllum spicatum*) having two contrasting plant architectures 'mesh-like' and 'strap-like'), to test the role of plant architecture and water velocity on sediment deposition and retention. Results show that architecture plant and flow velocity are linked and play an important role on particle sedimentation/retain in macrophyte stands. Between both, architecture plant emerges as a principal factor since for a given velocity macrophytes with 'mesh-like' architecture show higher FPM than those with 'strap-like' architecture. We also observe that at high flow velocities, low organic and inorganic matter was retained in macrophyte stands. Conversely, at moderate to low (but not zero) velocities, particle settling was encouraged resulting in high deposition rates. Thus, water velocity plays a key role on particle sedimentation and transference. However, the concentrations of trapped matter (both organic and inorganic) differed significantly among seasons, indicating the existence of a seasonal cycle in the retention of fine particulate matter mainly associated with macrophyte cover (and biomass) and water velocity. Although there were seasonal and spatial variations in sediment retention in both 'mesh-like' and 'strap-like' architectures, macrophytes were effective sediment traps.

EIC.03

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MAPPING WATER QUALITY IN THE ALBUFERA OF VALENCIA LAKE WITH THE NEW SENTINEL-2 EARTH OBSERVATION SATELLITE

The remote sensing of water quality in lakes and reservoirs has been hampered so far by the lack of appropriate Earth Observation satellites, which combine the sensitivity, spatial and spectral resolution needed for retrieving information on the optically active constituents (OAC) of inland waters. This situation is about to change with the European Sentinel-2 mission (S2), whose first satellite (S2-A) was launched in June 2015 and is already operational, while the launch of the second satellite of the constellation (S2-B) is expected for mid-2016. The Sentinel-2 satellites allow mapping water bodies with a high revisit time (5 days), a spatial resolution of up to 10 meters and have a set of spectral bands suited for retrieving key variables, namely chlorophyll-a concentration (Chl-a), water transparency, suspended solids (SS) or Colored Dissolved Organic Matter (CDOM).

A first assessment on the capabilities of S2 for water quality studies was carried out in the Albufera of Valencia, a very dynamic coastal hypertrophic lagoon. Several cloud-free S2 images of the Albufera, acquired in the period November 2015 – April 2016, were downloaded and corrected for the atmospheric effects, to get water reflectances. At the same time of image acquisition, field data was obtained at several sampling points across the lake, including Chl-a and hyperspectral radiometry measurements. On the other hand, models for the retrieval of Chl-a with S2 were generated from simulations of the water radiative transfer in the lake, based on measured optical properties and realistic combinations of OAC. The models, which use S2 spectral bands indices, were calibrated with the simulated data, applied to the S2 images and validated with the field measurements. The performance of the atmospheric correction was also assessed with the field data.

The best model, based on a combination of four S2 bands, retrieved Chl-a with a small relative error ($R^2 = 0.77$; $N = 18$ and $RMSE = 18.4 \text{ mg m}^{-3}$ for the range 50-200 mg m^{-3}) and produced detailed maps of the surface Chl-a distribution, highlighting the complexity and dynamism of the lake. The result is very promising and shows the capabilities of S2 for water quality monitoring.

ISM.02

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CHANGE IN ZOOPLANKTON COMPOSITION IN PYRENEAN LAKES DUE TO FISH INTRODUCTION AND THEIR RECOVERY AFTER FISH REMOVAL

Pyrenean lakes have suffered fish introductions, the older of them dating from the 14th century with the introduction of *Salmo trutta*. However, the introduction has been more intense during the 20th century, and other species have been stocked, such as *Onchorynchus mykiss*, *Salvelinus fontinalis*, and the minnow, *Phoxinus sp.*, that can be found together with trout or alone. Previous studies have shown that trout predation in alpine lakes may result in a decline in the abundance or size of the biggest zooplankton species, but the effect of minnow has not been studied in detail. The objective of this study was to study the effects of trout and minnows on crustacean zooplankton composition. We sampled ca. 130 lakes from the whole Pyrenees from 1998 until present. We found 18 species with *Daphnia longispina*, *Cyclops abyssorum* and *Eudiaptomus vulgaris* being the most abundant species. Both trout and minnows decreased significantly the abundance and the size of crustacean zooplankton. Species richness and Shannon diversity were also significantly reduced, being lowest in the lakes where minnows were the only fish species of the lake. Lakes with minnow had more abundant species of smaller size, such as *Paracyclops fimbriatus*, likely as a result of predation on larger species. This results are part of the demonstration actions of the LIFE+ project LIMNOPIRINEUS (2014-2019) that is removing exotic fish in eight different Pyrenean lakes.

RLW.17

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DETERMINACIÓN DE ÁREAS POTENCIALES DE RECUPERACIÓN MORFO-SEDIMENTARIA EN EL TRAMO BAJO DEL EBRO A PARTIR DE SU EVOLUCIÓN HISTÓRICA.

Tal y como se ha descrito en numerosos trabajos de investigación, el tramo bajo del río Ebro ha experimentado importantes alteraciones como consecuencia de los efectos del complejo de presas de Mequinenza, Riba-Roja y Flix construidas a mediados del siglo XX. Estas infraestructuras, junto con los impactos hidrológicos y la reducción del suministro de sedimentos asociados a los cambios de uso del suelo en la cabecera de la cuenca, han generado un fuerte desequilibrio sedimentario y un cambio en el régimen de crecidas. Ello se traduce en una pérdida de competencia del río para el transporte de agua y sedimentos, elementos esenciales para el funcionamiento del ecosistema fluvial. Como consecuencia, las unidades morfo-sedimentarias del río han experimentado una modificación notable, y la movilidad del cauce se ha visto reducida considerablemente. En este contexto, las fotografías aéreas de los años 1927, 1956, 1974 y 2002 ofrecen la oportunidad de realizar una reconstrucción histórica de las condiciones morfológicas del río para estudiar su evolución, y establecer un diagnóstico de la situación morfo-sedimentaria actual. Este trabajo analiza los cambios morfológicos del tramo bajo de río Ebro durante el siglo XX como base para la determinación de áreas potenciales de recuperación de unidades morfo-sedimentarias. Se ha integrado el material fotográfico en un SIG para identificar zonas de cambio asociadas a los impactos de la regulación, con especial énfasis en la detección de zonas activas y dinámicas altamente modificadas a lo largo de la historia y ya estabilizadas en la actualidad. Para la detección de áreas potenciales de recuperación se han utilizado técnicas multi-criterio de acuerdo con variables de tipo morfológico, ecológico y de marco legal, atendiendo, a la vez, a la evolución morfológica histórica y a las condiciones actuales. El estudio determina que los depósitos activos del cauce se han reducido un 74 % respecto a la situación anterior a los embalses y se ha producido una pérdida del 35% del corredor ribereño existente a principios de siglo XX. Se han identificado 25 sectores donde la aplicación de medidas de conservación podría contribuir a mejorar el estado ecológico y sedimentario del tramo bajo del río.

EBC.03

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CONSERVATION STATUS OF FRESHWATER FISH IN THE GUADALQUIVIR RIVER BASIN, IBERIAN PENINSULA

Freshwater fish are the world's most diverse and endangered vertebrate group after amphibians. In Mediterranean areas, where freshwater biodiversity is highly endemic, the International Union for Conservation of Nature estimates that around 56% of endemic freshwater fish species are threatened. Therefore, an updated and precise knowledge about Mediterranean freshwater fish is necessary to develop management and conservation strategies. Here, we used a database composed by 285 sampling sites over the entire basin, including stream sections and reservoirs, to assess the conservation status of the fish fauna in Guadalquivir River Basin (southern Spain). Sites were thoroughly distributed along 45 sub-basins and the main channel, encompassing about 95% of the total basin area. A total of 19 fish species were collected, most of them Cyprinidae. With the exception of barbel (*Luciobarbus sclateri*), all native species had a very restricted distribution and there were no fish captured at 18.2% of the sites, being all located in rivers. Among the sites with fishes, 42.1% had at least one introduced species, with *Cyprinidae* being the family with the greatest number of exotic species. Around 60 % of the species had some of the highest IUCN threat categories (vulnerable, endangered or critically endangered) and most (>70 %) of the sub-basins sampled presented some species in these categories. These results are consistent with other studies highlighting the extremely poor conservation status of the Guadalquivir ichthyofauna and the urgent need for effective conservation measures.

MRM.05

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CAMBIOS RECIENTES EN EL ZOOPLANCTON DE L'ALBUFERA DE VALENCIA

La Albufera de Valencia es una gran laguna costera (2320 ha) rodeada de un amplio marjal dedicado al cultivo del arroz desde el siglo XVIII y situada a escasos kilómetros de poblaciones importantes. Ambos hechos condicionan su hidrología y estado actual. Con el arroz se produjo la desalinización del lago en el último cuarto del siglo XIX. Hasta 1960, praderas de macrófitos cubrían el lago. En los 70 se produce la crisis ecológica con un drástico cambio a aguas turbias sin vegetación, alcanzando concentraciones de clorofila-a de 800 µg/l en los años 80. En los 90 diversos planes de saneamiento reducen los aportes de nutrientes. A partir de 1995 se producen breves "fases claras" muy estacionales. La concentración de clorofila-a disminuyó a 200 µg/l en el 2000 (media anual) y actualmente a 100 µg/l (datos GVA). La transparencia pasa de 10 cm en los 80, a 20 cm en el 2000 y 30 cm de media en la actualidad, lo cual en un lago somero de aproximadamente 1 metro de profundidad ha permitido la aparición estacional, dispersa y en zonas someras de macrófitos.

Numerosos estudios de la Universitat de Valencia han seguido la ecología del lago. En este recorrido de casi 50 años se ha conseguido una larga serie de datos del zooplancton que se detallan en esta presentación: la biomasa de zooplancton alcanza valores actuales de 450 µg/l, de los cuales un 40% se debe a la presencia de cladóceros, mientras que en los 80 estos estaban prácticamente desaparecidos. En momento de fases claras invernales, la presencia de *Daphnia magna* eleva esta biomasa hasta más de 1000 µg/l. También ha aumentado la biodiversidad: la riqueza de especies de cladóceros ha pasado a únicamente uno (*D. magna* únicamente en invierno) a 8 especies en algunos muestreos puntuales.

Si bien la reducción de nutrientes evidencia cierta mejoría, los aportes fluviales, que transformaron la laguna salobre en aguas dulces, cada vez son menores. Acciones conjuntas de saneamiento, mejores técnicas agrícolas y mayor renovación del agua, asegurando la conectividad del medio marino, lacustre y fluvial, deben confluír para llevar este ecosistema a una mejoría definitiva.

MRV.07

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LIMNOCHEMISTRY AND TRACE METAL DYNAMICS OF THE ULTRA-OLIGOTROPHIC, HIGH-MOUNTAIN LAKE MARBORÉ, ORDESA Y MONTE PERDIDO NATIONAL PARK, PYRENEES, NE SPAIN

Lake Marboré (or Ibón de Marboré) is a high-altitude (2,605 m.a.s.l.), alpine lake situated in the central part of the Pyrenees Ridge (NE Spain) which forms part of the Ordesa and Monte Perdido National park. This emblematic lake of glacial origin is currently fed by snow and meltwater, and presents an outlet which is the headwaters of the Cinca River. Given the extreme climatic conditions prevailing in the area and the difficulty for sampling and monitoring (a thick layer of ice and snow covers the circus during most of the year) this lake has been the subject of very little scientific research. Although some palaeo-climatic studies had been performed on sediment cores, no previous investigation has been carried out on the limnology (including limnochemistry, stratification dynamics and microbial ecology) of this lake. This presentation will show the main findings and conclusions emerging from a recent study conducted in the lake during the last three years (three summer campaigns between 2013 and 2015). The main efforts were directed to understand the trophic state, stratification dynamics and water chemistry of this lake (including nutrient availability and trace metal dynamics), as well as basic parameters related with its biological activity, such as O₂ consumption and redox chemistry. Our results show that Marboré Lake is ultra-oligotrophic and its very clear waters show signs of a very low biological activity, which is typical in these high-mountain lakes. Although the lake remains chemically homogenized during the observation window (September to November), a very slight stratification was detected with small vertical gradients of temperature (3-11 °C) and electric conductivity (60-100 µS/cm) between the lake bottom (situated at around 28 m depth) and the lake surface. The pH (7.0-7.8) is not compatible with the formation of calcite in the water column, which is coherent with findings in the sedimentary record. The most interesting geochemical finding, however, relates with presence of significant concentrations of trace metals like Fe and Zn, along with suspended mineral particles (including sulfates) near the thermocline, which suggests influence of the basin geology on the lake chemistry.

AFC.10

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FLOW INTERMITTENCE GRADIENTS ALTER THE COMPOSITION, STRUCTURE AND BIOLOGICAL TRAITS OF AQUATIC INVERTEBRATES IN UNDISTURBED MEDITERRANEAN STREAMS

It is increasingly recognized that the interruption of surface flow plays an essential role in shaping freshwater communities. However, studies addressing the effects of flow intermittence gradients on the resistance and resilience mechanisms of aquatic organisms are scarce. The objective of this study was to understand the effects of flow intermittence gradients (measured as dry event duration and distance to the nearest perennial site) on the composition, structure and biological traits of benthic invertebrate communities. Benthic invertebrate samples, along with environmental variables, were collected at two riffles in 13 and 8 sites along flow intermittence gradients in the Rogativa and Fuirosos streams (Spain) on two different sampling dates (pre and post-summer drying). Significant linear changes with increasing intermittence gradients (for both metrics) were found for total richness and EPT richness (negatively in both streams), EPT abundance (negatively in Rogativa), and OCH abundance (positively in Fuirosos), OCHD abundance and Diptera abundances (positively in Rogativa). Moreover, significant linear changes were also detected for relative abundance of individuals with both passive (positively in Rogativa; negatively in Fuirosos) and active aerial modes (negatively in Rogativa; positively in Fuirosos), eggs and statoblasts (negatively in Rogativa), diapauses or dominance (negatively in Fuirosos) and none resistance forms (positively in Rogativa), and filter feeders (positively in Rogativa; negatively in Fuirosos) with increasing intermittence gradients, being those relationships higher for dry event duration than for distance to perennial sites. Our findings support the hypothesis that flow intermittence is a master variable, not only driving benthic invertebrate structure and composition, but also the distribution of biological traits along intermittent streams. The detected impoverishment of biodiversity with increasing flow intermittence corresponds to the loss of taxa susceptible to drying rather than to the selection for desiccation-resistant specialists, reflecting the key role of resilience mechanisms in Mediterranean intermittent streams. These findings have important implications for the bioassessment, management and conservation of intermittent streams, especially in the context of increasing water scarcity as a result of climate change, land-use alteration and water abstraction. This study was funded by the CLITEMP Project (330466; MC-IEF; FP7-people-2012-IEF).

AFC.05

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ASSEMBLY MECHANISMS OF AQUATIC METACOMMUNITIES IN INTERMITTENT RIVERS VARY SEASONALLY.

Understanding the mechanisms underlying community assembly is among the basic tenet of metacommunity studies. Commonly, communities are considered to be assembled through a mixture of local (i.e. environmental sorting) and regional (i.e. dispersal) factors that are relatively stable through time. However, highly dynamic systems, such as intermittent rivers, are very likely to experience temporal shifts in their community structure and thus in the assembly mechanisms involved. We analyzed seasonal changes in community composition in perennial (PR) and intermittent rivers (IR) of the Iberian Mediterranean area, and assessed the relative effect of environmental sorting and dispersal-based processes on community variability among and between both river types. We used local environmental variables to assess environmental sorting, and considered overland, network and topographical distances as different dispersal surrogates. We found that the relationships between community dissimilarities and environmental and dispersal-based distances were temporally more stable in PRs than in IRs, confirming that assembly mechanisms are more variable in dynamic systems than in more stable ones. PRs community variability was constantly related to environmental and overland distances with a similar strength, indicating that both environmental sorting and dispersal-based processes were always important assembly mechanisms. In contrast, in IRs, the effect of environmental sorting and dispersal-based processes varied through time. Environmental sorting effect was important during the dry season and disappeared during the rewetting season, whereas the relationship between network distance and community dissimilarity was high at all seasons except for the dry season. Thus, in IRs, environmental sorting forces dominated assembly mechanisms during the drying season, whereas mass dispersal through flood events and stochastic processes likely dominated during the rewetting season. Environmental and dispersal-based distances had an overall weak and stable explanatory power over community variability between PR-IR. Topographical distance had the strongest explanatory power between PR-IR, suggesting that dispersal between them occurs mainly following the concavities of the landscape (where perennial refuges are more likely to be found). This study highlights the seasonal variability of community assembly mechanisms in IRs and, therefore, supports the importance of taking into consideration the temporal dimension into metacommunity studies to further improve conservation planning.

MRM.09

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SUCESIÓN FITOPLANCTÓNICA EN LA LAGUNA DE LA CRUZ

La sucesión fitoplanctónica en la Laguna de La Cruz sigue unos patrones estacionales muy característicos de una laguna meromítica marcadamente estratificada, presentando claras diferencias en el perfil vertical, con destacados picos de población en las zonas de gradiente.

La sucesión se inicia con la mezcla de la columna de agua a finales de otoño dominando *Cyclotella delicatula* en el mixolimnion durante todo el periodo de mezcla. La oxiclina se encuentra en capas profundas por lo que hay poca densidad de población, pero a finales de invierno empiezan a concentrarse algunas especies de Cryptomonas y euglenofíceas. A principios de la estratificación empiezan a cobrar importancia especies de mayor tamaño necesitadas de un sistema sin perturbaciones para desarrollar su población, con baja pérdida por sedimentación, los dinoflagelados, alcanzando sus mayores poblaciones en el epilimnion. Con el inicio de la estratificación empieza el crecimiento de densas poblaciones de clorofíceas, de altas tasas de crecimiento, ocasionando un rápido consumo de nutrientes. Diferentes especies de clorofíceas dominarán sucesivamente a lo largo del verano en el metalimnion. Finalmente, el fitoplancton estará constituido por una sucesión de conjugadas, Cosmarium, con máximos a finales de verano y otoño.

En la oxiclina, durante el periodo de estratificación cobran importancia las criptofíceas, que, presentes en toda la columna de agua durante la mezcla invernal, en verano se sitúan con picos de población en la oxiclina. El mismo patrón siguen las picocianobacterias, muy importantes en la Laguna de La Cruz. Las poblaciones en la oxiclina son más estables, constituidas durante todo el verano por especies de criptofíceas y picocianobacterias. En capas inferiores se situarán densos picos de crecimiento de bacterias fotosintéticas.

Los factores de variación de las poblaciones algales son en primer lugar los cambios estacionales enfrentándose las especies características de la época de mezcla frente a las del epi-metalimnion del periodo de estratificación mientras que en segundo lugar queda el gradiente vertical enfrentando las especies típicas de superficie frente a las de la oxiclina. La variación interanual de la sucesión fitoplanctónica es muy importante y refleja las variaciones en la intensidad de la mezcla vertical y agudeza del gradiente térmico.

EIC.11

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INTEGRATING TRAIT INFORMATION INTO A NEW EUROPEAN CHIRONOMIDAE DATABASE: DEVELOPMENT AND APPLICATIONS

Trait-based approaches have been developed as tools for the functional assessment of communities using trait database. European Chironomidae traits are available in macroinvertebrate trait databases only for subfamilies and tribes whereas for other families this information goes up to genus or species level. The lack of trait information for Chironomidae at finest levels of taxonomic resolution disregards their trait diversity in river ecosystems and may prevent their fully potential use as bioindicators. Therefore, we developed a trait database for European Chironomidae at the genus level taking into account information gathered at species level and using the fuzzy coding approach. We used between-class analysis to test the ability of our Chironomidae trait database to discriminate permanent and temporary river types (rivers from North to South Portugal) and disturbed and least-disturbed situations (from Mediterranean streams). Chironomidae traits allowed identifying differences between stream types ($R^2 = 0.17$, simulated- $P = 0.008$) and disturbance degrees ($R^2 = 0.29$, simulated- $P = 0.003$). Traits that best discriminated river types included relation to substrate and size, whereas disturbance levels were discriminated by life cycle duration, hibernation instars, voltinism, presence/absence of hemoglobin and feeding habits. Chironomidae trait information at finer taxonomic resolution levels was proved to be important in the discrimination of rivers types and disturbance level. We conclude that the trait information given by Chironomidae taxa can be particularly relevant in freshwaters that are naturally poor in groups traditionally used in bioassessment such as the Ephemeroptera, Plecoptera and Trichoptera.

BEB.01

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THE DOÑANA INVENTORY OF LARGE BRANCHIOPODS

The Doñana inventory of zooplankton species started many decades ago. This collective effort enable us to compare and contrast a recent invertebrate study (2006-2007) and thus, provide more information on the ecology and distribution of large branchiopods. A total of 8 species have been recorded in a handful of sites across the Doñana region since 1962: one Nostotraca (*Triops baeticus*), five Anostraca (*Chirocephalus diaphanus*, *Branchipus cortesi*, *B. schaefferi*, *Tanymanix stagnalis*, *Streptocephalus torvicornis*) and two Spinicaudata (*Maghrebestheria maroccana*, and *Cyzicus grubei*). This species collection corresponds to about half of the total number of large branchiopod species recorded in the Iberian Peninsula, including four endemic species with restricted distributions within the Mediterranean biome (*T. baeticus*, *B. cortesi*, *M. maroccana* and *C. grubei*). Therefore, we highlight that the absence of species from the genus *Lindleriella* in the Doñana region is noteworthy because this genus is endemic to this biome. Only *T. baeticus* has presented a wide distribution across Doñana (in either marshes and ponds), and has been found across a wide hydroperiod gradient (from ephemeral sites to long-hydroperiod ponds). In contrast, *S. torvicornis* was first cited in the Doñana region in 1982 (in a temporary pond just outside the protected area), and was not found again until 2007 in two ponds during an extensive survey of 80 sites across the Doñana National Park. In a collection of 11 surveys specifically designed to target these organisms, the average frequency of appearance was highest for *T. baeticus* (14.2 %) followed by *B. cortesi* (10.7 %), *M. maroccana* (7.7 %), *T. stagnalis* (7.2 %), *C. grubei* (2.4 %), *C. diaphanus* (2.2 %), and *B. schaefferi* (1.0 %). The presence and assemblage composition of large branchiopods were also indicative of particular environmental features. Some temporary ponds were particularly prone to harbour large branchiopods, with up to five species co-occurring in the same sample. The most repeated concurrent assemblage was *T. baeticus*, *M. maroccana* and *B. cortesi*. Cross-correlations of environmental variables suggested that large branchiopod species were more likely to co-occur in well-oxygenated ponds, with low conductivity and low iron deposits which corresponded to low depth/area ratio sites.

FEF.07

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ROLE OF PREDATION IN BIOLOGICAL COMMUNITIES IN NATURALLY EUTROPHIC SUBARCTIC LAKE MÝVATN, ICELAND

The relative importance of predator and resource control in lakes has been extensively debated and it has been shown to change markedly along trophic gradients. In oligotrophic Arctic and sub-Arctic lakes fish predation effects on consumers tend to be particularly strong, but this might not cascade to the phytoplankton level due to nutrient limitation. However, some lakes in cold environments are naturally mesotrophic or eutrophic. Thus, it remains unclear whether the fish influence the trophic structure and dynamics of naturally eutrophic lakes in these cold environments with simple food web structures in the same way as they would do in temperate more species-rich lakes. To study the role of fish in the trophic cascade of naturally eutrophic lakes, we conducted a 3-month in situ controlled experiment in the naturally eutrophic, sub-Arctic Lake Mývatn using three-spined sticklebacks (*Gasterosteus aculeatus* L.) as top predators. Our results indicated that both top-down and bottom-up forces are important for structuring the communities in the lake and that their relative importance changes over the summer and differs among the different trophic levels. Fish predation affected the biomass of zooplankton and epiphytic invertebrates and zooplankton size with cascading effect on the phytoplankton biomass during the first weeks, but in August a bloom of *Anabaena* overrode the cascading effect of the fish. Our results suggest that Arctic and sub-Arctic lakes could experience important changes in their trophic dynamics if they get warmer and more nutrient-rich, as it is expected with global change.

EIC.08

Solagaistua, Libe; Larrañaga, Aitor; Elosegi, Arturo

UPV/EHU

TEMPORAL RESPONSE OF PHYSIOLOGICAL VARIABLES OF FRESHWATER CONSUMERS TO STOICHIOMETRIC IMBALANCE OF FOOD RESOURCE AND ITS RELATIONSHIP WITH THE CONSUMPTION RATE

The seasonality of inputs from the terrestrial environment gradually changes stoichiometry of stream food resources along the year. Changes in land use can further affect the amount and quality of food resources. Consumers respond to these pressures with physiological changes, but little is known about the intensity of the response, the time required for each physiological variable to change, and the consequences of physiological responses for ecosystem functioning. Changes in physiological variables might be used as early detection tools to assess the health of ecosystems. Therefore, the link between resource stoichiometry, consumer physiological status and ecosystem functioning needs to be untangled. We performed a mesocosm experiment in which we subject *Echinogammarus berilloni* (Catta) and *Ancylus fluviatilis* (Müller) to a gradient of food quality (alder, ash, chestnut, oak and beech leaves). After 2, 4, 8, 16 and 32 d of incubation we measured the RNA:DNA ratio, lipid content, body mass condition and the growth rate of the consumer, and the consumption rate of the resource. The responses obtained in this kind of experiments can be used to define critical biological thresholds in which the effects of the environmental pressures are detected before ecosystem processes become irreversibly affected.

MRM.03

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IMPORTANCIA DE LAS APORTACIONES A LA ALBUFERA COMO FACTOR DETERMINANTE DE SU CALIDAD

Los estudios realizados en el seguimiento del estado trófico de la Albufera de Valencia y de la carga de nutrientes que recibe (fósforo y nitrógeno inorgánico) han mostrado unos valores en las aportaciones muy superiores a los límites de calidad para un ecosistema lagunar costero, cuya consecuencia es la situación de hipertrofia que se mantiene desde mediados de los años 70. Las medidas correctoras que la administración ha aplicado han influido poco en la mejora del estado trófico en el transcurso de los años. A pesar de las actuaciones realizadas, el estado actual según la clasificación establecida por la Directiva Marco del Agua continúa siendo malo. En el periodo de estudio, se han determinado los caudales influentes y las concentraciones de nutrientes en varias campañas en las acequias que confluyen. Los resultados obtenidos en estos estudios muestran que no se ha alcanzado el objetivo de reducir las aportaciones de nutrientes a valores adecuados. Muchas cargas son superiores a las que puede soportar el ecosistema, como muestran los valores medidos y el estado de la Albufera. Los estudios realizados en 1995 y 2005 por el Organismo de Cuenca, en colaboración con las Universidades valencianas proponían unos caudales necesarios para alcanzar los ratios de calidad exigidos por la DMA, que nunca se han alcanzado hasta el presente. El descenso de las aportaciones de aguas a la Albufera es constante año tras año. Uno de los principales problemas que se ha observado es la aportación de caudales procedentes de las depuradoras de aguas residuales, cuyas aguas tratadas se envían hacia la laguna. La falta de aportaciones de aguas con buena calidad requerida por el ecosistema es el segundo problema existente. Los resultados más recientes, junto con alguna experiencia de renovación de aguas realizada en el otoño de 2015, confirman las hipótesis planteadas. La conclusión es la necesidad de cumplir las medidas propuestas en los Planes y Estudios realizados por la Administración. Sin voluntad política de gestión de caudales adecuados tanto en calidad como en volumen, no mejorará la calidad del ecosistema, tal y como señalan los estudios científicos desde hace décadas.

AFC.09

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A META-ANALYSIS COMPARING THE BIODIVERSITY OF PERENNIAL AND INTERMITTENT RIVERS

Comprehensive knowledge of the effects of disturbances on biodiversity is crucial to achieve and improve conservation and management efforts, not least because ecosystems with low biodiversity may be more vulnerable to disturbances than those with high biodiversity. In rivers, the role of disturbance in shaping aquatic biodiversity has mainly focused on floods and droughts. Perennial rivers (PRs) often flood whereas intermittent rivers (IRs) flood and dry. Despite the recent and significant increase in research on IRs, controversy remains about whether they are more or less biodiverse than PRs. Our aim was to determine (Q1) if PRs and IRs differ in biodiversity and (Q2) if the direction and magnitude of the differences (effect sizes) are related to environmental factors such as climate, anthropogenic disturbance, longitudinal zonation, habitat, and season and/or biotic factors such as taxonomic group. We conducted a meta-analysis on 43 published studies of PR-IR biodiversity that had replicated data. We extracted means and standard deviations for richness of PRs and IRs from each, and obtained effect sizes using Hedge's *g*. We applied random effects models to the data to obtain weighted mean effect sizes for differences between PRs and IRs, and their confidence intervals, by first considering all studies and then by splitting studies into groups on the basis of the above factors. Overall, biodiversity was significantly higher in PRs than in IRs (Q1). Significant differences (PRs>IRs) were also found for studies conducted within arid, temperate or multiple climate zones, within large rivers (i.e. those spanning multiple longitudinal zonations), during dry or multiple seasons, within regions subject to medium-high levels of anthropogenic disturbance, and for studies on macroinvertebrates and fish (Q2). Our meta-analysis suggests that the expected increase in the prevalence of IRs in certain regions of the world could result in a decrease in river biodiversity, at least under particular environmental conditions and for certain taxonomic groups. This may ultimately affect the resistance and resilience of river ecosystems to future disturbances. Conservation efforts could be targeted towards specific environmental conditions or taxonomic groups, as indicated by our findings, to better manage and preserve biodiversity.

RLW.07

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CUANTIFICACIÓN DE LA CLOROFILA E ÍNDICES DE CALIDAD: INFLUENCIA DEL MÉTODO DE CUANTIFICACIÓN EN LOS VALORES DE LOS ÍNDICES.

La concentración de clorofila *a* en los ecosistemas acuáticos está fuertemente relacionada con la biomasa de la comunidad fitoplanctónica, el crecimiento de la cual depende de la disponibilidad de nutrientes. De esta manera, la concentración de clorofila *a* nos aporta información sobre el estado del sistema. Es por este motivo que la concentración de clorofila *a* es una de las variables más utilizadas en limnología para el cálculo de índices que determinen el estado trófico de los sistemas acuáticos. Consecuencia de esta importancia es el hecho de que desde hace aproximadamente sesenta años, se vienen desarrollando técnicas para la estimación de la clorofila en el medio acuático, y en la actualidad principalmente se utilizan tres técnicas diferentes: espectrofotometría, fluorimetría y cromatografía.

