XV INCONTRO DEI DOTTORANDI E GIOVANI RICERCATORI IN ECOLOGIA E SCIENZE DEI SISTEMI ACQUATICI

8-10 maggio 2019
Centro per lo Studio dei Fiumi Alpini – ALPSTREAM
c/o