Actualmente, la Directiva Marco del Agua establece un marco comunitario de actuación en el ámbito de la política de aguas, que para su implementación requiere de la evaluación del estado de las masas del agua en función de los elementos de calidad biológica, y para tal fin utiliza la clorofila *a* como un indicador para la evaluación del estado del fitoplancton. El problema surge cuando al no especificar que método se ha de utilizar en el cálculo de la concentración de clorofila *a*, cosa que tampoco se especifica en el Real decreto 817/2015, por el que se establecen los criterios de seguimiento y evaluación del estado de las aguas superficiales y las normas de calidad ambiental. No obstante, de forma sistemática los informes técnicos de intercalibración de la DMA y en los informes de seguimiento del estado de las aguas superficiales de las diferentes confederaciones hidrográficas, se utiliza el método espectrofotométrico.

Diversos autores han hecho hincapié en las diferencias entre resultados de concentración de clorofila *a* en función del método empleado para su obtención. Por tanto, se ve necesaria la comparación de los métodos actuales y comprobar si las diferencias en el uso de uno u otro método influyen en el resultado del cálculo de índices de calidad.

RSL.02

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SEGUIMIENTO DE LA MATERIA ORGÁNICA DISUELTA COLOREADA EN LOS EMBALSES DE LA CUENCA DEL EBRO MEDIANTE TELEDETECCIÓN.

La materia orgánica disuelta coloreada (CDOM, por sus siglas en inglés) juega un papel esencial en varios procesos importantes de las aguas superficiales, la productividad biológica y la penetración de la radiación UVB. No obstante, un exceso de CDOM podría provocar problemas de reducción de oxígeno por la degradación de la materia orgánica y una absorción de luz en longitudes de onda visible, reduciendo así la cantidad y la calidad de la radiación fotosintéticamente activa disponible. Por todo ello, su utilización como un elemento importante en la gestión de las aguas superficiales se ve fundamental.

El número de embalses existentes en la cuenca del río Ebro es muy elevado, y dada la extensión de estas masas de agua y su heterogeneidad espacial, se han aplicado técnicas de teledetección, en este caso con el sensor OLI (Operación de imágenes de la tierra) transportado por el satélite Landsat 8, para conocer en toda la superficie de estas masas de agua los valores de CDOM, a partir de los puntos muestreados.

Además, la materia orgánica disuelta (DOM) juega un papel importante en el ciclo biogeoquímico global del carbono, clave en los modelos climáticos globales. Por tanto, es muy interesante estimar la cantidad de DOM en la superficie del agua a partir de su componente ópticamente activo (CDOM) mediante sensores remotos.

Este estudio presenta los resultados obtenidos a partir de la elaboración de un algoritmo para la zona y periodo de estudio, valorando su aplicación potencial a los criterios de calidad ecológica de la DMA para facilitar su uso en la gestión de la calidad del agua.

EEC.02

Subirats, Jessica; Petrovic, Mira; Acuña, Vicenç; Sabater, Sergi; Borrego, Carles

Catalan institute of water research (ICRA)

DIFFERENCES IN THE COMPOSITION OF BIOFILM BACTERIAL COMMUNITIES AND THEIR ASSOCIATED RESISTOMES IN STREAMBED COMPARTMENTS OF TWO RIVERS IMPACTED BY ANTHROPOGENIC POLLUTION

Many studies demonstrate that discharges from wastewater treatment plants (WWTP) into rivers have a direct effect on the prevalence of antibiotic resistance genes (ARGs) in streambed bacterial communities. Less information is available, however, on how these resistance determinants distribute between different streambed compartments (e.g. epilithic and epipsammic biofilms). To investigate differences in the prevalence of ARGs between both compartments we have selected two tributaries of the Ebre River (La Bisbal de Falset and Vall-de-roures) differing in their pollution source. Whereas La Bisbal receives effluents from a local WWTP, Vall-de-roures is impacted by raw sewage from a neighboring village. In both streams, epilithic and epipsammic biofilms were collected upstream and downstream the discharge point as well as water samples from the pollution source (WWTP effluent (La Bisbal de Falset) and raw sewage (Vall-de-roures)). Quantitative PCR (qPCR) was used to determine the prevalence of nine antibiotic resistance genes (Sul-I, Sul-II *ermB*, *blaTEM*, *blaKPC*, *tetM*, *tetW*, *qnrS* and *vanA*), class 1 Integron integrase (*intl1*) and 16S ribosomal RNA (rRNA). Besides, the composition of bacterial communities in all samples was determined by high throughput sequencing and the concentration of antibiotic residues was determined in discharge water using LC-MS.

With the exception of *vanA* and *blaCTX-M*, all ARGs analyzed were detected in all samples, with higher abundances in biofilms collected at Vall-de-roures. In La Bisbal de Falset (treated water) only Sul-I significantly increased in abundance in downstream epipsammic biofilms whereas no significant differences were detected among epilithic biofilms. The impact of raw sewage (Vall-de-roures) was more pronounced since the concentration of all ARGs except *blaTEM* and *blaKPC* were significantly higher in downstream than upstream epipsammic biofilms. Interestingly, epilithic biofilms behaved differently and only the abundance of Sul-II and *ermB* were significantly higher in downstream epilithic biofilms.

These differences in the resistance profile between epilithic and epipsammic biofilms could be due either to the intrinsic differences in their bacterial communities (analysis of beta diversity, $p < 0.001$ according to Permanova test) or to an enhanced resistance response of bacteria inhabiting the sandy sediment towards the antibiotic pollution measured in the studied systems.

AFC.02

Tornero, Irene¹; **Bagella, Simonetta**²; **Pinto-Cruz, Carla**³; **Caria, Maria C.**²; **Belo, Anabela**³; **Lumbreras, Ana**³; **Gascón, Stéphanie**¹; **Sala, Jordi**¹; **Compte, Jordi**¹; **Boix, Dani**¹

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RESPONSES IN PLANT AND MACROFAUNAL ASSEMBLAGES TO CONNECTIVITY AND POND SIZE GRADIENT

We studied the relation between three biotic groups (animal active dispersers, animal passive dispersers and plants) and their spatial patterns in two networks of Mediterranean temporary ponds. The assemblages of these three groups in Mediterranean temporary ponds seem to have different spatio-temporal patterns, being plants more dependent on spatial factors and macrofauna on temporal changes. Habitat size is supposed to have a positive relationship with species richness. However, this relationship is still unclear in the case of temporary ponds. Moreover, the spatial connectivity of the system can modulate the influence of pond size on the community structure. The two studied pond networks were located in Vila Nova de Milfontes (Portugal) and Giara di Gesturi (Sardinia, Italy). Each pond network was characterized by a gradient of pond size and by a high connectivity among ponds, which enables the dispersal of organisms, especially for active dispersers. Thus, a continuous exchange of organisms was expected. We hypothesised that 1) assemblage similarity in composition among ponds would be greater for the active dispersers than for the other biotic groups; 2) the greater number of micro and mesohabitats in larger ponds would be more favourable for floristic than for faunal richness; and 3) the most isolated ponds within a network would act as taxonomic refuges enhancing taxon diversity and richness (since in these ponds competition and predation effects are reduced). We studied the relationships between pond size and connectivity, separately, considering two community parameters: species richness (SR) and taxonomic distinctness (TD). Our first prediction was validated in both pond networks. In relation to our second hypothesis, we did not find a significant relationship between pond size and SR of plants. On the contrary, we found a positive significant relationship between pond size and both SR of passive dispersers and TD of active dispersers. In accordance with our third hypothesis, three negative significant relationships were found between connectivity and (i) SR of active dispersers, (ii) SR of plants, and (iii) TD of plants. Hence, we observed the existence of different spatial patterns among the three biotic groups studied.

EIC.04

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DIATOMS AS ECOLOGICAL INDICATORS OF A MEDITERRANEAN DELTA (EBRO DELTA AND ESTUARY)

Diatoms are used extensively to study and monitor present and past environmental conditions in aquatic ecosystems worldwide, especially in freshwater. However, studies of the ecological preferences of diatoms in transitional waters (e.g. estuaries, coastal wetlands, deltas) are still scarce, despite the fact that these systems are ecologically and economically very important (Constanza et al. 1997, *Nature* 387:253-60) by virtue of the many ecosystem goods and services they provide (nutrient cycling, productivity, pollutant binding etc.) and the fact that benthic diatoms proved to be extremely important in these ecosystem functioning (for a review see Underwood & Kromkamp, 1999, *Adv Ecol Res* 29: 94-153).

In this talk we will present a synthesis of our studies on benthic diatoms from the Ebro Delta, taken as representative of Mediterranean coastal wetlands. Results showed that, nowadays, the main human pressure affecting the diatom community of the Ebro Estuary is the hydrological alteration resulting from river flow regulation and abstraction of water. Some diatom indicator species were identified that could allow the detection of such hydrological pressures at both spatial and temporal scales. However, none of the existing diatom indices proved to be adequate for assessing the ecological status of salt-wedge estuaries, such as the Ebro estuary. Our findings showed as well that benthic diatoms can also be used as indicators of the different coastal wetland habitats of the Delta, which may prove useful in future paleoecological studies.

Our lab based molecular studies revealed functional diversity among diatom clones of a very common and widespread diatom that cannot be distinguished morphologically, showing the growing importance of using molecular tools to study the ecology of diatoms in particular and microalgae in general.

RSL.01

Valente, João; Borreguero, David

Universidad Carlos III de Madrid

UN SISTEMA MULTI-ROBOT DE AGUA Y DE AIRE CON APLICACIÓN A TAREAS DE TELEDETECCIÓN EN ENTORNOS FLUVIALES.

La adquisición de muestras en determinados entornos acuáticos continentales es una tarea laboriosa y costosa, sea por las limitaciones de la resolución espacial de los métodos convencionales, sea por la complejidad de algunos entornos. Los vehículos aéreos no tripulados (VANT) embarcados con cámaras y otros sensores pueden desempeñar un papel importante en la mejora de esta labor.

Sin embargo si esas tareas son llevadas a cabo en áreas muy amplias los VANT no tienen suficiente autonomía para realizar toda la misión aérea completa necesitando así de una estación base cercana para cargar las baterías. Otra problemática que puedan surgir es que debido a fuertes corrientes de viento se puedan observar perturbaciones en la plataforma siendo necesario realizar un aterrizaje de emergencia.

De este modo, una solución a corto espacio de tiempo es tener una plataforma acuática, i.e., vehículo de superficie no tripulado (VSNT) de rescate que sirva de estación base móvil de auxilio al VANT en tareas de teledetección realizadas en entornos fluviales.

Este trabajo se centra en el diseño y desarrollo de un sistema multirobot acuático-aéreo constituido por un pequeño VANT comercial programable y un VSNT diseñado y fabricado con características y requisitos específicos para este tipo de misiones.

MRV.09

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Instituto Pirenaico de Ecología, Consejo Superior de Investigaciones Científicas

SEARCHING FOR AN INTEGRATING VIEW ON LAKE EVOLUTION: FRAGMENTS OF AN UNFINISHED ADVENTURE IN IBERIAN LAKES

Reconstructing past lake evolution is a complex research topic that needs not only multidisciplinary tools but the integration of multiple scientific disciplines. During the last decades, we have explored ways to integrate paleoecological data (both from the lakes and the watersheds) with sedimentological and geochemical information to detangle the relationships among local changes in the lakes and the watersheds and global forcings as atmospheric deposition and climate changes. Dra. Maria Rieradevall was a champion and a firm believer in the integration of different proxies and we worked together investigating the evolution of several mountain lakes in Spain. We found how changes in chironomid assemblages in Sanabria and Enol paralleled the sedimentological and geochemical evolution during the Late glacial to Holocene transition and how the multi-phased nature of the Little Ice Age was clearly shown in the lowlands (Estanya) and the highlands (Basa de la Mora) lakes in the Pyrenean Mountains by changes in macroinvertebrates, vegetation dynamics and paleohydrological indicators. We also documented changes in bioproductivity associated to climate phases during the last millennium (Medieval Climate Anomaly, Little Ice Age, recent warming) and to human impact in lakes in the Pyrenees, The Cantabrian Mountains and the Iberian Range. Teaming up paleoecologists with geologists gave both of us new perspectives on lake dynamics, brought up some new unexpected questions and showed a synergistic way to deal with the complexity of lakes evolution.

AFC.01

Valls, Lluís; Castillo-Escrivà, Andreu; Barrera, Luis; Gómez, Eulalia; Gil-Delgado, José Antonio; Mesquita, Francesc; Armengol, Xavier

Universidad de Valencia

BIRD-MEDIATED DISPERSAL OF AQUATIC INVERTEBRATES IN SHALLOW LAKES: AN EXPERIMENTAL TEST COMPARING FAECES FROM TWO DUCK SPECIES.

Animal vectors, and particularly waterfowl dispersal, are essential for the movement of invertebrate resting eggs between water bodies. However, differences in habitat preferences and feeding habits between bird species may result in different effects on invertebrate species passively dispersing via these birds, even if they live in the same lake. To test such effects, faecal samples from *Anas platyrhynchos* (collected in autumn and spring) and *Tadorna tadorna* (collected in spring) were cultured at 20°C and 12 L: 12 D conditions. One half of each excrement was cultured at a conductivity of 0.6 mS·cm⁻¹ and the other half at 6 mS·cm⁻¹. 1054 invertebrates hatched from a total of 60 faeces, including cladocerans, copepods, ostracods, rotifers and ciliates, with a wide variability among faeces. Autumn samples yielded a low hatching success (12.5%) compared to spring samples (90%). Significant differences were observed between birds, but not between conductivity treatments. Thus, our results imply different hatching patterns affected by disperser and season, but most species transported as eggs by birds seem to have a wide tolerance to hatch under variable salinity conditions. These differences have a major importance in the metacommunity dynamics of lake networks, a key factor to consider in wetland conservation planning.

EBC.02

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LOCAL AND REGIONAL FOUNDER EFFECTS IN LAKE ZOOPLANKTON PERSIST AFTER THOUSANDS OF YEARS DESPITE HIGH DISPERSAL POTENTIAL

We reconstructed the genetic structure of a planktonic crustacean *Daphnia longispina* living in high mountain lakes and ponds in the Pyrenees to investigate whether it was shaped by persistent founder effects originating shortly after the last glacial maximum or by ongoing dispersal and effective migration (gene flow). We found that the genetic structure can largely be explained by a single colonization event following gradual deglaciation of the Pyrenees ~10 000–15 000 years ago. Nuclear genetic diversity declined steeply from southeast to northwest, suggestive of serial colonization of available habitats with advancing deglaciation. The spatial genetic structure suggests that founder effects were major determinants of the present-day diversity, both at the catchment level and at the level of individual water bodies, further supporting extremely low effective migration rates. This study reveals a prime example of a founder effect that is both long lasting and maintained at small spatial scales. Our data suggest a process of isolation by colonization as a result of strong priority effects and monopolization. We found evidence for the spread of haplotypes with Pyrenean ancestry across the Palaearctic over distances up to 5500 km, although the local genetic structure after colonization was hardly influenced by contemporary dispersal. Finally, our data also suggest that mitochondrial mutation rates in the studied populations were seven times higher than typically assumed. Overall, we show that founder effects can persist for centuries even at small spatial scales at which the potential for dispersal is high.

MRM.02

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LA ALBUFERA DE VALENCIA, ESTUDIOS CIENTÍFICOS A LO LARGO DE 36 AÑOS

La Albufera de Valencia es la mayor laguna litoral de aguas oligohalinas en España. A pesar de la influencia humana sobre el lago en los últimos siglos, que determinaron dos grandes periodos bien patentes: la llamada Albufera de los pescadores y posteriormente la Albufera de los agricultores, periodos caracterizados por cambios de salinidad desde una Albufera de aguas salobres a una Albufera de aguas oligohalinas, condicionada por las entradas de agua fluvial de uso agrícola y, finalmente, el control de su comunicación con el mar mediante compuertas. Hasta la segunda mitad del siglo XX, la biodiversidad de la Albufera oligohalina permaneció en cotas altamente inusuales. Es en este momento cuando el arranque de la industrialización en su amplio entorno determinó el cambio en los sistemas de saneamiento de las ciudades circundantes al multiplicarse su población así como de las áreas industriales, aumentando el aporte de nutrientes y otros contaminantes directamente al lago. Cargas tan altas como 39 g m²/año de P total o 74 g m²/año de amonio y 81 g m²/año de nitrato explicarían el acelerado proceso de eutrofización del sistema. La Albufera estuvo completamente poblada de macrófitos acuáticos hasta que a mediados de los años 60 el brusco crecimiento del fitoplancton determinó su total desaparición. Los tres grandes hitos de cambio mencionados quedaron perfectamente registrados en los sedimentos y evidenciados en los estudios paleolimnológicos. El lago, hipertrófico extremo desde 1980, presentaba concentraciones medias de clorofila-a de 300 mg/m³, densidades de fitoplancton de un millón de células por mililitro y biomasa de 30 a 300 mg/L en peso fresco. La producción primaria estimada por el método del 14C fue de 1,7 kg m²/año. El fitoplancton estaba dominado por las cianobacterias filamentosas (80 %) y en la actualidad continúan siendo dominantes excepto en los eventos de fase clara, aunque su composición ha cambiado, dándose actualmente floraciones de *Microcystis*. Últimamente los procesos de producción/descomposición y sedimentación han cambiado con la creciente depuración de las aguas residuales y en la actualidad se está trabajando para mejorar el conocimiento de los ciclos del carbono, nitrógeno y fósforo.

MRV.11

Vidal-Abarca, María R.; Suárez, María L.

University of Murcia

BIODIVERSITY, ECOSYSTEM SERVICES AND EDUCATION: OUR STUDENTS UNDERSTAND HOW THE PROPER FUNCTIONING OF ECOSYSTEMS CONTRIBUTES TO HUMAN WELL-BEING?

In memory of Maria Rieradevall

One of the objectives of university education in Biology and Environmental Sciences' Grades is to prepare future professionals for carrying out efficient management of ecosystems and natural areas. The "ecosystem services approach" has been used by academics, researchers and managers to support and inform environmental management and biodiversity conservation. However, the inclusion of this concept in training programs of university students is still low or absent.

We analyzed preferences of students in Grades of Biology and Environmental Sciences at the University of Murcia, toward ecosystem services delivered by two types of ecosystems (aquatic and arid ecosystems). We specifically explore: What categories of ecosystem services (provisioning, regulating and cultural) preferably is selected by students in the two types of ecosystems analyzed?, Do students select different ecosystem services in each of the ecosystems analyzed?, Is this selection conditioned by sex? and Are students able to recognize ecosystem services arising from ecosystem functioning?

A total of 264 students of Biology and Environmental Sciences participated in the survey. A questionnaire was designed to assess the perception of ecosystem services of two ecosystems of Murcia Region: Segura River and an arid landscape. Two photographs, one of each ecosystem, were presented to students. Before responding to questionnaire, students were provided with a brief explanation on concept and typology of the ecosystem services. Each student selected the five ecosystem services most important in each one of the ecosystem, of the 22 proposed. Wilcoxon rank-sum tests were performed to identify and describe differences.

Provisioning services are preferentially selected by students for both ecosystems. Regulating services of arid ecosystem are selected by less than half of students. There are no significant differences in the selection of ecosystem services provided by the two ecosystems between men and women. For the aquatic ecosystem, "freshwater" is selected as the main provisioning service. For the arid ecosystem, students selected preferentially "mineral raw materials", and all regulating services were selected by less than 20% of students. Most regulating services provided by arid ecosystem were preferentially selected by women. Finally we found little overlap between the services selected by students and proposed as "very important" by ecosystem experts.

GCI.04

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EFFECTS OF MULTI-STRESSORS ON MARINE PLANKTONIC MICROALGAE (*TETRASELMIS CHUII*)

With the increase of human industrialization, marine and coastal ecosystems became the main recipients of several contaminants. In these ecosystems, organisms are usually exposed to complex mixtures of chemicals and the isolated effects are likely to be different from the effects caused by the mixtures. In this context, the effects of combined mixtures within and between metals and polycyclic aromatic hydrocarbons (PAHs) are poorly understood. Additionally, the temperature of several marine and coastal waters is expected to increase due to global warming, thus, the interactions between temperature and pollutants effects are of special relevance. In these scenarios, the effects of these interactions on planktonic primary producers are of particular concern since they are the basis of the pelagic ecosystem. Therefore, the main objective of this study was to investigate the effects of temperature increase (20°C to 25°C) on the toxicity of a relevant metal and polycyclic aromatic hydrocarbon (cadmium and benz(a)anthracene), alone and in mixture, to the marine planktonic algae *Tetraselmis chuii*. Microalgae cultures were exposed for 96h to different concentrations of the two substances individually and in binary mixtures, at 20 and 25 °C. The effect criterion was the inhibition of culture growth. The increase of temperature by 5 °C significantly increased the toxicity of both contaminants. Toxicological interactions among the stressors were found. The findings of this study highlight the need of more research on the effects of temperature on the toxicity of chemical mixtures.

EIC.12

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²URV

SUITABILITY OF FISH-BASED INDICES TO ASSESS HYDROLOGIC IMPACTS: THE CASE OF THE LOWER EBRO RIVER

The Water Framework Directive of European Union (2000) establishes fishes as suitable biological indicators for monitoring freshwater ecosystems. Previous studies demonstrated that the hydromorphological alterations due to human activities induced deep structural changes in the ecosystems of the lower Ebro River. In this study, we analyse a dataset of fish relative abundances from yearly electro fishing campaigns carried out between 2006 and 2015. By the use of multivariate statistics we identify which habitat factors are more deeply affecting fish assemblages and the metrics used for the calculation of fish-based indices. We analyse the effects of environmental variables such as dissolved oxygen, water temperature, water depth, velocity, conductivity, substratum, macrophyte cover, riparian habitat structure and a large set of hydrological regime indices. Moreover, we check the influence of sub-daily flow variations on the community, to determine if the hydropeaking generated by the Flix hydropower plant has to be taken into account as a factor of impact for fish populations.

EEF.04

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DINÁMICA TEMPORAL DE COMUNIDADES DE MACROINVERTEBRADOS ACUÁTICOS A ESCALA DE MESOHÁBITAT EN RÍOS ANDINOS DEL SUR DEL ECUADOR

El presente estudio ec hidrológico se llevó a cabo en una zona Andina poco estudiada del Sur del Ecuador, con el objetivo principal de analizar los procesos hidrológicos que controlan la dinámica temporal de las comunidades acuáticas a escala de mesohábitat. Así, se seleccionaron cuatro microcuencas en la subcuenca del río Zhurucay, ubicadas sobre los 3600 m de altitud, y en cada una se estudió un tramo de 50 m de longitud donde se establecieron 5 secciones transversales. En cada sección se efectuaron 19 campañas de muestreo entre diciembre de 2011 y octubre de 2013, que incluyeron mediciones hidráulicas y la recolección de macroinvertebrados con el uso de una red Surber. Los caudales diarios de cada microcuenca se analizaron para calcular 46 índices hidrológicos. En base a los cambios hidromorfológicos observados en campo y el respectivo análisis en gabinete de las series de caudales, se definieron los umbrales determinantes para los macroinvertebrados: pico alto, pico suave y caudal bajo. Adicionalmente, se agruparon las muestras bióticas según el tipo de mesohábitat y el número de Froude, en "pool", "run", y "riffle". Se efectuaron varios análisis estadísticos multivariados que sugieren que un total de 16 variables hidrológicas tienen influencia sobre distintos grupos taxonómicos y las métricas de la comunidad. Así, los eventos extremos influyen negativamente en la densidad de individuos y la riqueza, y positivamente en la proporción de EPT (Ephemeroptera, Plecoptera, Trichoptera) en los diferentes mesohabitats. Se observó un incremento significativo de la densidad de individuos al mantener caudales estables; el efecto es inverso para la riqueza de EPT, la equitatividad y la diversidad de Shannon. A nivel taxonómico, algunos grupos dominantes se asociaron a condiciones del hábitat estables y otros a fluctuantes. Aparentemente, el régimen inestable del caudal en los ríos de alta montaña Andina juega un rol muy importante en la dinámica temporal de ciertos grupos taxonómicos. Los resultados alcanzados permitirán sin duda avanzar en el conocimiento necesario para afrontar a futuro la determinación de caudales ambientes en la región; una tarea aún pendiente en el Austro Ecuatoriano.

AFC.06

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SEASONALITY, SPECIES RICHNESS AND TURNOVER MEDIATE INTRASPECIFIC TRAIT VARIABILITY IN FRESHWATER COMMUNITY RESPONSES ALONG AN ELEVATIONAL GRADIENT

Diversity is not evenly distributed in space. Across environmental gradients, some functional strategies are favoured over others based on their tolerance to the prevailing abiotic and biotic conditions, which results in differences in local species composition and Functional Trait Diversity (FD) among communities. Therefore, FD can be decomposed in Species Turnover Variability (STV) and Intraspecific Trait Variability (ITV) within a given species, which together contribute to Community Trait Variability (CTV) within and among communities. In other words, the variability in functional traits among individuals within and across species plays an important role in determining their distribution, thereby affecting community assembly at large spatial scale. We examined body-size variability of Plecoptera (Insecta) across 11 communities located along the elevational gradient in Sierra Nevada to assess the contribution of ITV and STV to CTV and determine trait-elevation matching. Temperature regulates growth rates and insects typically get smaller at higher temperatures because shortening life cycles is advantageous. Thus, we expected a higher contribution of ITV in headwaters, where environmental conditions reduce species richness and promote intraspecific phenotypic plasticity, than at lower elevations, where CTV might be driven mostly by STV. Streams were sampled fortnightly over one year, environmental data were quantified and 5 morphological traits were measured for 6893 individuals belonging to 16 species. In each season, species richness was similar across elevation and higher in spring-summer than winter and autumn, following temperature seasonal cycles. Across seasons and elevation, STV showed a higher contribution to CTV rather than ITV, which only becomes relatively relevant in species-poor communities. A weak trait-elevation matching was found. Abundant, widely-distributed and highly variable species contributed strongly to the among-communities ITV, whereas rare, isolated and trait-invariable species had low contribution. Since Plecoptera have limited dispersion, species-specific patterns of ITV are critical for ensuring species survival facing climate warming: species with little ITV along the elevation gradient are the most vulnerable to environmental changes (e.g., *Leuctra maroccana*). This first study on functional diversity partitioning at the intra- and interspecific levels for freshwater communities evidences the importance of quantifying ITV, which comprises the most basal level where diversity can be measured.

FEF.09

von Schiller, Daniel; Elosegui, Arturo;

University of the Basque Country

THE GLOBAQUA TOOLBOX: A COMPREHENSIVE COMPILATION OF METHODS TO MEASURE RIVER ECOSYSTEM FUNCTIONING

River ecosystems are subject to multiple stressors that affect their structure and functioning. River ecosystem structure refers to characteristics such as channel form, water quality or the composition of biological communities, whereas ecosystem functioning refers to processes such as nutrient cycling, organic matter decomposition or secondary production. Nowadays there is much more information on structural than on functional characteristics, and despite the many methods available to measure river functional properties, only structural ones are routinely used by river managers. The GLOBAQUA toolbox, produced within the frame of the EU-project with the same name, consists on a compilation of methods to measure key river ecosystem processes at different spatial and temporal scales, tailored for scientist as well as for routine monitoring by water agencies. Here, we present the toolbox, which includes a description of the main characteristics of each method, the aspects of the ecosystem they address, the environmental stressors they are sensitive to, possible difficulties in their implementation, as well as their general advantages and disadvantages. We also discuss the current limitations, potential improvements and future steps in the development of the toolbox. Our ultimate purpose is to contribute to a more functional perspective in river research and management.

FEF.18

Zufiaurre, Aitziber¹; Felip, Marisol²; Giménez-Grau, Pau¹; Camarero, Lluís¹; Pla-Rabés, Sergi¹; Catalán, Jordi¹

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PLANKTON COMMUNITY RESPONSE TO P-ENRICHMENT AND N-IMBALANCE: A MESOCOSM EXPERIMENT IN A P-LIMITED LAKE

High nitrogen deposition has shifted many mountain lakes to P-limitation during the last decades, although increased P deposition may be partially reversing the situation in some places. How these P-enrichments or the modification of N-imbalance modify the planktonic communities is largely unknown. We carried out a mesocosm experiment to test the effects of different degree of P and N enrichment in a P-limited lake in which time series have indicated a progressive reduction in the N:P imbalance (Lake Redòn, Pyrenees). Dissolved inorganic nitrogen (DIN) was added in two different forms (NH_4^+ , NO_3^-) to test for differential effects. Ten different treatments were performed, with two replicates for each and two control mesocosms. The mesocosms consisted in 20 m-long transparent cylindrical bags with sediment traps at the bottom and vertically deployed in the epilimnion of the lake for three weeks in summer. Remarkably, the replicates respond in a very similar way. Variation in species growth patterns and community composition were observed in both P-enrichment and N-imbalance treatments and varied for some species depending on the DIN forms. Changes related to P-enrichment were high, whereas only a part of the community responded to N-imbalance, without an apparent biomass effect in the entire community. The increase in biomass with P-enrichment resulted in a change of the main autotrophic groups. At high enrichments chrysophytes and dinoflagellates decreased and chlorophytes increased. However, when considering individual species, there were some of them not following the same response as most of the group. For instance, chrysophytes showed a negative response to an increased N-proportion, however, some of them responded to NH_4^+ and others to NO_3^- . The heterotrophic part of the community followed the same pattern as autotrophs in the P-enrichment treatments, increasing their abundance. However, the response in the N-imbalance was the opposed. The main groups of heterotrophs increased their abundance with higher N additions. These results will be useful for the interpretation of the seasonal and long-term changes observed in these lakes, where nutrients and other factors are simultaneously changing; thus revealing the precise role of nutrients on community variation from them is not straightforward.

Posters

PS1.10

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IS LITTER DECOMPOSITION AND ASSOCIATED FUNGI SENSITIVE TO THE IDENTITY OF COMPANION LITTER SPECIES IN MIXTURES?

The relationship between biodiversity and ecosystem function remains a primary focus of ecological research, especially under the ongoing loss of biodiversity at global scale. The effects of mixing different leaf litter species on litter decomposition in streams has received considerable attention in recent years, but most studies address the effects of litter mixing in the mixture as a whole, while important insight can be gained from the evaluation of the effects of mixing on component litter species. In this study, we compared the decomposition rates and associated fungi for two litter species of contrasting physical and chemical characteristics, when incubated alone and in mixture. We hypothesized an effect of litter mixing on the decomposition of component species since they would affect each other, inducing differences in microbial assemblages between the litter incubated in mixture and that incubated alone. To test this hypothesis, coarse-mesh bags with alder litter alone, oak litter alone and with a mixture of both, were incubated in a forest headwater stream during early spring.

Samples were retrieved in four occasions over 32 days and decomposition rates, microbial oxygen consumption rates, and aquatic hyphomycetes sporulation rates, species richness and community composition were determined; litter species in the mixture were processed individually. Litter decomposition was unaffected by mixing contrasting litter species (additive effects), with litter species in the mixture decomposing at the same rate as when incubated alone. The same pattern was observed for microbial parameters. Significant differences in litter decomposition and microbial parameters were found only between litter species. Decomposition rate and microbial colonization and activity depend primarily on the traits of the target litter species and are not affected by those of the companion species. This finding contributes to explain the lack of litter mixing effects reported previously by many studies.

PS2.23

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IMPROVEMENT PROJECT OF RIVER CHANNEL BY ENTERING WOOD IN THE ARAXES RIVER (ORIA RIVER BASIN-GIPUZKOA)

There has been a serious decline in the population of brown trout in the Araxes river belonging to the Oria basin (Gipuzkoa), especially in recent years, so that today the species is in a rather delicate situation. In order to improve the situation of brown trout's population in this river, there has been developed a project of introduction of wood (Large Woody Debris) led by Provincial Government of Gipuzkoa. This project aims to increase the structural complexity of the river channel and thereby, promote the natural wealth of river habitats, increasing the shelter capacity for different aquatic species and, particularly for the brown trout population.

This project follows BACI pattern (Before After Control Impact). It is the study of two sections, one control and one experimental, before and after the execution of the project, which allows to observe the differences arising in the river ecosystem once the project is completed. These differences are evaluated by a specific monitoring program that consists of controlling both abiotic and biotic parameters.

The results show a significant retention of sediments, especially small, in the experimental section, which benefits the presence of appropriate areas for locating spawning areas. It also benefits the creation of shelters and pools, which is of interest to the adult specimens of brown trout. On the other hand, the analysis of trophic groups of benthic macroinvertebrates indicates the existence of significant differences in shredders and filtering collectors, which may be related to the increase in fish biomass and a greater presence of pools. A significant increase of adult specimens of brown trout in the experimental section is observed as well, which is reflected in a significant increase in brown trout biomass.

PS2.24

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ANÁLISIS Y EVALUACIÓN DE LA CALIDAD DE AGUAS CONTINENTALES A PARTIR DEL ESTUDIO DE CARACTERÍSTICAS FÍSICO-QUÍMICAS Y DIFERENTES INDICADORES BIOLÓGICOS

Las familias fitoplanctónicas presentes en los embalses aparecen y permanecen en este hábitat cuando las condiciones son las adecuadas para su desarrollo, supervivencia y reproducción. Con datos de calidad de aguas (estratificación hidrodinámica, nutrientes y fitoplancton) de cuatro embalses de Galicia aportados por Augas de Galicia se intentó comprobar la posible influencia de las condiciones geo-hidromorfológicas y climáticas sobre las poblaciones de fitoplancton. Los datos empleados comprenden una serie constituida por 6 campañas ubicada entre los años 2011 y 2013.

El presente trabajo parte de una revisión inicial de las características geomorfológicas de cada embalse y de la determinación de su posible correlación con las características hidrodinámicas particulares de cada embalse. A continuación se cuantificaron para cada una de las campañas las variaciones climáticas y se determinaron las diferencias en las comunidades fitoplanctónicas. Finalmente se realizó la búsqueda de posibles correlaciones entre la distribución fitoplanctónica y las variaciones geo-hidromorfológicas y climáticas. Los aportes de nutrientes también fueron tenidos en cuenta para determinar si es o no fuente de las variaciones fitoplanctónicas encontradas.

Los resultados muestran que el factor geomorfológico afecta sobre todo a las condiciones de estabilidad de la columna de agua aunque no es clara su influencia sobre la estructura de este indicador biológico clave para el estudio de la calidad de sus aguas.

Por otra parte, se analizó la posible relación de las comunidades de fitoplancton con la climatología, observándose únicamente cierta correlación entre la estructura poblacional del fitoplancton y el índice de precipitaciones. Todo ello se ha estudiado teniendo en cuenta también la disponibilidad de nutrientes, que como cabía esperar y como se ha confirmado también en este estudio, resulta ser un factor determinante ya que esta fuente de variabilidad proporciona los aportes primarios para vida de estos seres vivos.

PS1.19

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EXPLORING THE MECHANISMS UNDERLYING STREAM WATER DISSOLVED NITROGEN IN HEADWATER CATCHMENTS IN THE MONTSENY MASSIF (NE IBERIAN PENINSULA)

The Northeastern Iberian Peninsula is currently receiving substantial nitrogen (N) deposition, which is expected to even increase in the future. As this chronic N input is processed on land and delivered to the aquatic systems, several processes occur in the soil - stream water interface. Recent work has shown that dissolved organic nitrogen (DON) dominates over dissolved inorganic nitrogen (DIN) in stream waters at unpolluted sites, while DIN loss increases with increased N deposition. DON in stream waters will vary depending on whether it is used as nutrient or as source of energy. If DON is a nutrient source, under low NO₃ availability, we expect DON concentration to increase as stream microbial communities are provided with more DIN and both variables will show positive correlation (DON release hypothesis). On the other hand, if DON is used as an energy source, we expect DON to decrease with increased DIN because this added N will stimulate demand of additional carbon which in its turn will cause an increase of DON consumption, and both variables will be inversely correlated (Passive carbon vehicle hypothesis).

Even though a considerable effort has been developed to describe the drivers of the N and C dynamics in soil and stream waters, several synoptic survey studies under temperate climate have produced inconsistent results, and to our knowledge, no such a study has been undertaken under a Mediterranean environment. Here we present results of DIN, DON, DOC concentrations in 90 streams draining headwater catchments in the Montseny Mountains with the objective of evaluating how catchments characteristics shape broad-scale patterns in the concentration of inorganic and organic nitrogen in headwater streams and evaluate the validity of the proposed hypothesis in the literature.

PS1.02

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FRESHWATER FISH BIODIVERSITY IN THE MADRE DE DIOS RIVER BASIN (PERUVIAN AMAZON): PATTERNS, THREATS AND CONSERVATION

The fish communities of the Amazon basin, specially in Madre de Dios, in the south eastern jungle of Peru, are the main inland water diversity reservoir in the world. Notwithstanding, it is affected by two large problems, a big gap in its knowledge and a significant decline in recent decades as a result of uncontrolled human activities (road building, alluvial gold mining, wastewater disposal, agriculture, fishing and aquaculture). Between 2009 and 2014, a total of 156 waterbodies were sampled, including rivers, streams and oxbow lakes. This produced 22586 fish catches of 10 orders, 37 families and 513 species, 22 new for Perú and 17 new for science. The most important orders were Characiformes (249 spp) and Perciformes (181 spp). This fauna tended to segregate between habitats, with specific communities from springs, high jungle, low jungle, flatland streams, temporary waters, lakes, and a widely distributed community made of by habitat generalist species. Most species were clearly arranged along an elevational gradient ranging between those typical from the uppermost watercourses (Astroblepidae and Trichomycteridae) to others strictly found in the lowest rainforest, usually associated to oxbows or large watercourses, like Sciaenidae, Lebiasinidae, Clupeidae, Engraulididae, Belonidae and Chilodontidae. Species richness per site increased steadily downstream, with a marked discontinuity in the piedmont strip, between 400 and 500 m, where a maximum occurred. The channel order did not have much impact on fish species richness per site, but some impact with respect to fish abundance that tended to be higher in the 5th order rivers. Most species (85%) were very rare and were only present in less than 5% of sampled locations. Only 4.5 % of the species was widely distributed, in more than 10 % of sites.

PS1.39

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PROYECTO DE GESTIÓN DE QUELONIOS EN LA RESERVA DE FAUNA SALVAJE DE LA ISLA DE AUDÍ (TRAMO BAJO DEL RÍO EBRO)

El tramo bajo del río Ebro está afectado por importantes alteraciones antrópicas que han conducido en paralelo a la proliferación de un gran número de especies exóticas. Entre ellas, la tortuga de "Florida" (*Trachemys scripta*), considerada como una de las 100 especies invasoras más extendidas, y que habita de forma abundante en este espacio fluvial. Su presencia conlleva una serie de repercusiones ecológicas negativas, en relación a la competencia que puede ejercer sobre especies de quelonios autóctonos, como, competencia por las zonas de insolación, así como posibles riesgos sanitarios y zoonóticos sobre la fauna autóctona. En este contexto, desde el año 2009 se está desarrollando un proyecto de conservación de quelonios, en la Reserva de Fauna Salvaje de la isla de Audí (un espacio fluvial del tramo bajo del río Ebro). Este consiste, en la aplicación de campañas de eliminación de tortugas exóticas, posterior liberación de tortugas autóctonas, galápago leproso (*Mauremys leprosa*) y realización de actuaciones de mejora del hábitat. Se presentan los resultados obtenidos en 5 campañas de seguimiento entre los años 2009 y 2015. Las acciones de erradicación de tortugas exóticas, se ha llevado a cabo mediante técnicas de trampeo con nasas y esperas. La reintroducción del galápago leproso consistió en la liberación de 35 ejemplares entre los años 2009 a 2015 (con 11 ejemplares monitorizados mediante emisores de radio seguimiento "bio-track"). El seguimiento de los ejemplares reintroducidos, se realizó mediante trampeo y radio seguimiento. Con los datos del trampeo, se controló la evolución biométrica de los individuos y el índice de captura. Los datos del radio seguimiento, permitieron analizar la preferencia del hábitat, así como, el área de campeo de la especie (utilizando el método del Mínimo Polígono Convexo para el 90% y 50% de localizaciones de cada individuo). Las preferencias de los ejemplares reintroducidos y el comportamiento en el medio de reintroducción, muestran que la isla de Audí constituye un hábitat idóneo para albergar poblaciones de galápago leproso. Sin embargo, hay que garantizar una protección más eficiente del espacio natural, con la necesidad de mejorar su gestión y la conservación de sus hábitats.

PS2.25

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ACTUACIONES DE NATURALIZACIÓN DEL HÁBITAT FLUVIAL: ELIMINACIÓN DE INFRAESTRUCTURAS HIDRÁULICAS OBSOLETAS Y PROGRAMA DE SEGUIMIENTO EN EL BARRANCO DE LA FOU.

Los pequeños ríos y barrancos del Parque Natural (PN) de Els Ports (sudoeste de Cataluña) constituyen elementos clave en la regulación de los recursos hídricos de muchos municipios y llanuras agrícolas de las Tierras del Ebro. Esta red de ríos y barrancos se ubica en áreas de cabecera de cuencas hidrográficas, y juegan un papel muy importante en la regulación hidrológica y sedimentaria. Asimismo, estos sistemas fluviales albergan importantes valores ambientales con una fauna y una flora ricas en especies protegidas, y un importante patrimonio geomorfológico con formaciones de alta singularidad y relevancia. Sin embargo, las características mediterráneas de estos ríos, la creciente demanda de agua en las zonas periféricas del PN, y los efectos del cambio global hacen que estos sistemas sean cada vez más vulnerables y frágiles. Por este motivo, es importante aplicar medidas de gestión orientadas a garantizar el buen estado ecológico y geomorfológico de estos sistemas fluviales. Recientemente, el PN de Els Ports ha ejecutado una actuación de mejora del hábitat y de la morfología fluvial en el barranco de la Fou, consistente en la eliminación de un pequeño dique de retención que ha perdido sus funciones como infraestructura hidráulica. La presencia de este dique comportaba una degradación del hábitat fluvial como espacio húmedo, así como implicaciones negativas sobre poblaciones de especies protegidas. Las actuaciones de mejora realizadas tienen por objetivo la recuperación de la zona húmeda, y el restablecimiento del transporte de sedimentos en este barranco. Para ello se ha demolido el dique, se han retirado los escombros, y se ha realizado el dragado mecánico de las gravas y bloques existentes en la cola del aterramiento. Este trabajo expone las obras planificadas y realizadas, así como el programa de seguimiento morfo-sedimentario y limnológico diseñado. Se emplearán técnicas de fotogrametría digital automatizada a partir de fotografías aéreas de proximidad para la obtención de ortofotomapas y topografías de elevada resolución; se realizarán caracterizaciones granulométricas de los sedimentos del lecho a lo largo de un tramo de 2 km, se obtendrán muestras de macroinvertebrados; y, finalmente, se monitorizará el caudal circulante a partir de una sonda capacitiva.

PS1.35

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IMPACT OF INVASIVE FISHES ON ISOETES LACUSTRIS POPULATIONS IN PYRENEAN LAKES

Since late XX century, half of the over 500 lakes of the Southern Pyrenees harbor invasive fishes with reported major consequences for local biodiversity, particularly for amphibian, macroinvertebrate and crustacean species. At certain population densities fishes cascade down water column food web by grazing on crustaceans and promoting phytoplankton blooming causing losses in water transparency. Aquatic macrophytes are an important component of the Pyrenean lakes' underwater landscape, and the impact of fish invasions is yet to be reported. The perennial *Isoetes lacustris* is a lake macrophyte largely threatened in Central Europe and Scandinavia during regional acidification and eutrophication. In the Pyrenees populations of this species are at their lower limit of distribution and have remained pristine. However, shifts in lake functioning associated to fish invasions may become a major threat to this ecosystem engineering species. In this study we report environmental factors that could stress on *I. lacustris* populations in the presence and absence of fish. We sampled five lakes; two as reference without fishes (Estanys de Baciver Nord i Sud), one with a mixed trout and minnows population (La Cabana), and two harboring dense populations of minnows (Tres Estanys de Baix i del Mig) in July and August 2015. We collected samples for water quality, sediment properties, particle deposition and epiphytic load on *I. lacustris* leaves. Results showed an increase in lake water nutrients in the presence of invasive fish, particularly in those holding monospecific minnow populations. Sedimentation load on *I. lacustris* beds and sediment respiration followed the same pattern. On the other hand, sediment organic content was high at reference lakes, this suggesting a totally different nature of the sediment organic matter in the presence of fishes. The epiphytic load on *Isoetes* leaves was over an order of magnitude in lakes with minnows compared to the rest. We concluded that monospecific minnow populations represent a major threat for *I. lacustris* in invaded lakes.

PS2.26

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RETHINKING RIPARIAN RESTORATION APPROACHES TO FACE INVASIVE SPECIES IN THE CONTEXT OF LIFE+ RIPISILVANATURA

Rivers have experienced intense and long-standing human pressures which have caused the impairment of aquatic and riparian habitats. These impacts favor the spreading of opportunistic and exotic species, with a detrimental effect on native communities. River restoration projects should lie in coordinated holistic measures planned at broad scale instead of local disconnected actions, to develop more effective management strategies. In this context, LIFE+ RIPISILVANATURA aims to control invasive alien species in the Segura river (SE of Iberian Peninsula) by strengthening riparian habitats (specially the 92A0 of European Directive 92/43/CEE). Taking the whole potential distribution of 92A0 habitat in the region, a selection of actions and restoration reaches were defined in order to face *Arundo donax* from a multidisciplinary perspective. We outline some of the innovative measures and objectives of LIFE+ RIPISILVANATURA:

- Case-specific riparian restoration: control of riparian invasive species by means of case-specific ecological engineering strategies and particular combination of species for each river reach.
- Long-term biomonitoring from the evaluation of the initial status to the final assessment of the actions' success.
- Raising public awareness about invasive species and the preservation of native riparian forest, and its role as a green infrastructure providing valuable ecosystem services, through scholar campaigns and voluntary service, among others.
- Removal of exotic fauna through the involvement of citizens and environmental agents.
- Creation of a Land Stewardship Network.
- Launching of a mobile app for people to report the presence of invasive species and fire in riverine habitats.
- Demarcation of public waters and removal of unnecessary embankments.
- Publication of management and conservation handbooks about sustainable agriculture, eradication protocols of alien species, urban gardens and monumental trees.
- Riparian bird's protection by marking power lines and creation of bird observatories.

Considering the performance of the proposed actions, we expect a reduction in invasive species' coverage and an improvement of the ecological status of the target riparian habitats. We also expect a substantial reduction in the cost-benefit rate of restoration measures considering not only the biological success but also the social implications which are usually omitted in this kind of projects.

PS1.36

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CONSERVATION OF AQUATIC HABITATS AND SPECIES IN THE HIGH MOUNTAINS OF THE PYRENEES

Aquatic continental systems are scarce environments with a very specific and sensitive fauna and flora where threatened species are abundant. In the Pyrenees, these wetland ecosystems are generally considered very natural landscapes. However, despite their remote location, anthropogenic perturbations have not been absent. The introduction and spread of alien species, especially various species of fish, is considered one of the main threats in high mountain lakes and streams originally fishless. Other threats include changes caused by the hydroelectric water level fluctuations and the excessive presence of both livestock and people around springs or peat bogs crossed by tourist path. LIMNOPIRINEUS (LIFE13 NAT/ES/001210) is a project aimed at improving the conservation status of species and aquatic habitats of European interest in the high mountains of the Pyrenees. Among the habitats of interest, there are certain types of mires, tufa-forming springs, rivers and lakes. The target species include some amphibians, some mammals that feed on the aquatic environment including two species of bats. The project includes also species with populations that are now in danger of extinction decimated by various anthropic actions. As part of this project, conservation actions will be taken in the National Park Aigüestortes i Estany de Sant Maurici, the Natural Park of Alt Pirineu, and the Estanho of Vilac located in the Val d'Aran. Conservation actions to be undertaken includes developing conservation plans and assessment protocols for the management of species and natural habitats, improving the quality of mires under heavy pressure from tourism by building elevated platforms, and restoring the natural state of some lakes through the elimination and control of alien fish species allowing the recovery of native species. The project aims also to disseminate the heritage value of natural areas and the impact of invasive species to students and general public through awareness campaigns.

PS1.11

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RIVERSCAPES AND DIATOMS: HOW DOES LAND USE AREA AFFECT DIATOM COMMUNITITES, INDICES AND LIFE FORMS? EXAMPLES OF THE EBRO RIVER BASIN

Diatoms are highly linked to water traits and consequently to land use parameters. Thus, these organisms are usually used to obtain water quality information. Since 2002 the Ebro River Basin Authorities (C. H. Ebro) established the biomonitoring network based on this and other phyla. Since not much research has been devoted to Bacillariophyte-land use relationships, we needed to extrapolate which longitude of upstream riverscape is ideal to show maximal correlation between diatom communities, their lifeforms and the land covers found on those stretches. We used a one-year survey of 20 sampling sites located in the Catalan tributaries of the Ebro Basin. Later we compared if airborne recognizable land use of 1 km, 2 km, 5 km or 10 km over the diatom sampling sites would be more closely correlated to diatom communities and life forms. Our preliminary results present mixed answers. Only a relative tendency of increasing with longitude correlations can be observed up to the 5km mark. Canonical correlation analysis shows a definite increase up to that point. Not every type of land use has specifically indicative diatom species nor life forms. The 5km longitude seems to have the best trade-off between error and actual influence on these organisms.

PS1.40

Cabanes, Pep; Alcaraz, Carles; Caiola, Nuno; Jornet, Lluís; Mateu, David; Prado, Patricia; Ibáñez, Carles

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EFFECT OF CALCIUM CYANAMIDE ON AQUATIC MACROINVERTEBRATE COMMUNITY OF RICE FIELDS IN THE EBRO DELTA

The Ebro Delta is one of the largest (320 km²) deltas in the north-western Mediterranean Basin. In agricultural terms, the Ebro Delta is of considerable importance because 210 km², ca. 65 % of the delta plain, are devoted to rice farming. In 2009 the golden apple snail (*Pomacea maculata*) was introduced to the Ebro Delta, being the first population established in Europe. The apple snail is among the most invasive species worldwide, with well documented impacts on rice production. It is a major crop pest in south East Asia and poses a serious threat to rice crop in the Ebro Delta. Thus, establishing effective management and control measures is of major concern.

The application of calcium cyanamide, a well-known molluscicide, is effective in the control of the apple snail. Originally used as a fertilizer containing nitrogen and calcium, its phytotoxicity effects on rice are well known, but its toxic effects on both benthic and water macroinvertebrate communities inhabiting rice fields are unknown. Analyzing the effects of calcium cyanamide on aquatic macroinvertebrate is of major interest, since they constitute a main food for waterfowl.

The aim of this study is to analyze the effect of calcium cyanamide concentration on the aquatic macroinvertebrate community and the recovery dynamics in rice fields from the Ebro Delta. According to farmer's practices four different concentrations were selected (control, 300, 380 and 400 kg/ha of calcium cyanamide). Benthic and water column macroinvertebrates were sampled before and after the application of calcium cyanamide, seven samples per treatment (5 replicates per treatment) along 55 days. All macroinvertebrates were classified to family level and counted.

The preliminary results show significant differences among sampling days, treatment concentrations and position (i.e., benthos and water column). Macroinvertebrate diversity decreased after the application of calcium cyanamide, to the fourth sampling day (12 days after the application), showing a rapid recovery from that moment until the end (55 days after the treatment).

PS1.52

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MACROINVERTEBRATE SHORT-TERM RESPONSES TO FLOW VARIATION AND OXYGEN DEPLETION PULSES IN MEDITERRANEAN RIVERS – A MESOCOSM APPROACH

Increasing human disturbance in river ecosystems is exposing benthic macroinvertebrates to a complex set of interacting stressors, re-shaping species distribution and abundance. In Mediterranean rivers, where water scarcity is a key stressor with direct and indirect effects on other stressors, such as hypoxia and water quality, the limited existing information makes predicting the responses of macroinvertebrates to anthropogenic disturbance quite challenging. The present study focused on the response of macroinvertebrates to single and combined effects of water scarcity, measured as flow velocity, and oxygen depletion by testing their drift/passive avoidance towards flow velocity decreases and different frequency pulses of dissolved oxygen (DO) depletion in a short-term experience (3 hours treatment), in terms of abundance and diversity. A factorial design of 2 flow velocity levels (Low = 0.06 ± 0.03 m/s; Medium = 0.2 ± 0.03 m/s) with 3 levels of DO depletion [control (C) = 99 % saturation ± 5.0 ; mild depletion (Md) = 1 pulse of DO reduction per hour; high depletion (Hd) = 2 pulses of DO reduction per hour], was performed in a set of artificial channels (mesocosm system). Macroinvertebrate drift samples were collected with a drift net every hour and within channel remaining individuals were also collected at the end of the experiment. The number of individuals drifting increased for both levels of DO depletion though sampling time as well as between Low and Medium flow velocities. Community diversity generally decreased after the first hour of exposure to both stressors, however it was higher under oxygen depletion conditions (Md and Hd). Despite most macroinvertebrates drifted within the first hour for every DO condition and flow velocity, it seems to be a positive relation between the number of individuals drifted and the increasing of DO depletion frequency in addition to Low flow. Water scarcity may in fact exacerbate the oxygen depletion conditions translating into a greater drifting of invertebrates. Our results suggests that the general tendency to find more diversity after the first hour for both oxygen depletion conditions, despite lower abundance, strengthens the importance of biodiversity to resilience and resistance under multiple stressors in mediterranean ecosystems.

PS1.25

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LAGUNAS DUNARES Y SU SEGUIMIENTO POR TELEDETECCIÓN

En la Península Ibérica los sistemas dunares son escasos y situados en zonas de transición entre el mar y la costa frecuentemente sometida a una gran presión antrópica. Son ecosistemas aislados y únicos donde la teledetección puede proporcionar valiosa información sobre los eventos naturales, los impactos de degradación o los resultados de los proyectos de restauración y conservación. Los estudios ecológicos basados en la evaluación de series temporales mediante teledetección mejoran el conocimiento sobre el funcionamiento de los ecosistemas acuáticos de pequeño tamaño enclavados en humedales complejos y con una alta biodiversidad.

El Parque Natural de la Albufera de Valencia es un territorio que abarca el lago de la Albufera de Valencia, el marjal circundante dedicado al cultivo del arroz y otros ecosistemas acuáticos, como son las lagunas dunares de la Devesa, que se conocen con el nombre de Malladas. Se localizan en las depresiones del cordón dunar que separa el lago de la Albufera del Mar Mediterráneo. Las malladas son masas de agua de pequeño tamaño, someras y en su mayor parte temporales. La disponibilidad de imágenes de satélite de Landsat desde 1984 hasta la actualidad permite realizar el seguimiento temporal de los cambios hidrológicos y ecológicos ocurridos en esta zona, pudiendo pudieron observar y evaluar cambios durante las intervenciones de restauración realizadas entre 1986 y 2008. Las fases de inundación del humedal y lagunas dunares y se han estudiado mediante la utilización de la banda infrarroja, el índice de agua (NDWI) y la clasificación no supervisada por el método IsoData. Los resultados mediante teledetección se calibraron con medidas de campo dentro del propio Parque Natural. La precisión obtenida detecta superficies inundadas de 0,1 ha y profundidades de lámina de agua de unos centímetros en zonas libres de vegetación acuática. Hemos podido observar en la serie temporal los ciclos hidrológicos de inundación y sequía en las lagunas temporales, relacionados con periodos de lluvias intensas y desecación. Asimismo, nos sirvieron para evaluar las modificaciones y los efectos de los proyectos de restauración del sistema dunar. La teledetección resultó ser una herramienta complementaria y útil a los estudios de campo.

PS1.03

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DISTRIBUTION AND ABUNDANCE OF AQUATIC MACROPHYTES IN A TROPICAL HYDROGRAPHIC BASIN: ITANHAÉM RIVER BASIN, SÃO PAULO, BRAZIL

Aquatic macrophytes are important components of many aquatic environments and display an important role in the functioning of the ecosystems. Knowledge about ecology of aquatic macrophytes in tropical regions is still scarce, hence basic studies on distribution and abundance of macrophytes are important. Our main goal was to assess the macrophyte distribution and abundance of Itanhaém River basin. We assess the incidence (presence/absence) and abundance of aquatic macrophytes, using the Domin-Krajina coverage scale (zero to 5), in nine different rivers of the basin (total of 137 sample sites). A total of 44 species of aquatic macrophytes was recorded in the basin. The submerged rooted *Egeria densa* was the most representative species in terms of frequency of occurrence (40.1%) and abundance (scale 5 in 25 sites) followed by the emergent *Eichhornia azurea* (29.9%, scale 5 in 20 sites). The emergent exotic *Urochloa arrecta* (18.2%, scale 5 in 18 sites) can be considered an invasive species in the basin. *Salvinia molesta* occurred in 25.5% of the sample sites but, in general, with low abundance. *Typha domingensis* and *Heteranthera multiflora* were the species less frequent (0.7%) and with little abundance. Some species appear to be restricted to certain environments, as the free floating *Ceratopteris thalictroides* and the rooted submerged *Nitella furcata* that occurs in only one river. In relation to the life forms we registered 25 emergents, 8 free floating, 5 rooted submerged, 3 rooted floating, 2 epiphytes e 1 free submerged. All life forms were found in the area, and emergent and free floating types were the most representative life forms in almost all environments. The pattern of distribution and abundance of aquatic macrophytes in Itanhaém River basin are similar to others regions of the world, with few species with high frequency of occurrence and abundance and large number of species with low frequency and abundance. The largest number of species belonging to emerging life form is also a frequent pattern in other studies.

PS1.04

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USE OF SYSTEMATIC PLANNING TOOLS TO DEFINE FRESHWATER RESERVES IN SPAIN: THE RESERVIAL PROJECT

Despite occupying a low percentage of the Earth surface, freshwater ecosystems hold a large proportion of global biodiversity but are highly threatened by numerous human impacts. This has led to the development and implementation of tools to assess, protect and restore these ecosystems and their biodiversity. In comparison to terrestrial ecosystems, freshwater ecosystems have not been traditionally considered in the designation of protected areas. However, in the last decade we are witnessing the implementation of freshwater reserves in several countries to protect areas with relevant biodiversity and ecosystem values. Systematic planning tools are specifically designed to meet pre-defined conservation objectives (e.g. to protect a proportion of the distribution area of all species or habitats under consideration) and they use objective ecological information that incorporates aspects of ecosystem functioning and health and socio-economic constraints (e.g., cost). The RESERVIAL project, funded by the BBVA Foundation, uses a systematic planning tool and public participation processes to define freshwater reserves taking into account ecological and socio-economic criteria. The Ebro river catchment is used as a pilot study for its heterogeneity in terms of environmental conditions and river types, it has many public data available and it is subjected to multiple social conflicts. The spatial distribution of biodiversity is being modelled throughout the catchment using environmental data, land-use attributes and other relevant topographical and climatic variables as predictors. After the definition of the conservation objectives, and the use of a complementary algorithm in the software MARXAN, a proposal of freshwater reserves will be obtained. A public participation process will be carried out to identify areas not scientifically selected as potential reserves but important from a social point of view, and to omit those with highly social conflicts. The main output of the RESERVIAL project is to provide a consensual proposal of freshwater reserves based on ecological and socio-economic criteria that can be useful to water managers and policy-makers. Ultimately, the project will help to fill the insufficient representation of freshwater biodiversity in the current network of protected areas.

PS2.01

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INTEGRATION OF BIOINDICATORS IN THE WEAP SYSTEM (WATER EVALUATION AND PLANNING SYSTEM) FOR INTEGRATED MODELING AND PREDICTION OF FUTURE SCENARIOS OF THE ECOLOGICAL QUALITY OF WATERSHEDS

The Pesquería River, north Mexico, is highly impacted by anthropogenic activity. Being positioned by the National Diversity Council (CONABIO) as a priority case, characterization of water quantity and quality is recommended, as well as its ecological status characterization. The object of this study is the evaluation of the ecological quality of Pesquería river, using macroinvertebrates as bioindicators, physicochemical properties of the water, indexes to evaluate the ecological quality of the river and of the riparian forest as habitats. The second part of the project we will estimate the water availability (supply-demand) and the physicochemical parameters to modelate the river, using the WEAP model (Water Evaluation and Planning System). Our study will provide data that can be used for the evaluation of the current ecological state of river Pesqueria as well as for the prediction of future scenarios of the ecological quality of the basin, and will assist the watershed management politics for the restoration and preservation of the river's sustainability.

PS1.29

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IMPLEMENTING THE WATER FRAMEWORK DIRECTIVE TO TEMPORARY RIVERS: THE TRIVERS PROJECT

Temporary streams are those that undergo the recurrent cessation of flow or the complete drying of the streambed. Although they may represent the main part of the elementary drainage network, or even most of the total network in some areas due to climatic or lithological reasons, temporary streams are rarely included in stream monitoring networks. As a result, hydrological data for assessing the regime of temporary streams are often scarce. The LIFE TRivers project is developing a software (TREHS, Temporary Rivers' Ecological and Hydrological Status), which is designed to help the managers for adequately implement the Water Framework Directive in this type of water bodies. The first need for managing a temporary stream is the characterization of its hydrological regime, in order to help managers selecting appropriate sampling dates and using the right methods to determine its ecological status. Yet, the deviation of the actual regime from the natural one should be determined in order to assess the potential hydrological alteration due to the human activity and thereby determine the 'hydrological status'. LIFE TRivers will contribute to the conservation and restoration of one of the most common river typologies in the Mediterranean Basin, which contains most of Europe's threatened freshwater biodiversity.

PS2.27

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DE-URBANIZING AND RECOVERING THE ECOLOGICAL FUNCTIONING OF A MEDITERRANEAN COASTAL ECOSYSTEM (LA PLETERA, NE IBERIAN PENINSULA)

La Pletera saltmarsh, located at the mouth of the Ter river (NE Iberian Peninsula), includes a set of coastal wetlands that suffered in the late 80s incomplete urbanization, which was abandoned in the 90s, leaving the saltmarsh interrupted by levees, access, a promenade and piles of rubble. Since 2014 we are developing a Life Nature project (LIFE-Pletera, LIFE13 NAT/ES/001001) that aims to carry out a comprehensive and definitive restoration in order to recover their ecological functions that were altered by the building works. LIFE-Pletera main actions include the excavation and removal of the manmade elements currently covering the wetlands and its replacement by a coastal lagoon system with flooded zones surrounded by their corresponding wetland flood belts and a well-preserved dune front. The restored marsh will have a space design arranged in bands according to the typical structure of the coastal marsh natural conditions: a first band of coastal dunes, a second band of gradient, consisting of a mixture of sandy materials and clay substrates, a third band of lagoons and a fourth band of saltmarsh vegetation. To check the effects of restoration, monitoring of physical and chemical water conditions, phytoplankton, aquatic fauna and terrestrial vegetation is being carried out before, during and after restoration actuations. The project aims to demonstrate that, despite the severe environmental deterioration suffered by the Mediterranean coast, it is still possible to reverse the process and turn damaged areas back into fully functioning natural ecosystems.

PS2.17

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FRESHWATER LARGE BRANCHIOPODS IN PORTUGAL: AN UPDATE OF THEIR DISTRIBUTION

The hereby presented work is mostly the result of 20 years of field and laboratory work, with surveys conducted by the authors and some other investigators. During this period several studies were done, resulting in scientific publications and project reports. The distribution of large branchiopods in Portugal was presented in 2 international scientific meetings (Conférence International "Les mares temporaires méditerranéennes: de la connaissance à la gestion et à la restauration" (Rochebrune-sur-Argens, France, 25-28 Maio, 2004 and 4th Conference of the European Pond Conservation Network (EPCN) (Berlin, Germany, 1-4 June 2010), but never published since a first paper of Vianna-Fernandes, from 1951 and in 1999 an update from ourselves concerning the southwest Portugal. So, this work intends to bring up to date the known distribution of this faunal group in freshwater temporary systems. This is pertinent, since in the last decade, the taxon *Triops cancriformis* have been revised on the base of genetic analyses. The Portuguese populations were assigned either to the Portuguese endemism *T. vicentinus*, or to *T. baeticus*, the more widely spread Iberian species. Furthermore, a new species, *Tanymastiges lusitanica* was found and described in Portugal. More recently, a male free (or, at least, a strongly female-biased) metapopulation of *T. cancriformis* was discovered in a rice field in central region of Portugal. Here we present an updated status of freshwater large branchiopod (FLB) species of Portuguese temporary lentic systems and their distribution, plotted into a UTM (10 x 10 km) grid. A total of 498 sites (temporary ponds or assemblages of closely located, not individualized temporary pools) have been surveyed (448 by ourselves). In 236 of those (47.4%) at least one species of LB was found in one occasion. From the 498 sites, only 86 are located North to Tagus River and from these, only in 17 (19.8 %) at least one species was found. South to Tagus River (Alentejo and Algarve), 53.2% of the sites were inhabited by at least one species. This inventory includes 7 anostracans, 2 spinicaudatans and 4 notostracans

PS1.12

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EFFECTS OF NUTRIENT ENRICHMENT AND MULTITROPHIC SPECIES DIVERSITY ON DETRITAL FOOD WEBS

This study addressed the effects of nutrient enrichment and multitrophic diversity on leaf-litter decomposition in streams. We used 4 fungal species (F) and 3 invertebrate detritivore species (I) which were assembled as follows: all possible single cultures, containing 1 fungal + 1 invertebrate species; and selected assemblages of 1F+2I, 1F+3I, 2F+1I, 3F+1I, 4F+1I, 2F+2I, 3F+2I, 4F+2I, 2F+3I, 3F+3I, 4F+3I. Microcosms were exposed to two levels of nutrient concentrations: low nutrient (0.4mg/L N-NO₃ and 0.03mg/L P-PO₄) or high nutrient (2mg/L N-NO₃ and 0.15mg/L P-PO₄). Microcosms were inoculated with fungal assemblages which were allowed to colonize the leaf disks for 1 week and after that time, invertebrate assemblages were added. Microcosms were kept under aeration, at 12 °C, and stream water was changed every 7 days during 2 weeks.

Fungal and invertebrate species number had no effect on leaf mass loss. However, fungal identity was important as leaf mass loss was higher in treatments containing *Heliscus lugdunensis* species. Overall, nutrient enrichment led to increased leaf mass loss. However, the effects of nutrients depended on species identity: leaf mass loss was lower in treatments containing particular invertebrate species. Leaf mass loss in mixtures was higher than that expected based on the sum of leaf mass loss of single cultures only at the lowest nutrient concentration. Fungal biomass was not stimulated by nutrient enrichment. However, fungal biomass increased with fungal species number and fungal identity was also important as treatments containing *Articulopora tetracladia* presented higher fungal biomass. As for leaf mass loss, fungal biomass in mixtures was higher than that expected based on the sum of fungal biomass of single cultures only at the lowest nutrient concentration.

In conclusion, both nutrient enrichment and changes in species diversity have the potential to alter leaf-litter breakdown and associated communities in streams. Nevertheless, leaf mass loss seems to depend more on nutrient enrichment while fungal biomass seems to depend more on species diversity and identity.

PS1.24

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STRUCTURAL AND COMPOSITIONAL PATTERNS OF RIPARIAN FORESTS USING REMOTE SENSING AND GIS APPROACHES

Riparian forests provide a wide range of ecological functions goods and services sustained by two main indicators: 1) high spatial structural dynamics i.e, the lateral and longitudinal continuity and the strata complexity and 2) species diversity. In this presentation we compiled the main findings obtained in recent studies at mainland Portugal, concerning the characterization of both indicators using remote sensing techniques. Results showed that high spatial resolution imagery is essential due to the limit width and high structural complexity of riparian communities. Also, the linear nature of these ecosystems limits the sampling and the object-based classification methods. A combination of peculiar morphological, phenological and ecological traits at species/community levels, with clear implications in the spectral behaviour, can improve the final classification accuracies. Particularly, separability analysis allowed the spectral identification of near-natural riparian species namely *Alnus glutinosa*, *Salix salviifolia* and *Nerium oleander* based on the differences on their optical traits, both at the leaf and at canopy level. *Alnus glutinosa* had the highest level of classification accuracy, using high spatial resolution airborne images (RGB-NIR, 50cm), which can be related with its peculiar yellowish-green tone. Field spectroradiometry analysis, using hyperspectral data, enabled the identification of the optimal bands for the remote detection of alien species (*Arundo donax*) in riparian galleries. The red edge region was repeatedly selected, although the visible region was also important, especially to separate the giant reed from the herbaceous vegetation and the mid infrared region to the discrimination of the giant reed from the surrounding forest classes. The optimal bands were applied in three simulated satellite images: Landsat, IKONOS and SPOT with classification accuracies near 95%. For the structural patterns, image-based methods combined with geostatistical techniques and the application of landscape metrics allowed the remote characterization of near-natural and impaired riparian areas. Well-preserved riparian galleries are characterized by large and highly complex vegetation patches while riparian zones invaded by alien species usually showed monospecific and elongated stands. The combination of spectral, textural, geometric and other contextual attributes of the riparian areas can improve the final classifications.

PS1.21

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AQUATIC MACROPHYTES IN PAREJA, LA PRESA VERDE AND EL VICARIO LIMNO-RESERVOIRS AS INDICATORS OF ECOLOGICAL STATUS

Reservoir operation causes negative environmental impacts, many of which are related to the dry exposed shoreline. The construction of dams in the riverine zone of various reservoirs has been promoted to mitigate these impacts, creating water bodies (“limno-reservoir”) whose behaviour resembles more a lake than a reservoir. On the other hand, aquatic macrophytes are one of the biological indicators to assess the ecological status/potential under the WFD and many examples of environmental control taking them into account can be found both in Europe and USA.

The present work follows the protocol recommended by MAGRAMA to study the aquatic macrophytes in the Pareja, La Presa Verde and El Vicario limno-reservoirs. They are artificial water bodies falling into the type 24, i.e. “Inland in sedimentation basin, fluvial origin, floodplain type, low or medium mineralization”. Aquatic macrophytes richness, hydrophytes total coverage, helophytes total coverage, eutrophic-indicator species coverage and exotic species coverage have been the indicators used. The Wetlands Evaluation Index from Cirujano et al. (1992), which allows classifying Spanish wetlands following botanical criteria, has also been applied. The three limno-reservoirs showed a “poor” ecological potential, mainly because of the low richness and coverage of aquatic macrophytes, especially of hydrophytes. This result matches up with the Wetlands Evaluation Index, which revealed that all the limno-reservoirs had a moderate or worse ecological potential: “bad” in Pareja, “poor” in La Presa Verde and “moderate” in El Vicario.

The ecological status was assessed through the study of aquatic macrophytes in the limno-reservoirs based on a unique sampling survey in spring 2015, therefore the results are preliminary, being desirable a further assessment during the next hydrological seasons.

PS1.13

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EFFECTS OF WHOLE-STREAM NITROGEN ENRICHMENT AND LITTER SPECIES MIXING ON LITTER DECOMPOSITION AND ASSOCIATED FUNGI

Nutrient enrichment and changes in riparian tree species composition affect many streams worldwide but their combined effects on decomposers and litter decomposition have been rarely assessed. In this study we assessed the effects of experimental nitrogen enrichment of a small forest stream on the decomposition of three leaf litter species differing in initial chemical composition [alder (*Alnus glutinosa*), chestnut (*Castanea sativa*) and poplar (*Populus nigra*)], incubated individually and in 2-species mixtures during late spring-early summer. To better understand the effects of litter mixing on litter decomposition, component litter species were processed individually for remaining mass and fungal reproductive activity. Nitrogen enrichment significantly stimulated litter decomposing only for alder incubated individually. Differences among litter treatments were found only at the nitrogen enriched site where the nutrient rich alder litter decomposed faster than all other litter treatments; only at this site was there a significant relationship between litter decomposition and initial litter N concentration. Decomposition rates of all litter mixtures were lower than those expected from the decomposition rates of the component litter species incubated individually, at the N enriched and reference site, suggesting antagonist effects of litter mixing. Conidial production by aquatic hyphomycetes for each sampling date was not affected by nutrient enrichment, litter species or mixing. Aquatic hyphomycetes species richness for each sampling date was higher at the N enriched site than at the reference site and higher for alder litter than for chestnut and poplar, but no effect of mixing was found. Aquatic hyphomycetes communities were structured by litter identity and to a lesser extent by site, with no effect of mixing. This study suggests that nutrient enrichment and litter quality may not have such strong effects on decomposers and litter decomposition in warmer seasons as it has been reported for autumn-winter. Changes in the composition of the riparian vegetation may have unpredictable effects on litter decomposition independently of stream trophics.

PS2.44

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SEGUIMIENTO DEL ESTADO TRÓFICO, HETEROGENEIDAD ESPACIAL Y CIRCULACIÓN DEL AGUA EN LA ALBUFERA DE VALENCIA, CONJUGANDO DATOS DE CAMPO Y DE TELEDETECCIÓN

Desde 1980, la profesora Miracle ha desarrollado una buena parte de su dedicación investigadora al estudio de las aguas de la Albufera de Valencia en todos sus aspectos, con la utilización de variados procedimientos y herramientas de observación y análisis. En los primeros años, los trabajos de campo eran la única posibilidad de seguimiento del estado trófico utilizando la metodología clásica (pigmentos fotosintéticos, biomasa algal, producción primaria, nutrientes, transparencia, especies indicadoras, etc.), cuyos frutos generaron varias Tesis Doctorales en las que se evidenciaba la degradación de la laguna si tomamos como referencia los datos de principios del siglo XX. Desde 1984, la teledetección por satélite ha proporcionado más posibilidades y gran calidad en sus imágenes que, en los momentos actuales constituyen un elemento de gran utilidad en el conocimiento, análisis y conclusiones, útiles para fundamentar las propuestas de actuación con mayor precisión y fiabilidad.

Landsat 5 constituyó con su largo periodo de servicio (desde 1984 a 2011) y el sensor TM de 30 m de resolución un hito en la teledetección. En los dos últimos años se han puesto en órbita los satélites Landsat 8, por parte de la NASA, con los sensores OLI y TIRS, también de 30 m de resolución y Sentinel 2, por parte de la ESA, con el sensor MSI, con resolución hasta 10 m, capaces de ofrecer una información muy importante y válida para objetivos científicos. También, a través de la cooperación con GSFC (USA), se han tomado imágenes de la zona de la Albufera por el sensor EO1/Hyperion, con 220 bandas entre 0.4 y 2.5 μm con amplitud de 10 nm.

El análisis de algunas de las imágenes obtenidas durante estos años por los citados sensores, cuando se complementan y validan con datos coetáneos "in situ", muestran su capacidad para ofrecer aspectos de gran valor sobre la calidad de las aguas, la diversidad entre masas de agua, la heterogeneidad espacial dentro de un mismo sistema, así como el dinamismo que las entradas, corrientes internas y flujos de salida confieren a la Albufera.

PS1.26

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HUMEDALES COSTEROS DE LA COMUNIDAD VALENCIANA Y SU SEGUIMIENTO MEDIANTE IMÁGENES DE SATÉLITE

Los humedales costeros valencianos están distribuidos a lo largo de la costa mediterránea, presentando gran variabilidad en su extensión, características y estados de conservación, como consecuencia de los diversos usos en su cuenca tanto en el pasado como actualmente. A partir de 1986, se comenzaron a implantar figuras de protección como Parque Natural en muchos de ellos, con la finalidad de proteger y tratar de limitar los impactos y usos en los entornos de estos humedales. Algunas de estas zonas húmedas están incluidas dentro de los espacios protegidos de la red Natura 2000 de la Directiva Hábitats como Lugares de Interés Comunitario (LIC) y tienen otras figuras de protección como, por ejemplo, zonas Ramsar. Por medio del análisis de imágenes de Landsat 5 y 8 se han evaluado los cambios que han tenido lugar durante los últimos treinta años en los principales humedales costeros de la Comunidad Valenciana. Se han estudiado los Parques Naturales de Cabanes-Torreblanca, Albufera de Valencia, Pego-Oliva, Santa Pola, Fondo d'Elx y lagunas de la Mata-Torrevieja, y también los LIC del Marjal de Almenara, dels Moros y de la Safor. Una vez procesadas las imágenes seleccionadas, se compararon y contrastaron los resultados obtenidos mediante los índices de vegetación (NDVI) y de agua (NDWI), así como los sistemas de clasificación supervisada por el filtro adaptado (MF), espectro adaptado (SAM) y el sistema de clasificación no supervisada de IsoData. Los resultados permitieron cuantificar y observar los cambios en los niveles y superficies de inundación de estos humedales a lo largo del tiempo, que fueron contrastados con mediciones de campo. Asimismo, se determinaron las variaciones espaciales en la vegetación palustre y los impactos antrópicos en los humedales y sus entornos. Las conclusiones que se obtienen muestran que todos los humedales han sufrido transformaciones. Algunos humedales como la Albufera de Valencia mantienen características similares a lo largo del tiempo, mientras en otros se observan alteraciones importantes y están en regresión o en riesgo de desaparición, como es el caso del humedal de La Safor. En muy pocos casos han aumentado su superficie inundada o de vegetación palustre, como en las zonas húmedas dels Moros y Elx, debido especialmente a la creación de pequeños espacios lagunares como zonas de reserva de especies amenazadas. En la mayoría de los humedales, las figuras de protección han servido para frenar, pero no paliar cambios e impactos importantes en el entorno de estos humedales costeros, que se encuentran sometidos en general a una fuerte presión urbanística, agrícola y de explotación hídrica.

PS2.02

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DOES BLOOD OF *GEOPHAGUS BRASILIENSIS* GEBR (CICHLIDAE: PERCIFORMES) IS A GOOD BIOMARKER OF RECENT EXPOSURE TO MERCURY? A CASE STUDY IN GRANDE RIVER, UPPER TIETÊ, SP, BRAZIL

This study was conducted in the Grande River, one of the main tributaries of the Billings Complex, a reservoir that is a strategic fresh water resource for the São Paulo metropolitan region. We aimed to evaluate the use of blood samples from a native fish and benthic feeding habit (*Geophagus brasiliensis*) as recent exposure biomarker of total Hg and its potential use as a support tool for monitoring environmental quality. Hg in blood was used as biomarker of exposure, and relationships with the concentrations of Hg in the sediment established. Sediment and fish blood samples were collected at six sampling sites during the rainy (January-March) and dry season (July-August) of 2009, and rainy season (January) of 2010. Total Hg in blood and in sediments were determined by atomic absorption spectrometry with cold vapor (CV AAS). The highest Hg concentrations in blood occurred in the sampling sites downstream from a chlor-alkali industry. Weight and length of fish were significantly associated with concentrations of Hg in blood as shown by a *F*-Fisher test ($r^2 = 0.597$). According to international values of sediment quality for Hg, concentrations were higher than PEL (Probable Effect Level) ($0.49 \mu\text{g kg}^{-1}$) in the final stretch of the Grande River and in the Billings reservoir, while the remaining sites presented values between 0.06 and $0.35 \mu\text{g kg}^{-1}$. The Pearson correlation analysis between the concentrations of Hg in blood and sediment was positive and significant ($r = + 0.844$)

PS1.41

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BIOMETRÍA DE *PROCAMBARUS CLARKII* Y LA ABUNDANCIA DE OSTRÁCODOS EPIBIONTES EN UNA LAGUNA DE LA RESERVA DE LOS GALACHOS DE LA ALFRANCA (ZARAGOZA)

El cangrejo rojo americano (*Procambarus clarkii*) es una especie de decápodo originaria de Norteamérica que ha sido introducida en multitud de países con fines económicos. En aquellos lugares donde se ha naturalizado, constituye una especie exótica invasora y, de hecho, es considerada como una de las 100 especies invasoras más dañinas del mundo, según la IUCN, a pesar de que se ha convertido en un elemento clave en la dieta de algunas especies protegidas, como la nutria paleártica (*Lutra lutra*) o múltiples ardeidas. Junto a los cangrejos, también se puede observar una fauna exótica asociada de ostrácodos entocitéricos epibiontes comensales del cangrejo. El presente estudio se llevó a cabo en la laguna artificial del Cascarro, en la Reserva Natural Dirigida de los Galachos de la Alfranca de Pastriz, la Cartuja y el Burgo de Ebro, a pocos kilómetros de la ciudad de Zaragoza. Mediante la colocación de 18 nasas repartidas por la orilla de la laguna, se capturaron un total de 45 cangrejos. Se llevó a cabo, por un lado, un análisis biométrico de *Procambarus clarkii* y, por otro lado, un estudio de los ostrácodos en función del tamaño del cangrejo. Los resultados obtenidos incluyen un modelo que permite predecir el peso del cangrejo en función del tamaño de la quela. Este modelo podría ser de aplicación al estudio de la alimentación de especies de interés para la conservación, tales como *Lutra lutra*. Se observan diferencias morfométricas entre los sexos de los cangrejos en la relación entre la longitud del cefalotórax y la de la quela. Finalmente, en cuanto a los epibiontes, el entocitérico observado pertenece a la especie *Ankylocythere sinuosa*, la misma que en otros estudios previos en el área, y se observó una relación entre el tamaño del cangrejo y la abundancia de epibiontes. Como conclusión, este estudio permite conocer en mayor profundidad la morfometría y ecología de dos especies exóticas de crustáceos presentes en una reserva natural.

PS2.03

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INSISTIENDO: EL ZOOPLANCTON DEBERÍA USARSE EN LOS ESTUDIOS DE CALIDAD DE AGUAS DE EMBALSES

La implementación de la Directiva Marco del Agua de la UE para lagos y embalses no incluye el zooplancton como un elemento biológico indicador de la calidad del agua a pesar de que es bien conocida su relevancia en el funcionamiento de los sistemas pelágicos. Algunas publicaciones recientes están poniendo de manifiesto las relaciones del zooplancton con su ambiente para reclamar su inclusión en los estudios de evaluación de la calidad. Esta es la base para nuestra insistencia en el uso del zooplancton en dichos estudios y de nuestra hipótesis: este grupo completará la varianza que explica el fitoplancton de los procesos de degradación del sistema. Afortunadamente, disponemos de los resultados del zooplancton estudiado en 20 embalses del ámbito de actuación de la Confederación Hidrográfica del Júcar, en verano y en inviernos desde 2006 hasta 2009, dentro de un seguimiento que además consiguió información sobre factores físicos, químicos y bióticos.

De acuerdo con nuestros resultados la abundancia de zooplancton (densidad o biomasa) explica aproximadamente hasta un 50 % del estado trófico medido en base a las variables más comúnmente usadas para expresar la penetración de la luz, la concentración de fósforo y de productores primarios. Además, hemos observado que la razón biomasa de zooplancton/fitoplancton inferior a uno tanto puede darse con altas, como con bajas, concentraciones de fitoplancton y, sin embargo, cuando esta razón es superior a uno las microalgas siempre fueron escasas. Estos resultados, entre otros, ilustran el por qué en muchos casos las métricas al uso no ofrecen la misma información sobre la calidad del agua. Hemos comprobado que la varianza de diferentes métricas queda mejor explicada cuando se analizan conjuntamente el fitoplancton y el zooplancton. Parte de esta mejora de debe a que los indicadores basados en la proliferación de microalgas no tienen en cuenta los posibles efectos de la cascada trófica. Ante la dificultad de analizar estas redes exhaustivamente, p.e. contemplando la abundancia piscícola, el uso conjunto y complementario del zooplancton y fitoplancton nos parece la mejor opción.

PS1.51

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REGIONAL AND LOCAL FACTORS CONTROLLING HEADWATER STREAM METABOLISM

Stream metabolism is a fundamental indicator of ecosystem structure, functionality, and a promising tool for evaluating the ecological status. In headwater streams, key local regulators of metabolic rates (i.e. light availability, nutrient concentrations, organic matter quantity and composition and hydrology) are well understood. Nonetheless, the relative influence of regional factors (i.e. precipitation, air temperature, vegetation, and land use) and their interactions with local factors on shaping stream metabolism remains still unknown. In this study, we characterized the magnitude and variability of ecosystem gross primary production (GPP) and ecosystem respiration (ER) across 10 headwaters streams located in three European ecoregions. We also aimed to identify the main factors regulating the ecosystem metabolic rates at different spatial scales (local to regional) by examining the in-stream, catchment, and regional potential drivers in two contrasting hydrological periods (low and high flows). This study was carried out in the context of the first collaborative project among young researchers of the Iberian Association of Limnology (DOMIPEX, 2013-2015). Except for one highly productive stream, all the studied streams were heterotrophic (GPP 90% of the variance in GPP and ER rates across headwater streams indicating that factors acting at both local and regional spatial scales controlled the metabolic rates in the studied streams. In particular, stream cross-sectional area and mean annual air temperature were identified as the main drivers of GPP variance across streams. In contrast, stream slope and catchment area explained most of the variance in the ER rates. In addition, mean annual precipitation in the catchment, stream conductivity, and the proportion of agricultural land use in the catchment were also identified as regulators of stream ER. Overall, our results show that both local and regional factors determine the variability of headwater streams GPP and ER, highlighting the need of including several spatial scales for the study of freshwater ecosystems metabolism.

EFFECTS OF FOREST CHANGE ON LITTER DECOMPOSITION AND ASSOCIATED AQUATIC HYPHOMYCETES IN ISLAND STREAMS (SÃO MIGUEL, AZORES)

Streams are intimately connected with their surrounding vegetation, which provides shading and fuels aquatic food webs with litter, and are therefore very vulnerable to changes in the riparian vegetation. The replacement of native forest by commercial tree plantations and invasions by exotic tree species can affect the existent biologic dynamics despite the fact that the heterotrophic nature of streams is maintained. However, those changes in riparian vegetation often show contrasting results, with stimulation, inhibition or no major differences in litter decomposition rates, suggesting that the effects of forest change could be moderated by other factors. In places where shredders are rare or absent, as in many island streams, the biotic decomposition of litter is mediated mostly by microbial activities. The present study evaluates the effects of forest change on stream communities and activities, in São Miguel island (Azores archipelago), by comparing litter decomposition rates of native (*Ilex perado*), conifer (*Cryptomeria japonica*) and exotic (*Pittosporum undulatum*) litter, and reproduction and community structure of litter associated aquatic hyphomycetes, between streams (n=9) flowing through native vegetation (laurel forest), conifer plantations and forests invaded by exotic wood species. Litter decomposition significantly differed between litter species, stream types and streams but the significant interactions stream type × species, stream type × stream and species × stream suggest that effects of one factor are dependent on another factor. Litter decomposition and hyphomycetes species richness and sporulation rates were significantly higher in streams running through invaded forests than in native or coniferous streams. This study shows that forest changes have strong impacts on stream ecosystem functioning and fungal decomposers, but the effects strongly depend on litter identity.

¿Y SI NO FUERA EL AGUA EL RECURSO EN JUEGO EN LOS HIDROCONFLICTOS? EL CASO DE LA RESERVA DE LA BIOSFERA DE LA MANCHA HÚMEDA

A pesar de la existencia de dispositivos de tipo participativo y de nuevos marcos jurídicos de control, seguimos constatando que las tensiones y los conflictos ligados al agua siguen presentes por doquier. En general, estos hidroconflictos se perpetúan sin que las diferentes iniciativas políticas o técnico/científicas logren solucionar estas situaciones.

La idea de hidroconflicto suele estar asociada a la idea de escasez de agua pero curiosamente se encuentran el mismo tipo de discursos alarmistas tanto en regiones áridas como en regiones húmedas. Interrogarse sobre lo que es la escasez de agua nos envía a procesos de calificación, es decir a la objetivación del estado cuantitativo y cualitativo del agua a través del filtro de las estrategias y relaciones de poder entre actores.

En base a los principios de la Political Ecology este trabajo presenta cuales son, en el seno de una estrategia territorial, los mecanismos sociales que producen los discursos sobre la escasez de agua (lo que se dice que provoca el conflicto) y los factores de poder, producción de conocimientos y representaciones sociales que provocan el conflicto.

Bajo esta perspectiva se está estudiando el hidroconflicto que perdura desde los años 80 en la Reserva de la Biosfera de la Mancha Húmeda, conflicto que ha sido juzgado tradicionalmente por la comunidad científica como la competencia entre diferentes tipos de uso del agua.

Los primeros resultados del análisis de discurso de las percepciones de los actores locales hacen pensar que el origen de la conflictividad en la zona no sería la cantidad «física» de agua disponible sino la manera en la que la sociedad manchega construye los argumentos para gestionar el agua a partir de los aportes científicos y técnicos.

¿Estamos pues ante un hidroconflicto provocado por la competencia por unos recursos que no son el recurso hídrico en sí mismo?

QUALIDADE AMBIENTAL NO ENTORNO DE AMBIENTES AQUÁTICOS USADOS PARA RECREAÇÃO E TURISMO: O CASO BRASILEIRO & AVALIAÇÃO SIMPLIFICADA DE IMPACTOS AMBIENTAIS EM PRAIAS FLUVIAIS NO BRASIL.

As praias costeiras são consideradas os principais espaços de lazer das populações e o produto turístico mais popular do mundo. Do mesmo modo, o uso “organizado” de ambientes aquáticos continentais para recreação vem se tornando uma prática comum, sobretudo, em pequenos e médios municípios do interior brasileiro. Neste contexto, este trabalho tem como objetivo discutir a recreação como um dos inúmeros usos múltiplos dos meios aquáticos continentais, enfatizando por um lado sua crescente exploração e por outro o potencial sustentável da atividade, em relação a outras formas de utilização da água. Para o desenvolvimento do trabalho foram realizadas pesquisas bibliográficas e documentais, além das experiências com a pesquisa “Uso e conservação dos recursos hídricos para recreação e turismo no Pontal do Paranapanema”, obtidas em trabalhos de campo em municípios da região noroeste do Estado de São Paulo, que exploram os ambientes aquáticos disponíveis em seu território para propiciar lazer à população local e como atrativo para atrair o turismo. A pesquisa tem mostrado a expansão de áreas públicas de recreação nas margens de ambientes aquáticos, sobretudo nos municípios estudados. O crescimento dessas áreas, denominadas balneários, está associado ao fato de serem vistas por gestores públicos da esfera municipal e estadual como espaços de lazer para as populações locais e indutoras de desenvolvimento local e regional por meio do turismo, visto como uma das atividades econômicas mais promissoras no cenário mundial. Além da geração de renda, a atividade tem sido considerada uma alternativa estratégica, que atua como agente de valorização cultural e de conservação ambiental, fortalecendo a sustentabilidade. No uso dos recursos hídricos, o potencial sustentável se caracteriza por se tratar de uso não consultivo e que, em geral, não promove alterações significativas na qualidade da água. Entretanto, observa-se em grande parte das vezes, a implantação e uso desses locais carecem de planejamento e gestão adequados e não contemplam ações e programas voltados para o monitoramento e a conservação dos ecossistemas aquáticos e seu entorno, para assegurar a qualidade ambiental e à saúde dos banhistas, garantindo assim, a continuidade do ambiente e do atrativo, em longo prazo.

ZEBRA MUSSEL LIFE CYCLE MONITORING IN GUADALQUIVIR BASIN (IZNAJAR RESERVOIR)

Along with the problems at the ecological level, the zebra mussel (*Dreissena polymorpha*) is a foreign species that causing havoc in those infrastructures that colonize. This involves significant costs for maintenance/changes to them and ensuring the supply of drinking water, irrigation, industrial use, etc. Therefore, knowing the life cycle and, consequently, the reproductive stage of this organism, is crucial both to apply corrective and preventive measures as well as anticipate the period of maximum dispersion/colonization.

This article presents the results of monitoring the life cycle of the zebra mussel in the Guadalquivir Basin in the period between late 2014 and 2015. Specifically, Iznájar reservoir was taken as a model, with proven this species from 2012. Biggest larval densities were monitored in the period between June and October.

PS1.14

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DISSOLVED ORGANIC MATTER IN TWO HEADWATER STREAMS UNDER CONTRASTED HYDROLOGICAL REGIMES

Hydrology is a key driver of the dissolved organic matter (DOM) dynamic in streams. The aim of this study is to compare the response of DOM properties to changes in discharge in two headwater streams showing different hydrological characteristics. Oberer Seebach (Austria) is a perennial subalpine stream with a snowmelt period in spring and its discharge ranging 100–25000 L S⁻¹. On the other hand, Fuirosos (Spain) is an intermittent Mediterranean stream with lower values of basal discharge, less frequent and irregular storms events and a summer drought.

Stream water was sampled intensively during three years in each stream to capture all hydrological conditions. DOM quality was described in terms of absorbance and fluorescence properties —specific ultraviolet absorbance, spectral slopes ratio, fluorescence index, humification index and biological index. The analysis was performed at global, seasonal and storm event scales. Overall, DOM in Fuirosos had a more allochthonous, aromatic and humic character and it seemed less sensitive to changes in discharge than in Oberer Seebach. However, analysing monthly data, DOM in Fuirosos was found highly linked to discharge in some periods (rewetting) and it had an inverse pattern in others (drying). Moreover, DOM aromaticity showed opposite annual trends in both streams. The variability of DOM responses during the recession limb of individual storm events was also related to the distinct hydrological conditions.

PS2.12

Gutiérrez-Cánovas, Cayetano; Durance, Isabelle; Ormerod, Steve J.

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MULTIPLE STRESSOR ANALYSIS REVEALS WEAK INTERACTIONS BETWEEN PAST ACIDIFICATION AND CURRENT LAND-USE INTENSIFICATION IN RIVER ECOSYSTEMS

Understanding the long-term effects of multiple stressors on aquatic ecosystems is often complicated by contrasting trends in the extent to which some stressors are ameliorated while others intensify. In some areas of Europe, for example, agricultural intensification has been juxtaposed with reduced industrial activity, restoration efforts and tighter environmental regulation. We analysed the response of river ecosystems to the combined effects of reductions in acid deposition and increasing land-use intensification in Wales (UK) over three time points spanning three decades (1984, 1995 and 2012). We used aquatic invertebrates as biodiversity indicators, and acidity, metals, nutrients and land-use as putative measures of stress. As response variables, we compared indicators commonly used in biomonitoring (taxon richness, BWMP, ASPT), with more novel trait-based metrics (functional diversity, and functional redundancy of predators and shredders). First, data exploration was conducted using CART models (Classification and Regression Trees) to identify the most important single and combined stressors. Second, we used GLM to test the significance of candidate stressors and detect the nature of the interactions. Exploratory analysis showed that acidity was the most important stressor, followed by aluminium and measures of land-use intensity (arable land and improved grassland). GLM analysis detected significant interactions between acidity and aluminium (taxon richness, functional diversity), acidity and nutrients (BWMP), and aluminium and nutrients (BWMP). Taxon richness and BWMP responded most clearly to stressor interactions. Among functional variables, functional diversity was the most sensitive metric. Our results suggest weak interactions between past acidification and land-use intensification, suggesting that the emphasis of ameliorating acid conditions has been an appropriate priority for environmental management in upland regions. Additionally, commonly used indicators, such as taxon richness or BWMP, seem adequate to detect stressor interactions, outperforming novel trait-based metrics such as functional diversity or functional redundancy.

PS2.11

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ESTUDIO DE CARACTERIZACIÓN FISCOQUÍMICA DE LAS MASAS DE AGUA TIPO RÍO EN LA CONFEDERACIÓN HIDROGRÁFICA DEL GUADALQUIVIR

Existen numerosas lagunas en cuanto a la caracterización fisicoquímica de los ríos y arroyo en España. Esto queda reflejado por el hecho de que en la Instrucción de Planificación Hidrológica y en el Borrador del Proyecto de Real Decreto por el que se establecen los criterios de seguimiento y evaluación del estado de las aguas y las normas de calidad ambiental, no se asigna ningún valor de condición específica del tipo para ninguno de los parámetros tenido en cuenta para el cálculo del estado ecológico y tan solo se establecen los límites de corte entre las clases de estado muy bueno/bueno y bueno/moderado. En el presente trabajo se ha realizado un estudio de las condiciones fisicoquímicas generales de las masas de agua de la Confederación Hidrográfica del Guadalquivir de las que se disponen de datos. Para la realización del trabajo se ha usado la base de datos fisicoquímica de las redes ICA y DMA de la Confederación Hidrográfica del Guadalquivir. Se ha trabajado originalmente con 267.048 datos en el periodo comprendido entre 1994 hasta 2009. El tratamiento estadístico ha consistido en la realización de la media y la desviación estándar (DS) de todas las medidas para cada parámetro y masa de agua. Todas aquellas estaciones que se salen del rango de la media más la desviación estándar y la media menos la desviación estándar (media+DS - media-DS), se han considerado como valores anormales y el análisis de estos valores anormales se ha realizado de forma individualizada para cada masa de agua, para considerar su adecuación a pertenecer a una tipología u otra. También se han realizado correlaciones gamma y un análisis de componentes principales para establecer la relación que tienen las distintas variables fisicoquímicas entre sí. Una serie de variables físico-químicas que definen la presencia de vertidos de aguas residuales como son el amonio, DBO₅, fosfatos, oxígeno disuelto y porcentaje de saturación de oxígeno, y otras variables son indicadoras de aguas altamente mineralizadas como es el caso de los sulfatos, cloruros, dureza total y conductividad (indicadoras de la litología). Los nitratos se agrupan más con este último tipo de aguas mencionadas, que con los vertidos de aguas residuales, lo que indica que buena parte de los nitratos presentes en las aguas de la demarcación del Guadalquivir provienen de forma natural gracias al sustrato.

PS2.30

Jiménez, Jéssica¹; Armengol, Javier¹; Rueda, Juan¹; Mesquita, Francesc¹; García, Eduardo M.¹; Benavent, Joanmi²; Galeano, Magda

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DINÁMICA TEMPORAL DEL ZOOPLANCTON Y ZOOBENTOS EN L'ALBUFERA DE VALÈNCIA DURANTE 2014.

L'Albufera de València es una de las más extensas e importantes lagunas costeras, someras y de agua dulce, del litoral mediterráneo ibérico. Próxima a la ciudad de Valencia y su área metropolitana, se ha visto muy afectada por el hombre. Durante el siglo XX se intensificó la agricultura y hubo un aumento del asentamiento urbano e industrial, con los importantes impactos que esto supone en los sistemas acuáticos. A finales de los años 60 se incrementó la eutrofización del sistema y, el lago de agua dulce con importante vegetación sumergida, se transformó en un lago de aguas hipertróficas con un alto grado de turbidez, grandes crecimientos fitoplanctónicos y la práctica desaparición de los macrófitos. Estos cambios también afectaron a las comunidades planctónicas y bentónicas del lago que entre otras cosas, disminuyeron su riqueza. A partir de los años 90, se tomaron algunas medidas encaminadas a reducir el aporte de contaminantes al lago e invertir el proceso de eutrofización, actuaciones que en los últimos años empiezan a dar algunos frutos. El objetivo de este trabajo fue constatar alguno de estos cambios mediante el seguimiento, durante un ciclo anual (2014), de la comunidad zooplanctónica y zoobentónica. Se muestreó con frecuencia mensual en un punto de la zona sur del lago alejado del litoral, mediante un tubo de metacrilato que integraba la columna de agua y los primeros 10 centímetros de sedimento; al mismo tiempo se analizaron algunas variables ambientales. A partir de estas muestras se clasificó y cuantificó el zooplancton y zoobentos. En el estudio se ponen de manifiesto los importantes cambios estacionales que se dan en la composición, diversidad y densidad de ambas comunidades. También se comparan los resultados con otros obtenidos en estudios anteriores, para poner de manifiesto la capacidad indicadora de estas comunidades. Entre los cambios observados respecto a estudios previos destacan la reducción de densidad de zooplancton y los cambios en la composición de especies, así como la presencia de algunas poblaciones de organismos bentónicos (turbelarios, nemátodos, ostrácodos, heterópteros) de los cuales, en muestreos similares, no se encontraron individuos vivos a principios del siglo.

PS2.31

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COMUNIDAD FITOPLANCTONICA DE EMBALSES DE LAS CUENCAS MEDITERRANEAS ANDALUZAS Y SU RELACIÓN CON LAS VARIABLES FÍSICO-QUÍMICAS.

En la Cuencas Mediterráneas Andaluzas se han realizado 6 campañas de muestreo de fitoplancton de embalses durante los años 2010-2011 (proyecto 1), 2014 y 2015 (proyecto 2) siguiendo las directrices del procedimiento M-LE-FP-2013 (MAGRAMA, 2013). Simultáneamente se han analizado los parámetros físico-químicos (alcalinidad, calcio soluble, amonio, nitrato, nitrito, fosfato, fósforo total, nitrógeno total, pH, conductividad y oxígeno disuelto). La riqueza taxonómica fitoplanctónica de este estudio es de 298 taxones, la mayoría identificados a nivel de especie. El primer proyecto muestra que existe una tendencia a la segregación (MDS) entre las comunidades del fitoplancton del invierno y del verano del mismo ciclo hidrológico (ANOSIM R=0.51). Para el segundo proyecto el análisis en MDS muestra que el fitoplancton estival de cada embalse tiende a diferenciarse del resto durante todo el estudio (ANOSIM R=0.53). Por tanto, para el fitoplancton de cada embalse no existen diferencias entre ciclos hidrológicos. Este mismo patrón se observa si analizamos las variables físico-químicas (ANOSIM R=0.93). Se ha realizado un análisis BIOENV y las variables conductividad y nitratos explican un 33.7% de la varianza del fitoplancton. Para discernir que especies son las más representativas (proyecto 2) el análisis SIMPER muestra que las abundancias de *Aphanocapsa holsatica*, *Merismopedia tenuissima* y *Tetrachlorella incerta* son relevantes en los embalses Guadalhorce, Charco Redondo y el Tomillar respectivamente. Los embalses de Rules, Guadarranque, La Concepción, El Limonero, Béznar y Beninar se distinguen por *Chrysochromulina parva*. Los embalses de Casasola, Guadalteba, El Conde del Guadalhorce, La Viñuela y Cuevas de Almanzora se caracterizan por *Planctonema lauterbornii*. Todos los resultados se han sometido a un análisis RDA que agrupan un 51% de la varianza en los dos primeros ejes. Se observa como las abundancias de *Tetrachlorella incerta*, *Planctonema lauterbornii* y *Aphanocapsa holsatica* están correlacionadas con la conductividad. Son especies abundantes en los embalses de Cuevas de Almanzora y Guadalhorce, cuya conductividad oscila entre 1500 y 4000 $\mu\text{s}/\text{cm}$. *Rhodomonas minuta* abundante en el embalse de Guadalteba entre otros, esta correlacionada con el nitrito y *Cryptomonas ovata* presente en los embalses de La Concepción, Guadalhorce y Béznar esta correlacionada con la concentración de nitratos.

PS2.04

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STUDY VARIABILITY INDICES OF MACROINVERTEBRATES (IBMWP AND IMMI-T) IN THE RIVERS OF SIERRA MORENA WITH SUMMER DROUGHT.

Traditionally it is assumed that the ecological status remains unchanged with seasonality in permanent rivers, but there are not many studies of the variability of biotic indices in seasonal rivers, like most of the water bodies ecotypes siliceous rivers piedmont Sierra Morena (R-T06) and low Mediterranean mountain rivers siliceous (R-T08). The aim of this study is to determine how the macroinvertebrate community evolves to the hydrological cycle (since the river begins to have circulating water until it stops having it) and what impact has the variability detected in biological indices IBMWP and IMMI-T. We have calculated the reference condition for the two indices of macroinvertebrates studied and for the two ecotypes taken into account. It also aims to establish the optimal period for the sampling. We conducted monthly samples of benthic macroinvertebrates in 3 reference rivers from ecotype R-T06 and 3 of ecotype RT-08 drying naturally with two sampling methodologies: ML-RV-I-2013 and semiquantitative IBMWP. With both protocols tested sample has been obtained that the optimal period for the sampling occurs throughout the spring in ecotype R-T06, whereas this optimal for ecotype R-T08 period is increased from the end of winter (February) to the end of the period with water. The sampling protocol ML-RV-I-2013 underestimates the score IBMWP index relative to the sampling protocol semiquantitative IBMWP in 28 points in the ecotype R-T06 and 30 points in the ecotype R-T08. It has detected a difference between the month with the highest score for the IBMWP index and the month with the minimum score. The reference condition for IBMWP index calculated in this paper does not fit as published in the RD 817/2015.

PS2.18

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FIRST RECORD OF THE TADPOLE SHRIMP *TRIOPS CANCRIFORMIS* (LAMARCK, 1801) (CRUSTACEA: BRANCHIOPODA: NOTOSTRACA) IN PORTUGAL

Notostracan crustaceans identified as *Triops cancriformis* according to the morphological criteria adopted by Korn et. al (2006) were recorded for the first time in Portugal in 2007. All previous records of *Triops* in Portugal belong to *mauritanicus* lineage species (i.e. *T. vicentinus* or *T. baeticus*). Morphological examination by M. Machado of a specimen purportedly belonging to *T. cancriformis* (Carvalho 1944) led to its re-classification as *T. baeticus*. During 2007, hundreds of individuals were observed throughout the rice paddies on the northern margin of Sorraia River (Vale do Sorraia, Coruche), yet that abundance has never been recorded again ever since. In the last 9 years, only a few specimens have been observed on the elevated margins of the paddies, in the flooded tracks left by trucks and other heavy machinery. This low number of individuals possibly results from changes of ecological conditions. Thus far, males of *T. cancriformis* have not been recorded, which may indicate that the observed meta-population is either androdioecious or made of hermaphrodite or parthenogenetic populations. This situation contrasts with the other populations of this species in the Iberian Peninsula that are gonochoric. Parthenogenetic/hermaphrodite/androdioecious lineages, present in Northern and Central Europe, are considered to have derived from gonochoric Iberian populations in the Pleistocene which makes this finding all the more interesting in evolutionary terms. Has this meta-population resulted from a recent recolonization from non-Iberian populations? Or has it derived directly from the assumed Iberian Pleistocene refuge? The potentially high dispersal abilities of *Triops* diapausing cysts and the possibility of hermaphrodite/parthenogenetic reproduction favour the 1st hypothesis of recolonization. Possible sources of individuals are (i) cysts attached to migratory birds arriving possibly from Southern France or Northern Italy and that are regularly seen feeding at these rice fields or ii) cysts unwittingly transported with the rice seeds used in the Vale do Sorraia. Both are in accordance with the assumption that nongonochoric reproductive mode confers a colonization advantage over gonochoric populations, which lack evidence of fast long-distance dispersal ability. Future multilocus phylogenetic analysis is expected to clarify the origin of *T. cancriformis* found in the Sorraia's rice fields.

PS2.32

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EVALUATION OF THE INFLUENCE OF ENVIRONMENTAL AND ANTHROPOGENIC FACTORS AFFECTING ZOOPLANKTON COMMUNITY IN FLATLAND PONDS

We investigated the relative influence of natural and anthropogenic processes on the taxonomic and functional composition of the zooplankton community in 52 flatland ponds located in Duero river basin (North Iberian Plateau). A total of 90 taxa were recorded, including 17 copepods, 29 cladocerans and 44 rotifers. Taxa were grouped into seven functional groups according to their feeding mode and size (small unselective filter-feeders, big unselective filter-feeders, selective filter-feeders, big predators, small predators and non-predatory rotifers). Constrained and partial canonical ordinations were used to assess the effect of three categories (habitat, disturbance and biotic) of environmental variables on the functional and taxonomic composition of assemblages. Constrained and partial canonical ordinations were performed using CANOCO.

Thirteen explanatory variables (depth, pH, PVI, phytoplankton biovolume, nitrate, SRP, VSS, TSS, DOC, forested land, cattle farms, scrub and rainfed crops) were retained in the CCA model after forward selection with taxonomic approach. The proportion of variation explained by all selected variables was 42.99 %. The analysis basically revealed a gradient from ponds affected by farming activities to ponds in good or best available condition, with forested lands and macrophyte communities. Variance partitioning showed that disturbance (27.79 %) was the best predictor of the zooplankton community (land uses 14.45% and chemical variables 13.34 %), while the contribution of habitat (5.39 %) and biotic (5.26 %) categories was lower.

With respect to functional feeding groups, depth, phytoplankton biovolume and TSS were only retained in the CCA model after forward selection, and the total variation explained was 25.05 %. The variance attributable to biotic variables was higher (11.23 %) than the proportion due to disturbance (3.68 %) and habitat (5.67 %) factors.

Overall, the results of this study support the use of taxonomic composition of zooplankton for monitoring human generated effects on flatland ponds, which have strong interaction with the adjacent modified terrestrial habitat. By contrast, functional feeding groups were mainly affected by changes mediated through biotic factors.

PS1.43

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EFFECTS OF ULTRASOUND TECHNOLOGY ON LARVAES OF ZEBRA MUSSEL (*DREISSENA POLYMORPHA*): BASIS FOR THE DEVELOPMENT OF AN ALTERNATIVE TREATMENT.

The zebra mussel (*Dreissena polymorpha*, Pallas, 1771) is a freshwater bivalve mollusk native from Caspian Sea. This invasive species is the major agents of biofouling in Europe and in the United States, colonizing hull of ships and surface of different hydraulic infrastructures and clogging pipes and filters. Since its introduction into the Ebro River basin from nearly a decade has been quickly spreading throughout the waterways of other basins in Spain causing serious economic and environmental consequences. Ultrasound technology has improved in recent years, in term of logistics, cost and maintenance and there is a need to find environmentally friendly methods against this invasive species. For these reasons, the ultrasonic treatment could be a viable alternative treatment. A study was carried out from June to December of 2015 to test the effects of the ultrasonic device DUMO Marina ACM, manufactured by Toscano Línea Electrónica S.L., on the viability of the larvae and their capacity of settlement and colonization of the substrate. This study was performed in the laboratory of CEIDE (Center of Studies and Documentation of ENDESA), in Riba-roja Reservoir (Ebro River basin). Here two hydraulic channels with raw water from the reservoir were used to test the effects of ultrasonic treatment: one treated-channel and one no-treated channel (control). Larvae were classified according to their viability: dead, affected and live larvae, using a methodology of staining. During the ultrasonic treatment was observed an increase between 32 and 50 % of affected larvae and the mortality of larvae increased in 29, 06 % in a sampling. On the other hand, a loss of the capacity of settlement in treated larvae was clearly observed. The exposure time of larvae to ultrasonic treatment was between 7 and 10 minutes. Although further studies are needed, this laboratory experiment shows the effective use of the ultrasound to prevent the settlement of zebra mussel larvae. Also is observed an affection of the larvae caused by the ultrasound. Definitely, the ultrasound technology should be assessed as an alternative treatment against the invasion of the zebra mussel.

PS2.48

Mellado, Andrés¹; Puente, Luis Javier.¹; Nolla, Pepita.¹; Serrano, María Jesús.¹; Vargas, Jorge¹; Verdugo, María¹; Copado, Marta²; Brieva, Cándido².

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CORRESPONDENCE BETWEEN STREAM COMMUNITIES AND ENVIRONMENTAL REGIONALIZATIONS IN THE GUADALQUIVIR RIVER BASIN

Environmental factors that shape the structure of communities in lotic systems are numerous and vary depending on the biological group considered. Mean size, life span, and other important life history traits may influence which environmental filters operate to determine community patterns. We tested the correspondence between several abiotic environmental and biotic regionalizations of peninsular Spain and community patterns of three different aquatic organism groups (macroinvertebrates, diatoms and macrophytes). We used a variety of classifications, including hydrological, geological, phytogeographic, multivariate environmental, riparian, and biological ones. We tested this congruity by means of MDS ordination and MVRPP analysis. In general, none of the regionalizations had a strong influence in driving community patterns simultaneously in all biological groups. The Spanish DMA river typology appeared moderately influential only for macroinvertebrates while the phytogeographic regionalization was the most congruent with macrophyte and diatom communities. Hydro-regions also discriminated clearly between different types of assemblages using diatoms and macroinvertebrates. Other classifications were not highly correlated with overall community structure, discriminating only particular types of sites and assemblages. We discuss also these results as well as their implications for stream bioassessment programs.

PS1.37

Miró, Alexandre¹; **Cruset, Eloi**²; **Jurado, Ismael**²; **Márquez, Meritxell**²; **Busquets, Laia**²; **Jorba, Òscar**²; **Sopena, Sara**²; **Porcar, Andreu**²; **Sabás, Ibor**¹; **Buchaca, Teresa**¹; **Ventura, Marc**¹

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GROWTH AND DEMOGRAPHY OF BROWN TROUT (*SALMO TRUTTA*) IN HIGH MOUNTAIN LAKES OF THE PYRENEES: INITIAL RESULTS OF THE PROJECT LIFE LIMNOPIRINEUS

Nowadays, more than half of Pyrenean high mountain lakes are occupied by fish, as a result of a historical process of introductions dating back to centuries ago, and that has been accelerated during the last 60 years. Brown trout (*Salmo trutta*) was the first introduced fish species in these lakes, initially from indigenous populations located in the nearest Pyrenean rivers, and more recently using trouts of central European origin coming from hatcheries. The specific impacts of the introduction of fish include, among others, the transformation of the ecosystem structure and trophic relations, and the reduction and extirpation of native species.

The project LIFE LimnoPirineus (LIFE13 NAT/ES/001210), started in 2014 and includes among its main objectives the restoration of eight high mountain lakes with fish (trout or minnow) and the recovery of native species of European interest, either by eradication or intensive control of introduced fish, depending on the size of the lake.

We have carried out surveys to assess fish populations in lakes in the area. In most of the lakes sampled so far, trout fishing has been forbidden for last 25 years. Sampling was based on the use of nets. Catches have been measured, weighed and sexed, on site. Individual age has been determined by otolith reading. Initial results on individual growth and demography are presented for five of the lakes surveyed and also for a small stream.

Brown trout has a high longevity in most lakes, although is higher in the case of Mediterranean stocks (20 years), compared with populations of Central European origin (12 years). Mean growth is very low.

PS1.22

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ENVIRONMENTAL SUSTAINABILITY OF LIMNO-RESERVOIRS: RESPONSE TO UNCERTAINTIES AFTER A MULTIDISCIPLINARY RESEARCH

Large reservoirs in the Mediterranean area demonstrate a variety of negative impacts, many of which result from large water level fluctuations. In Spain, water managers have implemented various mitigation measures to reduce these negative impacts. One such measure is the construction of small dams in the riverine zone of large reservoirs to create a water body with a constant water level (a "limno-reservoir") to provide the environmental and recreational services that the main reservoir cannot provide due to the water level variations. This study analyzes the environmental sustainability of such limno-reservoirs on the basis of results obtained in a multidisciplinary research project conducted in the Pareja Limno-reservoir. This limno-reservoir was built in 2006 in a sidearm of the Entrepeñas Reservoir (Guadalajara, central Spain); however, as its environmental sustainability was not assessed prior to construction, there is some uncertainty about the ability of the limno-reservoir to provide the expected socio-environmental services. This study reviews the research so far carried out in the Pareja Limno-reservoir and includes an integrative discussion endeavoring to answer questions regarding this uncertainty. Today, the Pareja Limno-reservoir is a successful tourist and environmental aquatic resource; however, our results reveal several factors that may reduce its ecological and social value, and maintenance of a constant water level plays an important role in this respect. The conclusions of this study may be useful for water managers by providing guidelines for assessing the environmental sustainability of limno-reservoirs.

PS2.51

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STRUCTURAL AND FUNCTIONAL RESPONSES OF STREAM ECOSYSTEM AFTER DROUGHT: DOES LAND USE MATTER?

Streams are among the most threatened habitats in the world due to human activities, replacement of native vegetation by exotic monocultures being one of the most predominant. This alteration affects energy inputs into streams and trophic interactions within these donor-controlled food webs. Moreover, these impacted systems must face up to the increasing frequency of drought periods due to the increases in water temperatures and changes in precipitation regimes. We examined if the re-colonization dynamics of benthic macroinvertebrate assemblages and the process of leaf-litter decomposition after a drought period differ depending on land use. The study was carried out in nine temperate streams that suffered for an unusual drought period during summer-fall of 2015: three streams draining native deciduous forest, three draining *Pinus radiata* plantations and three draining *Eucalyptus globulus* plantations. In each stream, five benthic samples were taken in three times after flow recovery, and a decomposition experiment using *Alnus glutinosa* leaves was developed. The structure of macroinvertebrate assemblage changed along time and differed among land use. However, surprisingly, the decomposition rates were similar independently of the watershed vegetation, and were related to the density of benthic shredders at the bags retrieval time. Thus, while the assemblage structure dynamics after a drought period depended on land use, the response of a key ecosystem function such as leaf-litter decomposition did not.

PS2.05

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VARIABILIDAD NATURAL O INDUCIDA DE LA CONCENTRACIÓN DE FÓSFORO EN LAGOS Y SU INFLUENCIA EN LA EVALUACIÓN DEL ESTADO ECOLÓGICO.

El fósforo es el nutriente limitante en la productividad de los lagos y el principal responsable de los procesos de eutrofización.

Por este motivo, los principales métodos de evaluación de la eutrofización y del estado o potencial ecológico emplean la concentración de fósforo total como indicador del grado de eutrofización. Por otro lado, el fósforo como elemento dentro de los ecosistemas acuáticos se encuentra en formas inorgánicas y orgánicas, en disolución, particulado o en el sedimento y la tasa de conversión de una forma a otra puede ser elevada en ciertas condiciones.

En la Confederación Hidrográfica del Júcar se ha analizado el contenido en fósforo total en las aguas de los lagos dentro de su demarcación desde el año 2008. En estos años se han obtenido resultados puntuales con concentraciones muy elevadas que han penalizado el estado ecológico de las masas de agua tanto en la evaluación anual como plurianual.

Como causas posibles de estos resultados se apuntan las siguientes:

Técnicas: Las características del fósforo como elemento limitante requieren que su presencia deba medirse en concentraciones muy bajas (ppb). Las técnicas analíticas deben ser capaces de dar resultados en el entorno de su límite de cuantificación y en ocasiones los límites entre estado se encuentran por debajo de este límite.

Variabilidad: En una misma masa de agua es frecuente que las concentraciones de fósforo halladas varíen en una relación superior a 10:1 sin que pueda hallarse correlación entre los valores obtenidos y otros factores estudiados como época de muestreo, concentración de clorofila a o variaciones en las presiones sufridas por la masa de agua.

Origen: En algunas masas de agua tipo lago hay una presencia abundante de fauna, especialmente avícola, que puede aumentar de forma significativa la presencia de fósforo en las aguas del lago de forma natural.

En conclusión: es necesario profundizar en el conocimiento del comportamiento del fósforo en los lagos para conocer las causas de la variabilidad del fósforo en esas masas de agua y la influencia de ésta en la determinación del estado.

PS2.33

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São Paulo State University - UNESP

THE PHYTOPLANKTON AS ENVIRONMENTAL DISCRIMINATOR OF RESERVOIRS IN CANTAREIRA SYSTEM (SÃO PAULO, SP, BRAZIL)

This study aimed to characterize and seasonally compare the water masses, from the point of view of the trophic state and check it for horizontal spatial distribution of phytoplankton along a longitudinal axis in each reservoir and between the reservoirs using phytoplankton as a prediction tool environmental. This study was conducted in five reservoirs (Jaguari, Jacarei, Cachoeira, Atibaia and Paiva Castro) of the Cantareira System.

We collected integrated water column samples for physical, chemical variables and phytoplankton analysis in 19 sampling points from the reservoirs in two periods May/June 2013 (dry season) and in November/December 2013 (rainy season). The reservoirs showed a trophic gradient. The results show a trend towards higher values in the first reservoir of the variable system: dissolved inorganic nitrogen (DIN), the total phosphorus, chlorophyll a, suspended solids and trophic state index (TSI). The Jaguari reservoir was classified as supertrophic/eutrophic, the Jacarei as eutrophic/mesotrophic and Cachoeira, Atibaia and Paiva Castro reservoirs as mesotrophic/oligotrophic. The phytoplankton in the dry period showed 214 taxa and in the rainy period 171 taxa. The density and biomass of phytoplankton was higher in Jaguari reservoir, and the dominant taxa were invasive species *Ceratium furcoides* (614.0mg.L⁻¹) in the dry period and the cyanobacteria *Aphanizomenon gracile* (69.6mg.L⁻¹) in the rainy period. The canonical correspondence analysis (CCA) clearly showed the spatial heterogeneity of the groups in the sample time and space. The main taxonomic classes associated with environmental variables were cyanobacteria, followed by Bacillariophyceae, Dinophyceae, Trebouxiophyceae and Xanthophyceae. Changes in water quality of these aquatic ecosystems are occurring at accelerated rapid rate, affecting directly and indirectly the phytoplankton community structure and, consequently, the trophic structure of water bodies. FAPESP (2013/08272-0) for the financial support.

PS1.15

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TROPHIC DESCRIPTORS OF MEDITERRANEAN RESERVOIRS (CATALONIA, SPAIN)

The aim was to determine which the phytoplankton community responded to different trophic states in a series of Mediterranean reservoirs (La Llosa del Cavall, Sant Ponç, La Baells, Santa Fe, Susqueda, Sau, and Foix) located in Catalonia (Spain) and contribute to establishing standards and general rules that explain the occurrence and permanence of phytoplankton associations under particular trophic conditions. Integrated water samples and phytoplankton (0–5 m) were collected in the summer. The results showed that the average trophic state index increased from the reservoirs. Differences in illumination, nutrient supply, and mixing regime, were the determining factors of this pattern, and were reflected in the functional groups (GFs) found. In the La Llosa, San Ponç, and La Baells reservoirs, oligotrophic conditions, extensive euphotic zones, and deficiency of phosphorus and CO₂ were associated with small flagellated mixotrophic organisms belonging to the Lo, E, X2, X3, A, and R functional groups. The Susqueda and Sau reservoirs were classified as mesotrophic and eutrophic, respectively, and were mainly dominated by small organisms tolerant to deficiency of light and nutrients (phosphorus), represented by the GFs - B, A, H1, X1, MP, N, J, S1, Y, and Lo. The hypereutrophic Foix reservoir, characterized by nutrient-rich conditions with high concentrations of organic matter, was dominated by large organisms tolerant to light deficiency and high turbidity, represented by codons Y, H1, and W2. In the Santa Fé reservoir, there was a predominance of algae represented by GFs W2 and C, which were adapted to light deficiency, slightly acidic pH, and high levels of nutrients such as phosphorus and silicate. From exploratory analyses conducted using the environmental variables and the composition of the phytoplankton community, considering classes and functional groups, it appeared that both of the latter parameters could explain the community. FAPESP (2011/02952-3) for the financial support.

PS1.16

Mosele Tonin, Alan¹; Boyero, Luz²; Gonçalves, José F.¹; Bambi, Paulino¹; Couceiro, Sheyla M.³; Hamada, Neusa⁴; Hepp, Luiz U.⁵; Kowalczyk, Vania G.L.⁶; Lemes, Luiza A.⁷; Moraes, Paula B. de⁸; Moretto, Yara⁹; Oliveira, Adriana¹⁰; Petrucio, Maurício⁷; Martins, Renato T.⁴; Feitoza, Lorraine A. M.⁶

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LARGE-SCALE TEMPORAL VARIATION OF LITTER INPUTS AND STORAGE IN NEOTROPICAL STREAMS

Freshwater ecosystems are widely spread across terrestrial landscapes and receive large amounts of litter from the surrounding riparian vegetation. Despite the small size of headwater streams, these receive, transport, store and process a significant amount of terrestrial organic carbon each year, and thus have an important contribution to carbon fluxes. The relative importance of these processes varies throughout the year, but there is virtually no information about such variation for tropical streams. We present a multi-site field experiment across three biomes in Brazil (Atlantic Forest, Cerrado savanna and Amazon) to explore temporal patterns of variation and environmental predictors of litter inputs (litterfall and lateral inputs) and storage. Our models revealed (i) higher litterfall in drier and hotter months at Amazon and Cerrado and homogeneous litterfall rates over the year at Atlantic Forest streams; (ii) higher lateral inputs at the most productive and rainy periods for Cerrado streams; and (iii) higher storage in higher litter input periods at Cerrado and Atlantic Forest, but also in drier periods at Cerrado streams. These results suggest there is a strong influence of precipitation on temporal patterns of variation of litter inputs and storage in tropical streams, but also show important differences among biomes, suggesting high regional complexity and the inadequacy of general models for all tropical areas.

PS1.27

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MORPHOMETRIC CHARACTERISTICS OF THE LAKES IN THE CAJAS NATIONAL PARK, ECUADOR

The present study is a part of a project, which constitutes a pioneering contribution to the understanding of the limnological characteristics of these unique nearly-pristine mosaic of tropical Andean lakes, representing the main water source for thousands of people in the region. Herein the results of the bathymetric surveys and analyses of morphometric characteristics of the main lakes existing in the Cajas National Park (PNC), a Ramsar Convention site, located in the southern part of Ecuador, is presented. It is expected that the morphology of the lacustrine basins has an important influence on the physical, chemical and biological dynamics of their lakes; hence, limnological research must consider their bathymetry and related morphometric characteristics. Out of the more than 240 lakes that make up this glacier lake system, 168 were selected for the present study. In 2014, the lakes were surveyed using bathymetric sonar and morphometric characteristics were determined. The studied lakes have widely varying horizontal and vertical dimensions. The maximum length of the studied lakes ranges from 0.01 to 2.15 km, whilst their area ranges from 0.04 to 77.48 ha. Correspondingly, the lake volume ranges from 0.0001 to 22.37 hm³. The maximum depth of the studied lakes is quite variable: about 17 lakes are the deepest ones in the PNC with depths ranging from 49.0 to 75.5 m. The results depicted herein are the basis of a catalogue that is being prepared at the moment and that will satisfy an important need from the decision makers that are in charge of the management of the Park. Further, these results will be integrated in the context of other scientific projects running in parallel at the same study zone.

PS1.30

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HABITAT SUITABILITY MODELLING FOR FRESHWATER FISH SPECIES IN A SMALL TANZANIAN RIVER

Damming and water diversion regulate rivers and negatively alter the natural dynamism of riverine ecosystems. Eastern Africa remained significantly unspoiled but population growth and the interest for their natural resources favoured the increase in the number of regulation facilities and the volumes of water eventually extracted. The physical habitat simulation approach is the standard method for environmental flow assessment evaluating the instream habitat for the target organism, typically fish assemblages, under different management alternatives. However, in eastern Africa, knowledge gaps and paucity of data about the specific habitat requirements of freshwater fish species hinder adequate implementations. Therefore, we studied the hydraulic niche of the ichthyofauna present in the Udagaji River, a small river located in the centre of Tanzania.

Eight different genera were captured by electrofishing in 300 microhabitats where flow velocity, depth, substrate and cover was measured. Three species presented sufficient sample size for data analysis, namely; *Labeo cylindricus* (Peters, 1852), *Parakneria spekii* (Günther, 1868), *Amphilius uranoscopus* (Pfeffer, 1889) and several small species of the genus *Barbus*, which were gathered as a single group. The R package *hypervolume* was used to calculate the four-dimensional hydraulic niche using presence-only data whereas the microhabitat preferences were modelled by means of 0-order Takagi-Sugeno-Kang (TSK) fuzzy rule base systems optimised with genetic and evolutionary algorithms.

L. cylindricus demonstrated to have the largest hydraulic niche followed by *Barbus spp.* The study site was shallow then depth was the least important variable and velocity the most. Apart from velocity, cover largely influenced *L. cylindricus* occurrence whereas substrate influenced the occurrence of the remaining species.

The TSK models achieved competent accuracy ($CCT = 0.74$) splitting each variable only into two different categories (*i.e.* Low and High). The dedicated partial dependency plots suggested a rheophilic nature of the studied species because they selected fast flow microhabitats with coarse substrate and rarely cover. Conversely, *Barbus spp.* preferred low flow velocity, fine to medium substrate and cover suggesting a more eurytopic nature of the species.

This study rendered novel and valuable information and ready-to-use habitat suitability models (the TSKs) to optimise the trade-off between human benefits and ecological impact.

PS1.20

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ECOLOGICAL STATUS ASSESSMENT OF PAREJA LIMNO-RESERVOIR (CENTRAL SPAIN) BASED ON PHYTOPLANKTON BIOMASS AND COMPOSITION

Pareja is a warm monomictic and calcareous limno-reservoir located in a sidearm of the Entrepeñas Reservoir (Central Spain). Four limnological surveys were performed in May, July and October of 2015 and January of 2016 as part of a comprehensive monitoring work to assess the ecological status of this limno-reservoir, that up to date is considered to be high/good. The aim of this work is to study the phytoplankton composition and biomass of the limno-reservoir along this period, in order to detect variations in phytoplankton metrics of ecological status compared with previous studies. Samples were taken near the dam at different depths (0, 2, 5 and 8 m). Cell numbers of each phytoplankton species were quantified with Utermöhl method and biovolume calculation was based on geometric models. Chlorophyll *a* was analyzed by photometry.

The annual means of chlorophyll *a* and total biovolume were 4.6 µg/l and 0.8 mm³/l respectively. Both chlorophyll *a* and total biovolume showed the highest values in July.

Small diatom species of the genus *Cyclotella* dominated the phytoplankton in all sampling dates. They had a contribution of more than 60 % of total biovolume in most samples, and reached its maximum absolute abundance in July. Other abundant taxa were the chlorophytes *Tetrachlorella incerta*, *Dictyosphaerium subsolitarium* and *Planctonema lauterbornii*, especially in summer, and the flagellates *Ceratium hirundinella* (Dinophyta) and *Chrysochromulina parva* (Haptophyta) in May and January respectively. Pennate diatoms and euglenophytes were only remarkable in July at 8 m depth. Cyanobacteria were very scarce, with a maximum relative abundance of 2 %. Its highest biovolume was found in October and January.

The phytoplankton taxonomic composition and dominant taxa found in this work are similar than those reported in a previous study of this limno-reservoir for the period 2008-2011. The most remarkable difference between that period and our study is an increase in total biovolume and chlorophyll *a*. Nevertheless, taking into account both biomass metrics and composition metrics, we can conclude that the ecological status of the reservoir has barely changed.

PS2.34

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BENTHIC DIATOM COMMUNITY RESPONSE TO RESTORATION OF TWO COASTAL LAGOONS (LIFE DELTA LAGOON). RESULTS UNTIL 2013.

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 finished 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 some of the results of the benthic diatom community study. Diatom samples were obtained from 17 sites distributed across the two coastal lagoons, both before (2011) and one and two years after habitat restoration actions were taken to restore (2012 and 2013).

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. A total of 46 samples have been analysed.

In total, 250 taxa have been identified, which are distributed among 58 genera. The genera represented by the highest numbers of species were: *Nitzschia* (50 spp), *Navicula* (29 spp), *Amphora* (21 spp) and *Mastogloia* (15 spp).

Differences in the composition and structure of the community will be discussed in relation to the physical-chemical data studied. Several statistical methods have been used in order to define assemblages of diatoms. It is possible to find 4 groups of localities and 4 assemblages of diatoms in correspondence with these groups. There are 21 diagnostic species that had high fidelity to its localities that can define the assemblages.

Diatom assemblages clearly detected changes occurred in the lagoons between 2011 (before restoration) and 2012-2013 (after restoration).

PS2.49

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EVALUACIÓN DEL EFECTO DE LOS METALES PESADOS SOBRE LAS DIATOMEAS BENTÓNICAS EN ROȘIA MONTANĂ (RUMANÍA) MEDIANTE GEOMETRÍA MORFOMÉTRICA

Roșia Montană (Rumanía) es una zona con una conocida tradición minera, extendida durante más de 2000 años, y que probablemente alberga el mayor depósito de oro de Europa. Actualmente, presenta un significativo deterioro debido a la duración de la actividad minera. El bajo pH da lugar a unas características químicamente agresivas, además de la significativa cantidad de metales pesados que son movilizados desde las rocas a la red fluvial. Esto afecta tanto a la superficie del agua como a la comunidad acuática.

Las diatomeas constituyen un grupo ideal para estudiar la biodiversidad y para entender los factores que la regulan. La estructura de la comunidad puede verse afectada por altos niveles de microcontaminantes, y en particular por metales, que pueden ser frecuentes en estos ríos. En este contexto, el objetivo de este trabajo fue estudiar los efectos causados por los metales pesados sobre la comunidad de diatomeas bentónicas en el Río Abrud, en la zona minera Roșia Montană. En este estudio se evalúa la relación entre la concentración de contaminantes acuáticos y la existencia de formas teratológicas en diatomeas epilíticas mediante estadística multivariante. Se ha usado geometría morfométrica para caracterizar la deformación celular observada en algunos taxones de diatomeas, y evaluar los efectos de estos factores de estrés en el grado de deformación. Para realizar este análisis, se capturaron los contornos de las valvas tanto de individuos deformados como normales, como una configuración geométrica de pseudolandmarks directamente digitalizados a partir de imágenes de microscopía óptica. La presencia de individuos deformados indica que la comunidad de diatomeas se vio fuertemente afectada por las aguas acidificadas debido a la actividad minera. Asimismo, se han observado algunos taxones dominantes que podrían sugerir la existencia de niveles sapróbicos extremos en el agua, lo que indicaría gran cantidad de materia orgánica proveniente de aguas residuales no tratadas, que junto con altas concentraciones de NO₃, pondrían de manifiesto la baja calidad de las aguas. Además, los valores de los parámetros físicos y químicos y la concentración de iones y metales pesados, indican alteraciones en la calidad debidos a la llegada de aguas mineras al río.

PS2.35

Oliveira, Vanessa; Abreu, P.C.; Odebrecht, C.; Souza, N. C.; Cardozo, A.; Silveira, S. B.

Federal University of Rio Grande - FURG Institute of Oceanography

EFFECT OF BIRD EXCREMENT ON THE EUTROPHICATION OF SUB-TROPICAL LAKES IN SOUTHERN BRAZIL

Piscivorous birds are an important link in the transfer of matter between aquatic and terrestrial ecosystems, as excrements can be an important source of nutrients in aquatic environments, depending on the number of birds. Natural and artificial lakes with varying trophic degrees are present at Campus Carreiros of the Federal University of Rio Grande. To test the hypothesis whether eutrophication is caused by the entry of bird guano, an experiment was conducted where bird excrements were added to the water of two Campus lakes: Lake Biguás (LB), eutrophic and Lake Polegar (LP), and the effects on phytoplankton community was evaluated. The experiment was conducted using bottles (5L) with water for each lake (LB and LP) distributed in eight treatments with three repetitions each: 1) Water Lake (WL)+guano+aeration; 2) WL+aeration; 3) WL+guano; 4) WL. Water samples were taken every two days for analysis of ammonium, phosphate, chlorophyll a and phytoplankton abundance. Nutrient values at the beginning of the experiment in the LB were 1.17 μM of ammonium, 0.30 μM of phosphate and 3.63 $\mu\text{g/L}$ of chlorophyll a and in LP values were 1.33 μM of ammonium, 0.28 μM of phosphate and 2.55 $\mu\text{g/L}$ chlorophyll a. The results indicate that both lakes presented mesotrophic conditions at the beginning of the experiment. After the guano addition there was an increase in ammonium and phosphate to respectively 16 μM and 2 μM in LP and 17 μM and 3 μM in LB. Chlorophyll a showed a significant increase in the water of the two lakes throughout the experiment, with higher values obtained with addition of guano without aeration. The most abundant autotrophic microorganisms were picoplankton, followed by flagellates and chlorophytes. However, chlorophyll increase was mainly due to the growth of green algae in treatments without guano, while flagellates prevailed in treatments with guano, but without aeration. We conclude that the guano of birds altered the nutrient composition and amounts and significantly increased phytoplankton in lakes, being likely responsible for the eutrophication observed in Biguá lake.

PS2.36

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SPATIAL DISTRIBUTION OF EPIPHYTIC ALGAE ON BLACK AND WHITE-WATER RIVERS IN A NEOTROPICAL LOTIC ECOSYSTEM (SÃO PAULO STATE, BRAZIL)

Itanhaém River basin is located in the South Coastal of São Paulo State (Brazil) and the rivers have different water colours (black, white and clear) and different physical and chemical characteristics. Despite these distinct characteristics the distribution of fish and macrophyte forms an upstream–downstream gradient of the basin, regardless of the type of water. The macrophyte *Eichhornia azurea* is abundant in the basin, both in black and white-water rivers. 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 five sites of black-water rivers and two sites of white-water river. We obtained the abiotic variables of the water in the macrophyte stands. Epiphytic algae were quantified using inverted microscope, according to Utermöhl. We estimated the species richness, total density and Shannon diversity. We identified a total of 234 taxa distributed in 14 classes. Epiphytic algae biomass formed an upstream–downstream gradient, regardless of the type of water, as registered to fish and macrophyte communities. However, we registered different species of algae in black and white-water rivers. We observed the formation of three groups by CCA. The first group containing Preto, Castro and Aguapeú Rivers with lowest values of pH and dissolved oxygen and diatoms species such as *Eolimna minima*, *Eunotia bilunaris* and *Gomphonema spp.* The second group containing Mineiros river with high species diversity (5.0 bits ind⁻¹) in different classes, such as Euglenophyceae (i.e. *Euglena sp.* and *Trachelomonas spp.*), Zygnemaphyceae (i.e. *Closterium spp.*, *Cosmarium spp.*, *Euastrum elegans*, *Staurastrum spp.*, and *Spirogyra spp.*) and Cyanobacteria (i.e. *Phormidium sp.* and *Geitlerinema amphibium*). The third group containing the Branco river with higher concentrations of nutrients and associated species such as *Frustulia saxonica*, *Geitlerinema splendidum*, *Eutetramorus sp.* and *Monoraphidium arcuatum*. 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.

PS2.10

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CÁLCULO DE CONDICIONES DE REFERENCIA EN EL EJE MEDITERRÁNEO DEL EBRO

Existen numerosos problemas a la hora de establecer las condiciones de referencia en aquellas tipologías de ríos en los que no existen masas de aguas en estado prístino. El objetivo del presente trabajo es establecer la condición de referencia y los límites de corte entre las clases de estado ecológico para el indicador “macroinvertebrados bentónicos” en las masas de agua del ecotipo R-T17 en la Demarcación del Ebro. Mediante la búsqueda bibliográfica en referencias de principios del siglo XX se ha establecido cuál sería la comunidad de referencia de esta tipología. También se han usado los datos de las Redes de Control del Estado Ecológico desde los años 2004 a 2013 para realizar un análisis de las frecuencias de aparición de los taxones en el ecotipo objeto de estudio. La comunidad de referencia final ha sido determinada mediante opinión de experto. La comunidad de referencia para el ecotipo R-T17 bis se compone de 47 taxones de macroinvertebrados y la condición de referencia del índice IBMWP ha sido de 234

PS1.05

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DE-NOVO ASSEMBLY AND ANALYSIS OF TRANSCRIPTOME FOR THE IDENTIFICATION OF SINGLE NUCLEOTIDE POLYMORPHISM (SNP) OF MUSCLE AND TELENCEPHALON GENES IN *SALMO TRUTTA*.

A de novo transcriptome sequencing strategy (RNA-seq) was performed to identify Single Nucleotide Polymorphisms (SNPs) as suitable genetic markers of *Salmo trutta* expressed genes in muscle and telencephalon. We obtained muscular and telencephalon tissue from 25 individuals from a wild population of the Flamisell River (Catalan Pyrenees). Samples were immediately flash frozen in liquid nitrogen and transported to the laboratory for RNA and DNA extraction. RNA-seq strategy was used to identify SNPs as suitable markers. RNA-seq analysis of equimolar-pooled RNA samples from muscle and telencephalon were sequenced using Illumina platform. Paired reads were de novo assembled by Trinity tool obtaining a total of 144984 sequences. These sequences were clustered in 91653 unigenes representing potential unic expressed transcripts. Unigenes were annotated by sequence homology to non-redundant nucleotide, protein motives and function databases. We found annotation for a total of 58261 (63.5%) unigenes. Specific unigene tissue expression was determinate by Cufflinks and Cuffdiff tools. At a False Discovery Rate of 0.05, a total of 5373 and 795 unigenes were detected as brain and muscle specific, respectively. Gene Ontology (GO) mapping was performed by blast2go. GO terms were obtained for 26840 (29%) unigenes. As expected for a muscle/telencephalon transcriptome, GO terms were enriched by synapse, binding and anatomical structure annotations. In addition, KEGG pathway orthology was assigned to 20272 (22 %) unigenes. Prediction of homolog genes to *Salmo salar* and *Oncorhynchus mykiss* was done by reciprocal blast. In silico prediction of single nucleotide polymorphisms (SNP) was performed by Naïve Variant Caller tool on reads mapped to unigenes by TopHat. A total of 156796 potential SNPs were detected that maps on 25501 (27.8%) unigenes (mean of 6.1 SNPs/unigene; 1 SNP/165 bp). We predicted open reading frames (ORF) to 25344 (27.6 %) unigenes and assign SNP variants to 1st, 2nd and 3rd codon position to 6292 (7%) unigenes. GO and KEGG orthology pathway was assigned to 4316 and 3401 unigenes containing ORF variants, respectively. After integrating all obtained results we are able to offer a set of 4648 well-characterized *Salmo trutta* unigene collection that includes tissue expression, pathway involvement, homology to known salmonid genes and SNP variation that could be a useful tool for researchers in the field.

PS1.06

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ASSOCIATION STUDY OF SINGLE NUCLEOTIDE POLYMORPHISMS (SNP) OF *SALMO TRUTTA* HOMOLOG GENE GLYCINE RECEPTOR-B (GLRB) WITH “UPSTREAM” STIMULUS BEHAVIOR

Understanding animal behavior adaptation and its underlying molecular basis is an important role in evolutionary biology. “Upstream” stimulus behavior is defined as an exploratory impulse exhibited by a proportion of individuals that swim long distance upstream. This stimulus behavior has been considered a proxy for the most complex migratory behavior exhibited by salmonids. Genetic component of migratory behavior has been previously related with variation on genes of olfactory system, circadian rhythm and neuromuscular system.

We plan to investigate a specific Single Nucleotide Polymorphism (SNP) Glycine Receptor-b gene (*glrb*) and its relation to the observed “upstream” stimulus behavior in *Salmo trutta*. We have selected *glrb* as candidate gene because of its previously described relation to swimming behavior in *Danio rerio*.

A total of 1000 individuals of *S. trutta* were randomly captured from a wild population of the Flamisell River (Catalan Pyrenees) and individual’s mobility was recorded by mark-recapture method. SNP variants were obtained by RNA-seq analysis. DNA samples obtained from each individual were genotyped by Primer Extension-Mass Array specific assay. Association of genotype with mobility was assessed by regression analysis including sex, age (length) and genotype as variables. A dependent variable that incorporates the effective distance recorded by each individual was defined (Home Range, HR). Frequencies of selected markers were compared among individuals grouped as sedentary (HR).

PS1.07

MRM.10

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BACTERIAL COMMUNITY ASSEMBLY IN SHALLOW LAKES FROM CENTRAL SPAIN: SPATIAL OR ENVIRONMENTAL FACTORS?

Inland waters are suitable ecosystems for to study bacterial biogeography. Most studies on this topic are focused in permanent aquatic ecosystems while research in temporal lakes under high environmental stress, such temporary shallow saline wetlands, is less common. The geographical scale, as well as environmental heterogeneity and temporality are known factors that affect bacteria community assembly. In our study at a regional scale (<100km) shallow saline wetlands-lakes were addressed. For these systems, environmental stressors (temperature, water level and hydroperiod, salinity, and trophic level) play a relevant role as environmental factors in the assembly and dynamic of bacterial communities. In this work, supported by the projects *ECOLAKE* (CGL2012-38909, MINECO) and *CARBONSINK* (Fundación Biodiversidad), 17 shallow lakes located in the “La Mancha Húmeda Biosphere Reserve (Central Spain)” were studied monthly along two hydrological cycles (2012-2014) to determine the community composition patterns of bacterial communities and its relationship with environmental and geographic factors. We checked, by multivariate analysis the response of community compositions to different environmental factors. Compositional patterns of bacterial communities were obtained by DNA-fingerprinting. Analyses of community assembly were realized by MEM’s analysis (Moran Eigenvector’s Maps). Our results show high environmental variability into (temporal) and between (both spatial and temporal) lakes that are linked to differences in their bacterial communities. Regarding explanatory factors, both environmental and spatial variables are relevant in for bacteria community assembly. A prevalence of environmental factors is observed, although spatial factor strongly explain community assembly in winter campaigns with higher flooding levels and less salinity. Our results suggest that bacterial communities of these wetlands are flexible and well-adapted to a high environmental stress. The studied region has a diverse wetland typology and high local environmental heterogeneity which allows a high microbial diversity.

PS1.17

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HETEROGENEIDADE ESPACIAL HORIZONTAL DA QUALIDADE DA ÁGUA E DO SEDIMENTO DE NOVE RESERVATÓRIOS BRASILEIROS: METAIS, NITROGÊNIO E FÓSFORO

No estado de São Paulo (Brasil), há intensos usos antrópicos e urbanos de suas bacias hidrográficas, que, somados à incipiente cobertura sanitária, conferem preocupante cenário futuro para seus reservatórios, já vivenciado por outros reservatórios brasileiros. Este trabalho tem como meta verificar se há contaminação potencial com metais, N e P no sedimento e zona fótica dos reservatórios Salto Grande, Barra Bonita, Broa, Itupararanga, Atibainha, braço Rio Grande, Igaratá, Paiva Castro e Guarapiranga. Nesses reservatórios foram tomadas amostras em três estações de coletas: na parte alta (zona de rio), no centro do reservatório e na região da barragem. Em 2015 foram levantados perfis de temperatura, DO, pH e EC, e teores de clorofila, sólidos em suspensão e nutrientes – série nitrogenada e fosfatada, na massa de água, amostrada de forma integrada representando a zona fótica. Nas mesmas estações de coletas o sedimento foi amostrado nos primeiros 4 centímetros superficiais. No sedimento e água foram analisadas as concentrações de Cd, Ni, Zn, Pb, Cu, Cr, Mn, Fe, Al, As, N e P total e matéria orgânica. Na análise de dados serão empregadas regressão linear, análise de cluster, PCA e One Way ANOVA. As concentrações dos elementos analisados também serão comparadas a valores de referência regional e ao “probably effect level”. As linhas de evidência serão comparadas com parâmetros de qualidade, transformadas em categorias de contaminação. Com base nas variáveis físicas e químicas da coluna de água, representadas pela zona fótica, os nove reservatórios listados compõem 3 grupamentos: A) os reservatórios Paiva Castro, Igaratá, Rio Grande, Atibainha e Itupararanga, de maneira geral com melhor qualidade de suas águas superficiais; B) Barra Bonita, Salto Grande, Guarapiranga e o Broa, com elevados índices de estado trófico e maiores teores de NO₂- e de EC; C) Broa e Guarapiranga estão associados à indicadores de contaminação antrópica por esgoto doméstico. Destacam-se, (a) o Guarapiranga apresentou a maior heterogeneidade espacial horizontal, com a porção representada pela entrada do rio Parelheiros, com alarmante teor de NH₄⁺ (1300 µg/l). O Broa, nas décadas de 70/80/90 encontrava-se oligomesotrófico, mas hoje encontra-se eutrófico.

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PS2.19

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FACTORS ASSOCIATED WITH THE LIFE CYCLE OF *BRANCHINECTELLA MEDIA* IN A TEMPORARY SALINE LAGOON

Research on the life cycle of organisms helps understanding the environmental variables that determine their distribution and drive local adaptation. The aim of this study was to identify what factors affect the abundance of the anostracan *Branchinecta media* throughout their life cycle in a temporary, saline and shallow lagoon from central Spain (Alcahozo, La Mancha). In addition, we analyzed the life cycle characteristics (sizes of ovigerous females, clutches and eggs) along its presence in the lagoon to assess the influence of these factors on the phenology of the population. To do this we took weekly quantitative and qualitative samples and we measured environmental variables during the inundation period. The population was present in the water column from October 2015 to March 2016, with peaks of abundance between the second and the tenth week of the study and gradually reduced until the end of the cycle. The most important variables associated with these changes were salinity, pH and temperature, which also were influential on the size of females. Clutch size increased towards the end of the cycle. The population disappeared long before the drying of the lagoon, suggesting an adaptation to the variability and unpredictability of Mediterranean temporary environments.

PS1.44

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SIX YEARS OF POPULATION CONTROL OF EXOTIC FISH IN LAKE BANYOLES IN THE CONTEXT OF TWO LIFE PROJECTS.

Currently, invasive alien species constitute the main challenge for the management of Lake Banyoles, especially fish such as Largemouth bass (*Micropterus salmoides*), Pumpkinseed (*Lepomis gibbosus*), Perch (*Perca fluviatilis*) and Carp (*Cyprinus carpio*). Their proliferation has led to the extinction or rarefaction of native fish (*Gasterosteus aculeatus*, *Barbus meridionalis*, *Squalius laietanus* and *Salarias fluviatilis*).

Between 2010 and 2014, LIFE Projecte Estany (LIFE08 NAT/E/000078) had as main objective to design and implement a global action to reverse the decline of species and habitats of Community interest, through control of invasive species and population, among other actions. Currently, under the LIFE Potamo Fauna (LIFE 12 NAT/ES/001091), has continued part of this strategy. The results obtained with the control of exotic fish fauna are presented.

Control of exotic fish populations was based on population culling, through intensive fishing combining various capture techniques: electric fishing, nets, large traps and longlines. Near 160.000 fish of alien species were captured. For Largemouth bass, till the fourth year, was achieved a reduction of more than 90 % of the population fraction with size above 40cm; during the last two years, due to a diminution in the intensity of capture, there has been a partial recovery of the population of this species. In the case of Carp, initially, a greater than 80 % reduction of the total starting population has been achieved; the two last years, its population has recovered slightly. However, for the Pumpkinseed and Perch there are not significant results.

Another challenge for these projects is focused on optimizing techniques and procedures, with a reasonable cost, to maintain sufficient pressure on populations of exotic fish that will ensure conservation of native species.

PS1.45

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NEW CITATIONS AND REVIEW OF THE CURRENT TREND OF ALIEN FISH IN THE WATERSHEDS OF NORTHEASTERN CATALONIA.

New citations of exotic fish species for the basins of the rivers Muga, Fluvià, Ter, Tordera, and other watersheds of Girona are given, all them accumulated over the past six years. These citations have been obtained under several samplings of aquatic fauna and specific observations, carried out in the context of various research or conservation projects, including the ongoing LIFE Potamo Fauna (LIFE12 NAT/ES/001091).

Moreover, based on new data and existing information in the available literature, as well in certain angling forums, we analyze the current situation (distribution and trends) of exotic fish species recorded along the last three decades in the area (37): *Oncorhynchus mykiss*, *Esox lucius*, *Blicca bjoerkna*, *Abramis brema*, *Alburnus alburnus*, *Rutilus rutilus*, *Scardinius erythrophthalmus*, *Pseudorasbora parva*, *Parachondrostoma mieggi*, *Luciobarbus graellsii*, *Carassius auratus*, *C. carassius*, *Cyprinus carpio*, *Tinca tinca*, *Ctenopharyngodon idella*, *Gobio occitaniae*, *G. lozanoi*, *Phoxinus bigerri*, *P. phoxinus*, *P. septimaniae*, *Squalius cephalus*, *Aspius aspius*, *Cobitis bilineata*, *C. paludica*, *Misgurnus anguillicaudatus*, *Barbatula barbatula*, *B. quignardi*, *Ameiurus melas*, *Ictalurus punctatus*, *Silurus glanis*, *Poecilia reticulata*, *Gambusia holbrooki*, *Hypostomus plecostomus*, *Lepomis gibbosus*, *Micropterus salmoides*, *Perca fluviatilis* y *Sander lucioperca*. Of these, at least 3 species records are not fully confirmed. On the other hand, there are still doubts about the validity of some of the citations from species of the genera *Barbatula*, *Gobio* and *Phoxinus*, which could significantly change the relationship of species.

Seven of these alien species are of recent appearance.

PS2.37

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EFFECTS OF ENHANCED HYDROLOGICAL CONNECTIVITY ON MEDITERRANEAN SALT MARSH FISH ASSEMBLAGES

In order to achieve more pristine habitat conditions hydrological connections were created between salt marsh ponds and the sea in a Mediterranean wetland containing isolated ponds resulting from former salt extraction and aquaculture activities. A preliminary assessment provided evidence that ponds farther from the sea hosted very large numbers of the endangered Spanish toothcarp, *Aphanius iberus*, suggesting that these fish have been trapped and consequently reach unnaturally high densities. In order to achieve both habitat rehabilitation and toothcarp conservation, efforts were made to create a gradient of hydrologically connected areas, including isolated fish reservoirs, semi-isolated, and connected salt marsh–sea areas that could allow migratory movements of fish and provide some protection for *A. iberus*. The fish community was monitored prior to, and for three years after rehabilitation. Results showed an increase in the number of fish species within semi-isolated areas (Zone A), relative to connected areas (Zone B), while at the assemblage level, structural differences between zones were higher than interannual variability. Environmental variables explained 29.7 % of variability in species composition, with distance to the sea accounting for most of the variability of both CCA axes (34.7 % of explained variation). The abundance of *A. iberus* was consistently higher in semi-isolated areas at greater distances from the sea, but a decline occurred in both zones and in reservoir ponds after restoration efforts, which may be attributable to interannual factors such as differences in recruitment success. A negative effect of restoration works on fish population cannot be excluded, but the final outcome of the intervention likely needs a longer period.

PS1.46

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SOUTHWARD EXPANSION OF ASIATIC INVASIVE FISH SPECIES *PSEUDORASBORA PARVA* (TEMMINCK AND SCHLEGEL, 1842) IN THE IBERIAN PENINSULA

The Asiatic topmouth gudgeon (*Pseudorasbora parva*) is one of the most extraordinary invasive freshwater fish species. First introduced in Central Europe, was subsequently dispersed throughout the continent, reaching nowadays almost every country. The relatively isolated Iberian Peninsula has not been colonized until recently by this invasive species. In this paper were analysed the last topmouth gudgeon population found in Spain, in the Hozgarganta stream, a quasi-pristine basin in southern Spain. This new species was numerically dominant in the lower reaches of the Hozgarganta fish community, made of by six species, three native (*Anguilla anguilla*, *Luciobarbus sclateri* and *Pseudochondrostoma willkommii*) and three exotics, including topmouth gudgeon (*Carassius auratus* and *Gambusia holbrooki*). The recent evolution of this community, has gone from a highly diverse pristine one, with three South Iberian endemisms and up to eight additional native species, to the aforementioned one. Finally it was discussed the observed dispersion pathway followed by the topmouth gudgeon in the Iberian Peninsula, a typical long dispersal stepping stone, rather than diffusion, at a moderately high dispersion speed.

PS1.18

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SUMMER TEMPERATURE VARIABILITY OF PYRENEAN STREAMS

There is a high number of eurithermal macroinvertebrate species in high mountain streams. Some of them may have an invasive potential associated to climate change. Understanding the water temperature patterns in the streams may provide clues to explain why it is so.

The aims of this study were: 1) to examine the effect of lakes on the temperature of streams flowing out from them and 2) the effect of forest canopy shading on the temperature of streams. To address those questions, we have used water temperature time series recorded at the LOOP. These data allow us to interpret the observed temperature variability in high mountain streams. We compared water temperature record from stream reaches and lakes from the same basin (Sant Nicolau River Basin, within the Aigüestortes National Park): the near-surface (1 m depth) and outflow water temperature in lakes Llong (1999 m a.s.l.) and Llebreta (1619 m a.s.l.) and the temperature of several streams above and below the timberline.

Preliminary results indicate the importance of the forest shading. The river sections within the forest have temperatures 2°C lower than the upper open sections. Not clear altitudinal differences in lake temperature patterns were observed. It was found that the water temperature at the outflow of lake Llong is similar or higher than at lake Llebreta lake during the same time period (daily cycle and summer period). Daily averaged temperature at the outflow of the lakes was often higher than 14°C. In the same altitudinal range, water temperatures below 10°C were only recorded in streams that are not fed by lakes.

PS2.13

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DEVELOPING DIATOM-BASED TRANSFER FUNCTIONS FOR AZOREAN LAKES AND ITS VALIDATION BY HISTORICAL DATA

Uncontrolled exploitation of natural resources and climate change have led to a rapid degradation of aquatic ecosystems, affecting water quality and altering the composition and functioning of aquatic ecosystems. The natural fragility of island ecosystems, associated with its exceptional level of conservation value due to their high number of endemic species, makes insular aquatic ecosystems extremely vulnerable. Historical environmental variables can be estimated from sedimentary sequences of diatoms to infer the level of current and past anthropogenic impacts and environmental and climate change. A 41-lake diatom training dataset was developed for oceanic islands (Azores archipelago) to examine the response of surface sediment diatom assemblages to pH and total phosphorous (TP). Weighted averaging (WA) and weighted averaging partial least squares (WA-PLS) models were developed for quantifying environmental changes in pH and TP conditions. The WA-PLS with three components showed the lowest root mean square error of prediction (RMSEP; deep lakes: pH = 0.010, TP = 0.170; shallow lakes: pH = 0.016, TP = 0.190) and the highest correlation coefficient (R²jackknife; deep lakes: pH = 0.939, TP = 0.726; shallow lakes: pH = 0.805, TP = 0.840) for the observed vs. predicted pH and TP values among the calibration-set lakes. Once independent cross-validation is considered a more objective validation method, we performed an independent cross-validation using historical data to assess the performance of the diatom pH and TP transfer functions. WA model with inverse deshrinking (WA-inv) performed best with the historical data reconstructions, being suitable for oligo-, meso-, and eutrophic lakes. Application of the pH and TP transfer functions developed here will enable the generation of quantitative water quality data from the expanding number of paleolimnological records available for the oceanic islands. This study contributes for the development of paleolimnological approaches in the reconstruction of past lake water quality, ecological assessment and restoration which are crucial to establish accurate baselines to predict responses to future environmental changes.

PS2.06

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COMUNIDAD FITOPLANCTONICA DE LOS SISTEMAS LÉNTICOS DE LA CUENCA DEL DUERO Y SU RELACIÓN CON LAS VARIABLES FÍSICO-QUÍMICAS.

En la Cuenca Hidrográfica del Duero se han realizado 2 campañas de muestreo de fitoplancton durante los años 2014 y 2015 en lagos, lagunas y embalses siguiendo el procedimiento M-LE-FP-2013 (MAGRAMA, 2013). Simultáneamente se ha analizado los parámetros físico-químicos (alcalinidad, calcio soluble, amonio, nitrato, nitrito, fosfato, fósforo total, nitrógeno total, pH, conductividad y oxígeno disuelto) siguiendo el procedimiento anterior. La riqueza taxonómica fitoplanctónica de este estudio es de 458 taxones, donde la mayoría están identificados a nivel de especie. Se ha realizado un análisis en MDS para la abundancia de fitoplancton y el biovolumen. En ambos casos se observa una tendencia a la diferenciación de los tres tipos de masas de agua: las lagunas temporales, los lagos de alta montaña y embalses (ANOSIM $R = 0,51$ y $R = 0,50$, respectivamente). La misma tendencia se ha observado con los parámetros físico-químicos (ANOSIM $R=0,55$). Se ha realizado un análisis BIOENV donde se refleja que la conductividad, el fósforo total y la turbidez explican un 45% de la varianza del fitoplancton durante este estudio.

Si se evalúa por separado el biovolumen de los embalses, el MDS refleja que existen dos grupos (ANOSIM $R = 0,640$). El grupo 1 incluye embalses con alta densidad fitoplanctónica, alto biovolumen y clorofila "a", mientras que el grupo 2 se caracteriza por presentar valores menores de alguna de las tres variables anteriores. Se ha realizado un SIMPER que refleja que el grupo 1 contempla los taxones *Coenochloris fotti*, *Scenedesmus quadricauda*, *Cryptomonas ovata* y *Aulacoseira granulata* que aportan el 23,79 %, 11,11 %, 9,63 % y 8,69 % de la similaridad, respectivamente. Estos taxones presentan abundancias importantes y, aunque sean de pequeño porte, el biovolumen acumulado es destacado, sobre todo en los taxones "coloniales". El grupo 2 se caracteriza por los taxones *Cryptomonas erosa*, *Cyclotella sp.*, *Cryptomonas marssonii*, y *Rhodomonas minuta*, que aportan el 29,17 %, 25,36%, 11,62 % y 10,35 % de la similaridad, respectivamente. Todos estos taxones son "no coloniales" y, aunque puedan ser numerosos, aportan un bajo biovolumen a la muestra. El análisis BIOENV de los embalses muestra que el 31 % de la varianza del fitoplancton es explicada por las variables calcio soluble, nitrógeno total y transparencia.

PS1.08

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INFLUENCE OF POST-HARVEST FLOODING MANAGEMENT OF RICE FIELDS ON BIRD COMMUNITY

The project LIFE EBRO-ADMICLIM proposes an integrated approach for managing water, sediments and habitats by carrying out several pilot actions for adaptation and mitigation of climate change in the Ebro Delta (Catalonia, Spain), an area of 320 km², highly vulnerable to sea level rise and subsidence. The area is of great international relevance for bird conservation and near 70 % of the delta is actually occupied by rice fields, considered important seminatural wetland habitats, where birds search for shelter and food. In this context, we wanted to find out the effect of different rice field flooding management strategies on birds during the post-harvest season (October 2015-January 2016). We performed a total of 8 censuses of 15 different rice fields, identified and counted all birds in order to calculate bird diversity and abundance. At the same time we collected other field data like percentages of flooded field area and vegetation cover, water depth and ploughing to analyse the influence of post-harvest flooding and straw management of rice fields on bird diversity. Flooded fields had more birds whereas waders were the most abundant family followed by gulls and herons. Dry fields were dominated by passerines. The distribution of bird families significantly differed with flooding levels. Bird diversity was higher during October and November, and in fields 5 % flooded, in opposition to dry fields where the diversity was the lowest. Bird abundance showed a different pattern than diversity: the first was positively related with flooding (birds preferred flooded areas bigger than 25% flooded) whereas the abundance of birds was negatively related with both vegetation cover and water depth. Fields with higher water depth and with the straw not incorporated to the soil were less used by birds.

The results show that if high bird diversity is a conservation objective, maintaining saturated fields with low water level could be the best flooding management approach.

PS2.38

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INTRAPOPULATION VARIABILITY IN THE MOVEMENT BEHAVIOUR OF STREAM-RESIDENT BROWN TROUT (*SALMO TRUTTA*)

The pattern of movements of a stream-resident population of brown trout (*Salmo trutta* L.) was investigated in the river Flamisell (Ebro basin, North East Spain) over an 11-month period (April 2013 - February 2014). Brown trout is the only fish species present and the population belongs to Mediterranean lineage. The study was conducted by PIT-tagging 997 trout (mean fork length: 143.2 mm \pm 36.0 S.D.; range: 80-310 mm) and tracking their movements over a 3560-m-long river stretch on a monthly basis. Locations of PIT-tagged fish were determined with a portable antenna scanner. The 70.4 % of the PIT-tags implanted were detected at least once over the study period. The brown trout population showed limited mobility, although some individuals exhibited long range movements. Considering all movement data, the 76.8 % of the recorded movements between sample surveys were less than 20 m, and only the 6.8% were higher than 100 m. The maximum movement recorded was 1753 m. Individual fish tended to adopt a persistent mobile or non-mobile behaviour over time. These results are consistent with most of the movement patterns reported for stream-resident salmonids, in which there is evidence for the partitioning of fish populations into sedentary and mobile individuals. Differences in movement behaviour among individuals could be a product of individual traits such as learning, dominance, personality traits, and, ultimately, genetic differentiation. The results of the study highlight the importance that brown trout populations should not be longer treated as homogeneous units composed of individuals with the same biological traits, but both sedentary and mobile behaviours should be also taken into account in management and conservation plans.

PS1.50

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COMBINED EFFECTS OF SALINITY AND PHOTO-INDUCED MODIFICATIONS CAUSED BY UV RADIATION IN THE DISSOLVED ORGANIC MATTER OF TWO SALINE LAKES FROM CENTRAL SPAIN

The study of chromophoric dissolved organic matter (CDOM) provides useful information about biogeochemical processes occurring in aquatic ecosystems. The characteristics of this CDOM were seasonally studied in both a clean (Alcahozo) and a human impacted (Manjavacas) saline lake located in the UNESCO's Mancha Húmeda Biosphere Reserve (Central Spain), as part of the research projects, ClimaWet and CarbonNat, aiming to assess the role of Mediterranean wetlands in the sequestration of atmospheric carbon. The survey consisted in measurements of DOM spectral and fluorescence properties, which are regarded as proxies of molecular weight, origin and nature. Seasonal and within-lakes variations were mainly related to in-lake biotic transformations, evapo-concentration processes, and likely to modifications caused by the sunlight exposure. A fundamental difference among lakes consisted in a higher occurrence of allochthonous and high-molecular weight DOM in Manjavacas compared to Alcahozo, indicating that runoff contribute more to the DOM pool in the former. Our target was testing the extent of this environmental forcing and the possible existence of synergistic effects in the alteration of DOM. To do this, shifts in DOM optical characteristics were recorded after the experimental exposure to UV radiation of samples subjected to stepwise increments of salinity. During experiments, water samples were properly filtered to avoid degradation or amendments of DOM produced by microorganism. As a general trend, the proneness to photochemical decomposition increased with the reduction of the ionic strength, suggesting that related changes in the molecular configuration of DOM enhanced photobleaching. As judged from results, the influence of the natural sunlight on organic matter transformation, and therefore on the processes of carbon cycling, is expected to be greater in shallow aquatic systems, getting furthermore stronger as the water residence time increases. Our findings provide sights on how climatic forcing may affect the progression of DOM properties through the evaporation that seasonally occurs in these temporal lakes, which otherwise is also assumed to be influenced by microbial processing. On this sense, this study comprises a novel contribution in a poorly explored concerns as the mechanisms of production, turnover and accumulation of DOM in saline lakes.

PS2.39

Rodrigo, María A.; Segura, Matilde; Rojo, Carmen

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PLANKTON CONTRIBUTION TO EUTROPHICATION REDUCTION: THE CASE STUDY OF THREE CONSTRUCTED WETLANDS WITHIN ALBUFERA DE VALÈNCIA NATURAL PARK

The two-year plankton assessment of Tancat de la Pipa, Tancat de Mília and Tancat de l'Illa constructed wetlands in the framework of LIFE+12 Albufera project is finished. We corroborate how microalgal biomass is reduced after passing through the constructed wetlands, with a frequency of 52%, 80% and 100% in Illa, Pipa and Mília, respectively, and with values of reductions of 74 ± 23 , 49 ± 30 , 78 ± 17 % (means and S.D., based in chlorophyll a concentrations), respectively. However, the removal rates per unit of surface show large variability throughout time and they are different depending on the zone of the Tancat considered and also depending on each Tancat. Overall removal rates were 0.1 ± 0.5 , 0.7 ± 0.1 and 1.3 ± 0.9 mg Chl/m² d in Illa, Pipa and Mília, respectively and represented an accumulate removal mass for the whole monitoring period of 4, 72 and 159 kg Chl, respectively. The constructed wetlands also brought about beneficial changes in phytoplankton assemblages: when comparing the inflows and the outflows, important reductions in cyanobacteria biomass and increases in other groups biomass (diatoms and cryptophytes), easily edible by zooplankton, were observed. For example, in Mília, cyanobacteria biovolume was reduced from a share of 74% in the inflow to only 17% in the outflow in the second year of operation. Some zones of the Tancats are particularly prone to produce zooplankton, originating 34 mg Dry Weight/m² d, mainly of Ostracods and Copepods, in Pipa. Conversely, in the other two Tancats, Cladocerans were the large herbivores produced in the final zones (an accumulated production of 230 kg DW in Illa, for example). The role of large zooplankton was relevant in water clearing, particularly during the spring. These Tancats revealed as key systems in microalgal reductions and favourable shifts in plankton community structures in the effluents.

PS1.09

Rodríguez-Lozano, Pablo; Verkaik, Iraima; Vila-Escalé, Mireia; Fortuño, Pau; Rieradevall, Maria; Prat, Narcís

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MORE THAN A DECADE AFTER THE 2003 SANT LLORENÇ WILDFIRE: LESSONS LEARNED

On August 2003, a forest fire affected the Sant Llorenç del Munt i l'Obac Natural Park (Barcelona), burning 4543 ha. This wildfire was a unique opportunity to study the fire effects on terrestrial and aquatic ecosystems in the Mediterranean region, in part, thanks to the monitoring research that was being performed in that moment in the area, which led to valuable pre-fire knowledge of these ecosystems. Therefore, ecologists predicted short- and mid-term effects of the 2003 fire on land vegetation, terrestrial wildlife, and aquatic ecosystems based on scientific understanding of the time, and several research projects were conducted in the area, which became a natural laboratory. Furthermore, with the aim of speeding up the natural succession and fostering the socio-economic recovery of the affected zone, a series of multidisciplinary projects were carried out. Ten-plus years of subsequent study allow us to gather all the knowledge generated and evaluate the impact of the post-fire restoration practices. Looking ahead to projected more frequent large fires due to climate change, the documented ecological responses to the 2003 Sant Llorenç wildfire provide a foundation for predicting impacts of future fires in the Mediterranean region, for determining the knowledge gaps on this topic, and for establishing management recommendations.

PS2.40

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IN THE ROLE OF ESTIMATE MEDITERRANEAN RICE FIELDS AS FILTERS OF NUTRIENTS: THE EBRO DELTA AS CASE STUDY.

In the Ebro Delta, intensive rice farming during the 20th century has increased coastal eutrophication and caused ecological and economic impacts. Rice fields are most of times agroecosystems with a continuous flow of water. The objective of this study is to estimate the filtering capacity of the rice fields in the Ebro Delta to elucidate if they act as sinks or sources of the different nutrient forms. A field study in the southeast of the Ebro Delta was carried out to compare nutrient loads from an irrigation and drainage channel from a rice field sub-basin. A water balance of the sub-basin was performed to estimate the outflow from rice fields and nutrient concentration was measured in the irrigation and drainage water in order to estimate nutrient loading and removal or release of each form. The following nutrients were analyzed; total phosphorus (TP), total nitrogen (TN), nitrite (N-NO₂⁻), nitrate (N-NO₃⁻), ammonium (N-NH₄⁺), phosphate (P-PO₄³⁻), silica (Si-SiO₂). The water balance in rice fields was calculated through the following equation (Chung et al; 2003): $\Delta S = (R + IR) - (ET + DR)$. The potential ET is computed using the Penman-Monteith indirect method using weather and environmental parameters, and a crop factor. In addition the physical and chemical parameters from the surface water were measured using an YSI 556 multiprobe. The sampling period lasted one annual cycle from October 2009 to November 2010, including the growing season (May-September) and the post-harvest season (October-December).

Preliminary results indicated an overall N-NO₃⁻ and Si-SiO₂ concentration reduction (80.20 % and 6.01 %, respectively) in the growing season, while there was a lower concentration reduction of N-NO₃⁻ and Si-SiO₂ in the post-harvest season (70.31 % and 5.43 %, respectively). In the case of TN, N-NH₄⁺, TP and P-PO₄³⁻ there was an increase concentration (6.7%, 435.51 %, 218.61 % and 26.59 %) in the growing season.

PS2.16

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ADAPTATION AND MITIGATION MEASURES TO CLIMATE CHANGE IN THE EBRO DELTA: THE LIFE+ EBRO-ADMICLIM PROJECT

The LIFE+ EBRO-ADMICLIM project aims the implementation of pilot actions for adaptation and mitigation of the climate change in the Ebro Delta (Catalonia, Spain), through an integrated approach for managing water, sediment and habitats (rice fields and wetlands), with the multiple aim of optimizing ground elevation, reducing coastal erosion, increasing carbon accumulation in the soil, reducing greenhouse gas emissions, and improving water quality.

The main pilot adaptation actions of the project focus on sediment inputs from the Ebro River into its delta as well as on the assessment and identification of the areas of the delta plain vulnerable to subsidence and sea level rise. The goal is to demonstrate the feasibility of permanently restoring the sediment flow, both from a water purification plant on the Ebro (Consorci d'Aigües de Tarragona) and from the reservoirs along the lowest parts of the Ebro River. Expected results are: 1) Demonstration of the feasibility of reincorporating ca 1,000 T/yr of Ebro River sediments currently retained in a water purification plant. 2) Determination of the real capacity of the Ebro River for sediment transport, and 3) Accurate assessment of Ebro Delta subsidence and identification of the areas most vulnerable to rising relative sea level.

Pilot mitigation actions are aimed to optimize the GHG emissions, carbon sequestration and nutrients while increasing ground elevation of rice fields and wetlands. The outputs of these actions are: 1) Optimization of the performance of constructed wetlands and, 2) Accurate assessment of GHG emissions from Delta rice fields.

The obtained results will serve to establish guidelines for a Plan for Climate Action in the Ebro Delta following the directives of the Catalan Strategy for Adapting to Climate Change and designed by the Catalan Office for Climate Change via a public participatory process with main stakeholders. In the Plan for Climate Action specific and effective measures of adaptation and mitigation for climate change will be defined.

PS2.14

Rubio, Juan; Casas, J. J.; Salinas, M. J.; López-Carrique, E. M.; Ramos-Miras, J.J.; Gil, C. J.

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EFFECTS OF CLIMATE AND SOIL ON LEAF QUALITY FROM RIPARIAN VEGETATION IN MEDITERRANEAN HEADWATER STREAMS

Permanent headwater streams in Mediterranean regions are among the most sensitive ecosystems to global change. Leaf litter inputs from riparian vegetation are a fundamental fuel for food webs in low-order stream. As leaves are highly responsive to climate and soil characteristics, the quantity and quality of leaf litter inputs to streams are expected to change under the climate change scenarios of increasing aridity predicted for most the Mediterranean regions. We hypothesized that increasing aridity, whether directly or indirectly through decreasing soil fertility, might reduce the nutritional quality of riparian leaf litter inputs, therefore eventually affecting stream food webs.

To investigate this, we adopted a space per time substitution approach, by studying intra and interspecific variability of leaf quality of the riparian vegetation from 34 permanent headwater streams (between 3-5 species per stream) across an aridity gradient in southern Spain. Twenty physical and chemical leaf traits were measured as indicators of their quality. We used 9 climatic and 11 soil variables as potential predictors of leaf quality. We used Principal Component Analyses (PCA) to reduce the dimensions of the dependent and independent data sets, and step-wise multiple linear regressions to determine relationships between orthogonal dependent variables and predictors.

The first principal component of leaf quality represented a gradient of increasing leaf carbon and lignin contents parallel to decreasing N, P and K concentrations. This leaf quality gradient was positively related to an environmental gradient of increasing precipitation under mild winters and summers (Mediterranean perhumid subtropical climate), also associated with low soil pH values. The second principal component of leaf quality data represented a gradient of increasing toughness and Si content, but decreasing lignin content. This quality gradient was mainly predicted by the second environmental gradient related with aridity (decreasing precipitation, but increasing PET and % of interchangeable Na in riparian soils). Based on this second set of results we can conclude that, if the predicted increasing aridity exacerbates riparian soil evapotranspiration, this could leads to significant changes in the quality of leaf litter inputs to headwater streams, but this could be likely modulated by lithology. This study was funded by the Spanish MINECO-FEDER, project CGL2012-39635 (RIBARID).

PS2.07

Ruiz-Verdú, Antonio; Pereira, Marcela A.; Jiménez, Juan C.; Delegido, Jesús; Tenjo, Carolina; Peña, Ramón; Moreno, José; Gibaja, Guiomar

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REMOTE SENSING OF CHLOROPHYLL-A AND WATER TEMPERATURE IN LAKE TITICACA

Lake Titicaca (Peru-Bolivia) is a unique large high-altitude tropical lake. It is composed of two almost independent sub-basins, of which the larger and deeper Lago Mayor is monomictic, while the smaller and shallower Lago Menor is polymictic. Although considered oligotrophic, in the last decades, several shallow areas are undergoing accelerated anthropogenic eutrophication, resulting in an increase of floating and submerged macrophytes and in the appearance of dense phytoplankton blooms never observed before. However, despite the unique characteristics of the lake and the worrying trends, during the last decades it has been poorly studied and never monitored. Satellite remote sensing is the only tool that can fill this decadal monitoring gap. The pelagic area can be mapped for chlorophyll-a concentration (Chl-a) and Lake Surface Temperature (LST) with daily images of the ocean color sensor MODIS-Aqua (1 km² pixel size). But for the shallow coastal areas, the higher spatial resolution (30 m) of the Landsat satellites is required.

For evaluating the capabilities of Landsat for monitoring Chl-a and temperature of Lake Titicaca, we processed and analyzed time-series of this images, using MODIS products as a reference. From simulated data, we developed MODIS-like models for retrieving Chl-a with Landsat, and then compared the obtained maps with coincident MODIS Chl-a maps ($N = 340$ cloud-free pelagic 4 km² sub-images). The best performing L8 model showed a linear correlation with MODIS ($r = 0.79$) and a RMSE = 1.99 mg m⁻³. The effect of different atmospheric correction methods for L8 was also evaluated. LST maps of Landsat-8 and MODIS-Aqua were also compared and show consistent results, although, due to the difference in the acquisition time of both satellites (4 hours), the statistical analysis showed systematic bias that appear to be seasonal dependent. The results confirm the capabilities of Landsat-8 for monitoring Chl-a and temperature in the oligotrophic Lake Titicaca.

PS1.31

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METODOLOGÍA PARA EL ANÁLISIS HISTÓRICO DE CAMBIOS MORFOLÓGICOS Y TOPOGRÁFICOS EN CAUCES FLUVIALES: EL CASO DEL SIURANA

El río Siurana es el principal tributario del río Ebro aguas abajo de la presa de Flix. Su dinámica hidrológica y morfo-sedimentaria ha sido altamente modificada. Los embalses, construidos en los años 70 del siglo XX, han alterado el régimen hidrológico y sedimentario del río y han reducido la magnitud y frecuencia de las crecidas. A ello hay que sumar el efecto de las extracciones de áridos realizadas mayoritariamente en su tramo bajo. Ambos impactos han generado cambios substanciales en la morfología y la dinámica hidro-sedimentaria del río. En este contexto, el objetivo de este trabajo es evaluar los cambios morfológicos y topográficos en un tramo de 5 kilómetros del cauce del río Siurana afectado de manera local por extracciones de áridos, y de manera estructural por el impacto de los embalses. Para realizar esta evaluación se ha desarrollado una metodología para la obtención de una serie histórica de productos cartográficos y topográficos comparables. Para ello, se utilizan fotografías aéreas estereoscópicas tomadas en los años 1946 y 1974 (en ausencia de impactos antrópicos directos), datos topográficos de 2010, procedentes de un vuelo con sensor LiDAR aerotransportado, y ortofotografías de 2015 (una vez los impactos de la extracción de áridos y de la construcción de embalses son ya evidentes). Para realizar el estudio se ha utilizado software basado en la fotogrametría digital automatizada (específicamente la combinación de algoritmos SfM-MVS), Sistemas de Información Geográfica (SIG) y Teledetección. Como resultado se ha podido obtener una cartografía geomorfológica y de vegetación de ribera para cada año analizado y un balance sedimentario entre periodos a modo de mapas de cambio topográficos (volúmenes de sedimentos). La elaboración de una cartografía multi-temporal y de modelos digitales del terreno ha permitido el análisis de los cambios morfológicos y topográficos entre los periodos analizados. Estos cambios se estudian bajo el enfoque de los efectos de los impactos antrópicos sobre la dinámica fluvial del tramo bajo del Siurana, y como estos impactos condicionan el estado de los hábitats fluviales y la dinámica sedimentaria aguas abajo, tanto en el propio cauce como en la zona de confluencia con el río Ebro.

PS2.47

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LOCAL AND REGIONAL HABITAT REQUIREMENTS FOR FRESHWATER FISH IN THE GUADALQUIVIR RIVER BASIN (SOUTHERN SPAIN)

The knowledge of species' habitat requirements is key to define its ecology and conservation status. In addition, it is basic to construct species distribution models, a fundamental tool for predicting their occurrence in a given area and thus to determine changes in their range associated to human disturbances. Patterns of habitat selection can be determined not only by local factors, but also on a large scale. Thus, analysis of regional and local factors can contribute to a more complete understanding of the spatial ecology of the species and their main environmental influences. We examined the distribution and habitat requirements of 19 freshwater fish species from the Guadalquivir River Basin. Local and regional patterns were studied using several environmental variables obtained in situ or through GIS. A logistic regression model based on Wald's test was performed to assess the most influential variables on each species. Thirty-five environmental variables were selected in the model. The species occurrence was significantly related to both regional and local variables. At a local scale, 'altitude' and 'distance to the nearest town' were the most selected variables. The altitude was positively selected by *Squalius pyrenaicus* and *Salmo trutta* while *Luciobarbus sclateri*, *Lepomis gibbosus*, *Ciprinus carpio* and *Gambusia holbrooki*, on the contrary, selected it negatively. At a regional scale, 'sub-basin area' and 'drainage area slope' were the most selected variables. *S. trutta* and *S. pyrenaicus* selected areas with a high slope, while *M. salmoides*, *C. carpio* and *G. holbrooki* selected flat areas.

PS2.20

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ESTADO DE CONSERVACIÓN DE LOS GRANDES BRANQUIÓPODOS EN LA COMUNITAT VALENCIANA

Un extensivo estudio en lagunas temporales interiores de agua dulce en la Comunitat Valenciana puso de relieve una importante riqueza en grandes branquiópodos, con siete especies identificadas en estado activo: dos Spinicaudata, un Notostraca y cuatro Anostraca. Sin embargo estas poblaciones están en muchos casos amenazadas por tratarse de poblaciones únicas o con muy pocas localidades en la zona. La especie más extendida es el anostráceo *Branchipus schaefferi* con una prevalencia (porcentaje de lugares en los que se ha encontrado la especie respecto del total de lagunas temporales exploradas) de 27. Le siguen *Triops spp* y *Chirocephalus diaphanus* con una prevalencia de 6, *Streptocephalus torvicornis* con tan sólo 3, y *Branchipus cortesi*, *Leptestheria mayeti* y *Maghrebetheria maroccana* con una única localidad. Ninguna especie tiene protección legal, sin embargo algunas de las localidades están catalogadas como zonas húmedas o bien son microreservas de fauna y/o flora por ser el hábitat de anfibios o especies de flora protegida. No obstante no están exentas de amenazas principalmente por desecación y contaminación por productos agrícolas y exceso de ganadería. Se analizan en este trabajo las principales amenazas y medidas de gestión para proteger estos hábitats y se hace una valoración de su estado de conservación.

PS2.21

Sala, Jordi

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SPECIES RICHNESS AND COMPOSITION PATTERNS OF LARGE BRANCHIOPODS ASSEMBLAGES IN THE IBERIAN PENINSULA AND BALEARIC ISLANDS

The presence of the large branchiopod fauna in the Iberian Peninsula and Balearic Islands was recorded obtained from bibliographical and recent captures. The fauna includes 16 anostracans, 7 notostracans and 4 spinicaudatans, although we considered the different species of genus *Triops* as one taxa, due to the difficulties to allocate the bibliographical records of this genus to the 6 new species (the co-occurrence of different species of *Triops* has not been recorded in the Iberian Peninsula or the Balearic Islands). More than 30% of sites presented co-occurrence of species. A maximum of 6 species were found co-occurring together. High values of co-occurrences were more common in the south of the Iberian Peninsula (specially in Andalucía in Spain, and in Alentejo in Portugal). For each UTM 100 km grid square, diversity patterns were measured as γ -, β -, and, mean α -diversity and were thereafter compared along latitudinal and longitudinal gradients. UTM 100km grid squares with less than 5 localities were removed from the analyses. Results showed that mean α -diversity and γ -diversity showed a tendency to increase towards the west and the south of the Iberian Peninsula.

PS2.15

Saldaña, Jesús A.; Martínez, Maite; Alcaraz, Carles; Viñas, Marc; Aranda, Xavier; Ibáñez, Carles

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DAILY VARIATION CH₄ EMISSIONS IN EBRO DELTA RICE FIELDS

Rice cultivated under flooded conditions is one of the main contributors to anthropogenic emissions of greenhouse gases (GHG), in particular methane (CH₄). The project Life+ EBRO-ADMICLIM (2014-2018) puts forwards pilot actions for adaptation to and mitigation of climate change in the Ebro Delta (Catalonia, Spain) with the final goal of creating a Climate Action Plan which will include among others, measures to reduce GHG emissions from rice fields. For this purpose, a specific action was carried out aiming at estimating GHG emission and its seasonal and daily pattern, and assessing its relationship with both agronomic management and physicochemical characteristics of the field (soil and water).

From May to December 2015, a total of 15 commercial fields distributed all over Ebro Delta, covering geographical and physicochemical variability were monitored. Data collected was: GHG emission, agronomic practices, and soil and water physicochemical parameters (pH, conductivity, temperature, and redox). Moreover, the same measurements were conducted collected in 2-hour intervals during one day within the reproductive stage (16th July, 2015) in one field. GHG were sampled using the closed chamber method, with three replicates per sampling, gases analyzed by gas chromatography. Multivariate Principal Component Analysis (PCA) was carried out to analyze the relationships between factors that control the greenhouse gases emissions.

Our results show that CH₄ emissions remained stable over the day (2.24-3.7 mg m⁻² hr⁻¹) although an increasing trend of CH₄ emission over afternoon and evening (19:00 to 23:00 h) was consistently observed in the three replicates. The statistical analysis indicates a negative correlation between CH₄ and temperature, likely because of temperature enhances plant physiological activity and thus, O₂ diffusion to the rhizosphere, through aerenchyma resulting in inhibition of methanogenic activity.

The variability in plant cover observed at the three replicates allowed as to observe a positive correlation with flux of methane. The performance confirm the rice have the ability to emit CH₄ from rhizosphere to the atmosphere.

PS1.23

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LAKES OF SALIENCIA (SOMIEDO NATURAL PARK, ASTURIAS, NW SPAIN): A LIMNOLOGICAL, GEOCHEMICAL AND ENVIRONMENTAL STUDY

The lakes La Cueva and El Valle (Somiedo Natural Park, Asturias, NW Spain) form, along with a number of other smaller lakes (e.g., Calabazosa, Cervériz), a stunning mountain landscape known as "Saliencia Lakes". Situated at an altitude of 1,600 m.a.s.l. and surrounded by the peaks of Picos Albos and Peña la Mortera, this group of glacial alpine lakes represents a remarkable natural ecosystem of great environmental value. At the same time, however, these lakes have suffered a significant anthropogenic pressure in modern times in the form of either metal mining in La Cueva (Santa Rita iron ore mine, 1805-1978) or damming activities for hydroelectric exploitation in El Valle (1920). No previous report existed on the chemistry, limnology or ecology of these lakes, and a research project is presently being conducted by the Spanish Geological Survey. This presentation will show the results and main conclusions from a recent limnological and geochemical study conducted in these two lakes. We will discuss different hydrological and biogeochemical processes of environmental relevance based on depth profiles of temperature, conductivity, pH and ORP, as well as dissolved oxygen, chlorophyll-a, carbon, nutrient and metal concentration. In the sampling periods covered by our investigations (July to September, 2014-2015), the lakes showed a marked thermal stratification, with a well-defined thermocline separating a lighter and warmer epilimnion (16-20 °C) from a lower and cooler hypolimnion (5-7 °C). Both lakes showed a reasonably good environmental state as regards to metal pollution (with all toxic metals analyzed close to or below detection), though both displayed a low carbon and nutrient content typical of oligotrophic conditions. Despite their relatively low-intensity biological activity, deep chlorophyll-a maxima (DCM) with corresponding oxygen maxima developed at the thermoclines. Notable chemical gradients existed between the oxygenic epilimnion and the anoxic-reducing hypolimnion as a result of different biogeochemical processes (settling of phytoplanktonic biomass, carbon mineralization, metal cycling). Decomposition of organic matter in bottom sediments leads to strong hypolimnetic oxygen depletion, and anoxia subsequently leads to biological anaerobic respiration coupled to iron and manganese oxide reduction, which in turn results in important increases in both Fe and Mn concentration.

PS1.32

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HERRAMIENTA DE SIMULACIÓN NUMÉRICA PARA LA EVALUACIÓN DE LA HABITABILIDAD PARA PECES (HPU)

La caracterización y cuantificación del Hábitat Potencial Útil (HPU) para peces en base a modelos de simulación hidráulica diseñados ad hoc, es una herramienta de amplio uso en la gestión ambiental de ríos, utilizada, entre otras aplicaciones, para el establecimiento de caudales ecológicos. El cálculo del HPU se fundamenta en la disponibilidad de unas curvas de preferencia o idoneidad adecuadas para la especie de pez y estadio de desarrollo considerados, así como en el uso de modelos de simulación hidráulica robustos, preferentemente bidimensionales, capaces de incorporar y operar de forma combinada variables hidráulicas e hidrobiológicas.

Iber es un modelo numérico de simulación de flujo turbulento en lámina libre en régimen no-permanente y de procesos medioambientales en hidráulica fluvial. Iber resuelve las ecuaciones de aguas poco profundas en dos dimensiones, o ecuaciones de Saint Venant bidimensionales, sobre una malla de volúmenes finitos, que puede ser irregular y no estructurada, formada por triángulos, cuadriláteros o combinaciones de ambos. Para su resolución Iber utiliza el método de los volúmenes finitos con el esquema de Roe, lo que permite obtener valores de variables hidráulicas (calados, velocidades, etc) e hidrobiológicas (temperatura, salinidad, oxígeno disuelto etc.) para diferentes escenarios de cálculo.

Se presenta el desarrollo y aplicación, mediante un caso de estudio, del nuevo módulo de Iber denominado: Idoneidad del Hábitat Físico (IHF) que permite incorporar curvas de preferencia de cualquier especie acuática y estadio de desarrollo para el cálculo de la distribución espacial y temporal del HPU correspondiente. En el caso de estudio se ha evaluado el hábitat físico disponible de la trucha común (alevín, juvenil y adulto) en función del calado y la velocidad del agua. Posteriores evoluciones del módulo IHF, permitirán incorporar a la cuantificación del HPU otras variables hidráulicas e hidrobiológicas, así como combinaciones entre ellas, para explorar futuras aplicaciones de Iber en la gestión ambiental de ecosistemas fluviales, con más prestaciones y más fiables.

PS2.08

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DIEZ AÑOS EVALUANDO LA CALIDAD DEL AGUA DE LOS EMBALSES DEL ÁMBITO DE ACTUACIÓN DE LA CONFEDERACIÓN HIDROGRÁFICA DEL JÚCAR.

La ecología del fitoplancton tiene interés para comprender la estructura y funcionamiento de un ecosistema acuático pero también, y cada vez más, para ayudar en la gestión ambiental de dichos ecosistemas. El análisis y cálculo de métricas de fitoplancton en embalses es de obligada aplicación en la explotación de las redes oficiales de evaluación del estado/potencial ecológico en cumplimiento de la Directiva Marco del Agua 2000/60/CE.

Este trabajo evalúa la dinámica de estos indicadores en los últimos 10 años en 24 embalses de la Confederación Hidrográfica del Júcar. Se escogen las muestras obtenidas en el verano tardío en la zona de presa. La metodología sigue los estándares propuestos por el Ministerio de Agricultura, Alimentación y Medio Ambiente. Además, con ánimo de ilustrar los ensamblados fitoplanctónicos de estos embalses, se detalla su estructura en 26 embalses en el verano de 2015.

El biovolumen promedio en el año 2006 fue de 6,5 mm³/l, en 2007 descendió hasta 2,5 mm³/l y desde entonces presenta una tendencia lineal

PS2.45

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EL EMBALSE DE MARGALEF, UN EMBALSE MODERADO.

La presa de Margalef se localiza en el término municipal del mismo nombre, Margalef, de la comarca del Priorat, (Tarragona, NE de España) y forma parte del “Parc Natural de la Serra del Montsant”. Su construcción finalizó en 1995 y tras una década se iniciaron los estudios de seguimiento de la calidad de sus aguas por parte de la Confederación Hidrográfica del Ebro.

Posee una cuenca vertiente de 94.35 Km², una superficie inundada de 31.57 ha y regula las aguas del río Montsant con una capacidad de 2.98 hm³. La cuenca se enclava entre los materiales del Cenozoico, dentro del Paleógeno con conglomerados y lutitas y del Eoceno-Oligoceno con calizas. Entre los elementos característicos del relieve destacan cuevas y abrigos formados por erosión diferencial. Esta característica ha convertido a Margalef en una de las zonas más famosas y punteras de escalada del mundo con sus cantos en forma de agujeros.

El embalse forma parte del Registro de Zonas Protegidas elaborado por la Confederación Hidrográfica del Ebro, en contestación al artículo 6 de la Directiva Marco del Agua, en la categoría de zonas de extracción de aguas para consumo humano y zonas de protección de hábitat o especie (Punto Red Natura 2000: ZEPA y LIC ES5140017 “Serra de Montsant-Pas de l’Ase”). Es un embalse monomítico, situado en zona no húmeda de cabecera y tramos altos usándose sus aguas para abastecimiento e industria de poco consumo.

Durante todos los años de seguimiento del estado trófico realizado por la Demarcación Hidrográfica del Ebro, caracterizando sus aspectos tanto hidrológicos, físico-químicos y biológicos, el embalse de Margalef ha sido clasificado como mesotrófico, excepto en el año 2015 en que quedó clasificado como oligotrófico, porque la concentración de fósforo total fue la menor de toda la serie estudiada. Los elementos de calidad que más han influido en su estado han sido el fósforo total y el disco de Secchi. Sin embargo, tras el estudio de todos los parámetros e indicadores, su potencial ecológico normativo siempre ha quedado catalogado como moderado.

PS2.46

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RELACIÓN ENTRE FACTORES FÍSICOS-QUÍMICOS Y DIVERSIDAD MICROBIANA EN ECOSISTEMAS DEL PARQUE NACIONAL DE DOÑANA

Es esperable que las comunidades microbianas estén constituidas por unos pocos tipos de microorganismos muy abundantes y un gran número de microorganismos diferentes, pero escasos o, incluso, raros. Se plantea la hipótesis de que estos microorganismos minoritarios sean, sin embargo, importantes en los ecosistemas. Con objeto de detectarlos y conocer su papel en los ciclos biogeoquímicos y redes tróficas, se han estudiado los cambios estacionales de la comunidad microbiana a lo largo de un amplio gradiente ambiental en el entorno de una laguna temporal del Parque Nacional de Doñana durante 2012. Se monitorizaron las comunidades de procariotas por pirosecuenciación de amplicones de los genes ARN ribosomal 16S en muestras de suelos y sedimentos en diferentes zonas sometidas a factores ambientales estresantes: a) playa (salinidad), b) dunas litorales (sequedad), c) matorral perilagunar (limitación por nutrientes) y d) orilla laguna (fluctuación desecación/inundación). Además, se determinaron las concentraciones de nutrientes, cationes y aniones principales, metales pesados, materia orgánica fina, pH y texturas (arcillas, limos y arenas). El porcentaje de materia orgánica y la proporción de materiales finos resultaron ser las variables más importantes en la ordenación multidimensional (NMDS) del total de muestras. Las zonas cercanas a la laguna reflejaron un ambiente significativamente más rico en nutrientes y minerales. La mayor acumulación de materiales finos y de disponibilidad de agua, hacen pensar que las zonas cercanas a la laguna constituyeron ambientes comparativamente menos estresantes que las zonas de dunas y playa para las comunidades microbianas. La distribución de los microorganismos también estuvo fuertemente relacionada con los nutrientes y factores de estrés, observándose diferencias en base a la disponibilidad de agua en el ambiente.

PS1.47

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EFFECT OF *EICHHORNIA CRASSIPES* (MART.) SOLMS IN DIET SUPPLEMENTATION ON GROWTH PERFORMANCE OF *PTEROPHYLLUM SCALERE* (SCHULTZE, 1823) JUVENILES

Current study investigated the effect of *Eichhornia crassipes* as ingredient food in the growth performance of *Pterophyllum scalare*, in two principal ways: macrophyte ground and macrophyte extract. A formulated diet (basal diet) and more three different diets were formulated adding dried macrophyte ground and macrophyte extract in the basal diet. Specific growth rate, weight gain, feed intake and final body weight were higher ($P < 0.05$), whilst the highest percent survival (100 %) was recorded in macrophyte ground in dietary treatment. No significant difference ($P > 0.05$) was reported between dietary treatments with regard to water parameters except to nitrite and ammonia. Nitrite and ammonia were higher (P mainly regards to macrophyte extract dietary treatment that result were similar to basal diet. There is virtually little information concerning ingestion and survival rates of *P. scalare* fed on fresh water *E. crassipes*, it is apparent that the use of processed this aquatic plant holds much better promise. Fish feed ingredients containing sources of unconventional feed for culture fish are important information for effective management of ornamental fish. In summary for *P. scalare* the use of *E. crassipes* in extract form can be utilized substituting the water in the basal diet due the good results of growth performance and survival. In addition, to use organic waste generated by aquatic plants in aquaculture farm.

PS2.41

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EL RESURGIR DE SAN BENITO (ESTE PENINSULAR) TRAS LA INUNDACIÓN DE 2015

La laguna de San Benito se sitúa a caballo entre los municipios de Ayora (Valencia) y Almansa (Albacete). Se trata de una laguna endorreica permanente hasta el siglo XIX en el que se estableció un drenaje de 8 km hasta el río Reconque que la desecó, ocupándose su cubeta con cultivos y quedando desde entonces como laguna temporal. Al menos se conoce que se llenó en tres ocasiones, tras las intensas lluvias de 1956, las 1984 y en 1986. La cuarta ha sido durante los meses de agosto a octubre de 2015 en que nuevamente las aguas inundaron una parte importante de su cubeta, dando lugar al resurgir de su fauna acuática. Se aprovechó este periodo para efectuar diferentes muestreos de su físico-química y de un análisis de los organismos existentes en sus aguas, así como el seguimiento de la zona inundada por medio de teledetección. Destacan entre otros la presencia de los grupos siguientes: Ostracoda, Anostraca, Notostraca, Cladocera, Copepoda, Odonata, Ephemeroptera, Heteroptera, Coleoptera y Diptera. También se observó la vegetación acuática, así como el fitoplancton. Uno de los aspectos más interesante ha sido que el periodo prolongado de la inundación de tres meses ha permitido la renovación del banco de huevos de resistencia pertenecientes a diferentes especies del grupo de los Branchiopoda. Después de treinta años sin una inundación, se comprobó que *Triops cancriformis*, *Branchippus schaefferi*, *B. visnyai* y *Streptocephalus torvicornis* pudieron completar su ciclo y dispersar gran cantidad de huevos en el sedimento.

PS2.42

Urquía, Uxue; Castillo-Escrivà, Andreu; Valls, Luís; Diez, Silvia; Rochera, Carlos; Camacho, Antonio; Mesquita-Joanes, Francesc; Armengol, Xavier

Universitat de València

DINÁMICA TEMPORAL DEL ZOOPLANCTON EN LAGUNAS SOMERAS Y ESTACIONALES CON DIFERENTE SALINIDAD Y NIVEL TRÓFICO DE LA MANCHA HÚMEDA

Las lagunas salobres del interior de la península ibérica constituyen sistemas único en Europa y de gran interés ecológico, a pesar de que muchas de ellas están seriamente afectadas por distintos impactos de origen antrópico (residuos, desecación, contaminación, agricultura). En varias de estas lagunas, temporales y someras, de la zona conocida como "La Mancha Húmeda" (que incluye humedales situados en las provincias de Cuenca, Albacete, Ciudad Real y Toledo), se ha llevado a cabo el estudio de la dinámica del zooplancton en relación con el ambiente. Los muestreos, de carácter mensual, se llevaron a cabo durante el periodo de inundación, que fue desde septiembre de 2013 hasta la primavera/verano de 2014; junto con las muestras de zooplancton se tomaron muestras de agua y se registraron algunas variables ambientales. Existe una marcada variación temporal en las poblaciones de zooplancton relacionada con los importantes cambios ambientales que se dan en las lagunas. Los rotíferos son el grupo dominante en densidad en la mayoría de sistemas estudiados, sobre todo aquellos del grupo de *Brachionus plicatilis*, dominantes en muchas lagunas y que llegaron a alcanzar densidades superiores a los 5000 ind/l. Entre los copépodos dominan los calanoides del género *Arctodiaptomus* y cladóceros como *Daphnia magna* o *D. mediterranea*. A partir de los datos de zooplancton se han realizado análisis multivariantes y correlaciones con las principales variables ambientales, realizado una descripción de las diferentes comunidades de zooplancton en dichas lagunas y mostrando la influencia de los factores ambientales sobre estas comunidades, en particular aquellos relacionados con el nivel trófico y con la salinidad. Este trabajo se ha realizado en el marco del proyecto ECOLAKE "Patrones ecológicos en lagunas mesetarias: las claves para su conservación, CGL2012-38909", financiado por el Ministerio de Economía y Competitividad del Gobierno de España y por la Unión Europea a través del Fondo Europeo de Desarrollo Regional - FEDER "Una manera de hacer Europa".

PS1.48

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ASPECTOS TRÓFICOS DE LA ICTIOFAUNA DE LA LAGUNA DEL CASCARRO (ZARAGOZA)

La presencia de especies piscícolas invasoras es muy frecuente en los sistemas acuáticos ibéricos, siendo la cuenca del Ebro una de las más afectadas por este problema. En muestreos realizados durante la primavera de 2016 en la charca artificial del Cascarro (Reserva de los galachos de la Alfranca, Zaragoza), próxima al río Ebro, se capturaron individuos de dos de estas especies, *Ameiurus melas* y *Gambusia holbrooki*. Los datos de las capturas sugieren que ambas especies estaban distribuidas en zonas de la laguna con características diferentes. *A. melas*, se capturó exclusivamente en la zona de la laguna más profunda (1,5 metros) y turbia, esta zona fue excavada hace unos años como medida de restauración de la charca. *G. holbrooki* se capturó mayoritariamente en una zona de la laguna muy colmatada, de escasa profundidad (0,3 m), mayor transparencia y abundancia de carrizo (*Phragmites australis*).

Con el objetivo de estudiar la dieta de ambos peces y compararla con los recursos tróficos (zooplancton y macroinvertebrados) disponibles en cada zona, se tomaron 10 individuos de cada una de las especies y se examinó e identificó el contenido de sus tractos digestivos. Además se tomaron muestras de plancton (redes de plancton de 63 y 250 micras) y bentos (red de mano de 500 micras) en las dos zonas de la charca. Los índices de electividad de Ivlev obtenidos al comparar el contenido intestinal y las muestras, pusieron en manifiesto que *A. melas* presentó una marcada preferencia por los quironómidos y ceratopogónidos y en menor medida por *Daphnia curvirostris*, esta especie también presentó en su estómago restos de peces. *G. holbrooki* presentó selección positiva por *Chydorus sphaericus* y *Bosmina longirostris*, destacando la ausencia de larvas de macroinvertebrados entre los restos identificados. En ambas especies se obtuvieron valores negativos del índice de electividad para rotíferos y copépodos.

PS1.38

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FIRST SIGNS OF RECOVERY FOLLOWING REMOVAL OF INTRODUCED MINNOWS IN A HIGH MOUNTAIN LAKE OF THE PYRENEES

High mountain lakes are naturally fishless, but there have been numerous trout and minnow introductions to such ecosystems since the 19th century, mainly associated with angling activities. These introductions cause ecosystem alterations, since they occupy the highest trophic position. In July 2013, we started a pioneer pilot study of minnow, *Phoxinus sp.*, eradication from the lake Closell (Pallars Sobirà), an hydrographically isolated lake situated in the southern slope of the Pyrenees, at 2072 m of altitude, with 0.75 ha of surface area and 3 meters of maximum depth. The objective was to test different fishing tools and study the speed of the lake recovery. Minnows were caught during the ice-free season using fyke nets and electrofishing at the littoral zone and gill nets in the pelagic zone. At the same time, a monitoring program was started to evaluate the lake's recovery and changes in the ecological status. After three years of work we estimate that we have reduced a 99% of *Phoxinus sp.* initial population. Limnological monitoring showed clear signs of lake recovery. At the end of the first summer we detected the presence of palmate newt, *Lissotriton helveticus*, for the first time in the lake, and confirmed its reproduction and survival of larvae. We also found a clear recovery of macroinvertebrates such as dragonflies, beetles and caddisflies at the second year. The last year we also found a substantial increase of the crustacean *Daphnia longispina* that was also accompanied with a recovery of the lake's original transparency. Results showed that high mountain lake restoration is fast when recently introduced fish are removed. Lake Closell has recovered some sensitive fauna even before complete fish eradication. We are now continuing exotic fish removal in Lake Closell and in other seven Pyrenean lakes through the LIFE+ project LIMNOPIRINEUS (2014-2019).

PS2.22

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DISTRIBUTION OF LARGE BRANCHIOPODS IN MURCIA REGION (SE SPAIN): THE ROLE OF FARM PONDS AS IMPORTANT HABITATS FOR THEIR CONSERVATION

The Region of Murcia is located in a semiarid climate area, where natural freshwater bodies are scarce. Moreover, during the last decades land use changes and water abstraction for agricultural purposes have caused the loss of a great number of these aquatic systems. Nevertheless, farm ponds constitute alternative aquatic habitats which might act as relevant habitats for the conservation of freshwater biodiversity. This study presents the occurrence of large branchiopods species (orders Anostraca and Notostraca), during a survey of 57 temporal freshwater ponds belonging to the farm ponds type according the Regional Inventory of wetlands in Murcia. Three species were detected: the anostracans *Branchipus schaefferi* and *Streptocephalus torvicornis*, and the notostracan *Triops cancriformis/simplex*. The most widely distributed species was *S. torvicornis* which was present at 15 localities distributed through 9 UTM 10 x 10 km grids. The other two species have a more restricted distribution: *B. schaefferi* was found at 5 sites through 3 UTM grids; and *T. cancriformis/simplex* was only present at 4 ponds in 2 adjacent UTM grids. Most of the surveyed ponds only had one species, but in farm ponds at the Llanos del Cagitan area a higher coexistence level were observed, with several ponds containing two or three species. The high occurrence of large branquiopods in these systems puts in evidence the importance of farm ponds for this animal group where natural temporary ponds are scarce. Therefore, it is necessary to develop adequate conservation policies and management measures to ensure their conservation.

PS2.43

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LA APLICACIÓN RIU.NET: CIENCIA Y CONCIENCIACIÓN CIUDADANA AL ALCANCE DE TODOS

RIU.net es una aplicación diseñada para móviles inteligentes y tabletas para ser utilizada por los ciudadanos y poder evaluar el estado ecológico del río mediante parámetros hidromorfológicos y biológicos, siguiendo la Directiva Marco del Agua (DMA). Con una primera fase financiada por la FECYT, la segunda versión de la aplicación RIU.net ya está en pleno funcionamiento desde noviembre del 2014 en castellano, catalán e inglés, y es uno de los pocos proyectos de ciencia ciudadana existentes en el ámbito de gestión y ecología de ríos. Hasta mayo del 2016, se han contabilizado 1800 descargas con un registro de 600 evaluaciones del estado ecológico de algún río, de los cuales la mitad han sido correctamente validados. El retorno de valoración de los usuarios ha sido en general positivo, siendo crucial la sencillez del método y la interactividad con el software a través del dispositivo móvil. El uso de nuevas tecnologías en el caso de estudiantes de secundaria, por ejemplo, ha representado una herramienta poderosa para fomentar el conocimiento así como la autonomía para evaluar el estado ecológico de los ríos. Así también, se está usando también en cursos universitarios como introducción al estudio de la sostenibilidad del ciclo del agua. La obtención de datos válidos acerca del estado ecológico en una escala espacial y temporal más amplia de diversos ríos son de acceso libre que podrán ser de ayuda tanto para las Administraciones como Gestores del Agua, investigadores o la sociedad en general. Y tal como exige la DMA, RIU.net ha consolidado el acercamiento entre la sociedad y los científicos así como también ha contribuido al conocimiento e interés de los ecosistemas fluviales de manera cognitiva, afectiva y conductual para fomentar la mejora del estado ecológico y preservar nuestros ríos.

PS1.28

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CARTOGRAFÍA TEMÁTICA DE CLOROFILA-A Y OTRAS VARIABLES BIO-ÓPTICAS DE AGUAS CONTINENTALES EN LA ZONA DE SAO PAULO CON IMÁGENES DE LOS SATÉLITES LANDSAT-8 Y SENTINEL-2

La Región Metropolitana de San Pablo (Região Metropolitana de Sao Paulo), con 7943 km², reúne 39 municipios del Estado de São Paulo (Brasil), en un intenso proceso de conurbación. Tiene una población de más de 25 millones de habitantes, que viven en una gran mancha urbana continua. Es la región más poblada de Sudamérica y del hemisferio Sur y la octava de las áreas urbanas más pobladas del mundo.

En la zona hay numerosas masas de agua continentales con un papel importante como recurso hídrico y soporte de la biodiversidad, incluyendo el suministro de agua potable. La Universidad de São Paulo estudia con regularidad la calidad ambiental (en los términos de la DMA) de estos recursos y está interesada, a través de sus acuerdos con la Universidad de Valencia, en la estimación de la distribución espacial de los valores de concentración de pigmentos fotosintéticos y otras variables para el conocimiento del estado trófico y potencial ecológico de lagos y embalses.

Por ello se ha iniciado un programa de actividades conjuntas para la obtención de información "in situ" y el desarrollo de algoritmos de estimación de las variables limnológicas en esos medios. En esta comunicación se recoge el desarrollo de este programa y los primeros resultados.

Los satélites Landsat 8 y Sentinel 2 han sido lanzados en los últimos dos años y están dotados de los sensores OLI y TIRS con resolución espacial de 30 m en Landsat y el MSI, con pixel de 10 m, en Sentinel, capaces de ofrecer una buena información de las variables de calidad del agua, como herramientas para una mejor gestión de los recursos hídricos. Se recogen algunas de las imágenes obtenidas que muestran su capacidad para el estudio de la calidad y diversidad de estas y su heterogeneidad espacial.

PS1.49

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MONITORING FISH COMMUNITY OF THE LOWER Ebro RIVER: A 9-YEAR DATA SERIES

To study the fish community of the lower Ebro River we analysed a dataset of fish relative abundances from yearly electro fishing campaigns carried out during the last 9 years (2006-2015). We found 21 species: 8 autochthonous (1 listed as vulnerable) and 13 introduced (11 classified as invasive). As we expected, these results show a strong predominance of alien species in the area, both in richness and in abundance. Furthermore, some of them are showing strong growth, such as *Alburnus alburnus* that increased from 26 to 60% of total catches in the last three years, and *Perca fluviatilis* that was found for the first time in 2014 in two of the sampling reaches. In regard to spatial distribution, we found that the presence of a weir in Xerta (located 57 km from the mouth) causes a loss of connectivity that avoids the pass of native migrating fishes. This factor, along with others, causes a significant difference between the percentages of introduced species upstream (90-95%) and downstream (65%) from the weir. These results contribute to quantify the problem of invasive species on the lower Ebro River and we expect them to be useful for water managers.

PS1.33

Villena-Alvarez, Maria J.; Tebar, Noemi; Pujante, Ana

Laboratorios tecnológicos de Levante

DIATOMEAS EN AMBIENTES ÁCIDOS

Desde la implantación de la Directiva Marco del Agua (2000/60/CE), muchos son los programas de seguimientos diseñados y llevados a cabo por las distintas administraciones de cuenca para comprobar el cumplimiento de los objetivos marcados en dicha directiva. Gracias a estos programas han aumentado gratamente el número de datos existentes en la actualidad, a nivel nacional, de los diferentes elementos biológicos. Sin embargo, la información generada en estos programas se centra principalmente en establecer el estado o potencial ecológico de las masas de agua estudiadas dejando a un lado en muchas ocasiones la riqueza de información taxonómica y ecológica que se ha generado con tanto esfuerzo.

Las cuencas de los ríos Tintos, Odiel y Piedras presentan una singularidad respecto a otras cuencas debido a la influencia del drenaje ácido minero. A través del programa de seguimiento de estas cuencas, bajo la dirección de la Junta de Andalucía, se obtuvieron datos de 44 estaciones de ríos en tres campañas: primavera de 2014, otoño de 2014 y primavera de 2015. Del total de estaciones, 11 las consideramos de aguas ácidas por presentar valores de pH.

PS1.34

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VARIACIONES EN LOS ÓRDENES EPHEMEROPTERA, PLECOPTERA Y TRICHOPTERA SEGÚN VARIABLES AMBIENTALES EN RÍOS ALTOANDINOS DEL SUR DE ECUADOR

La presente investigación se realizó en una cuenca altoandina al sur del Ecuador, con el objeto de determinar los principales factores ambientales que influyen en la variación espacial de los macroinvertebrados acuáticos de los órdenes EPT (Ephemeroptera, Plecoptera, Trichoptera), en ríos de cabecera. Para ello, se seleccionaron cuatro tramos de 50 m de longitud en la subcuenca alta del río Zhuruca, cada tramo con 5 secciones transversales. Se realizaron en total 19 campañas de muestreo entre diciembre de 2011 y octubre de 2013. En base a los períodos de mayor estabilidad del caudal se escogieron 133 muestras bióticas para los análisis. Para cada muestra tomada con red surber se tomaron también datos abióticos, siendo un total de 37 variables ambientales agrupadas en tres gradientes (corredor ribereño, hidromorfológico y calidad del agua). Para el análisis estadístico se aplicaron pruebas multivariadas, que sugieren que la densidad de individuos de los órdenes EPT varía con el tipo de mesohábitat, y concretamente la densidad de Plecoptera con la relación anchura/profundidad. En el gradiente corredor ribereño, se destacan dos variables; con el orden de río se tuvo una afinidad de algunos grupos (Xiphocentronidae, Contulma y Helicopsyche) y otros con el tipo de vegetación ribereña (Ochrotrichia, Nectopsyche y Phylloicus). En cambio, el número de Froude, la grava y relación anchura/profundidad fueron las variables hidromorfológicas más relevantes de la variación de los EPT. En este caso, Phylloicus, Ochrotrichia y Nectopsyche fueron habituales en sitios lénticos - número de Froude bajo-, en tanto que las proporciones de grava y los valores de la relación anchura/profundidad limitaron al género Helicopsyche. El fósforo total fue la única variable relevante del gradiente calidad del agua, que actúa restrictivamente sobre el género Mortoniella. En conclusión, aunque muchos estudios ecológicos o de biomonitorio usan a los macroinvertebrados por su relación con la calidad del agua según el tipo uso de suelo, esta investigación demuestra la importancia de otros procesos determinantes de las comunidades acuáticas como son las hidromorfológicas, poco conocidas en la región andina y esenciales en el estudio de caudales ecológicos y en la evaluación de integridad ecológica de ríos.

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THE TAGUS RIVER BASIN DIATOM MAZE. A FELTRON PERSPECTIVE

YEAR 2014. The diatom flora of 124 rivers throughout the Spanish side of the Tagus River Basin was studied. Diatoms were collected from a mixture of substrates including rocks, macrophytes and artificial substrates (MAGRAMA ML-R-D-2013). Taxonomical analysis resulted in a total of 249 species with relative abundances above 1% in the samples. Average species richness was 35 ± 10 taxa per sample and the most diverse genera were *Navicula* (25) and *Nitzschia* (31). However, *Cocconeis euglypta*; *Eolimna minima*; *Achnanthis minutissimum*; *Planothidium frequentissimum* and *Cocconeis lineata* were the most common taxa and the most widely distributed (frequency = $69\% \pm 8\%$).

Likewise, samples from 2014 were used to develop the new TADI Index (TAGUS Diatom Index). The biological status of the sampled rivers was assessed and compared with the SPI (Specific Pollution Sensitivity Index) and the Ecological Quality Ratios considered in the Tagus River Basin Management Plan 2015.

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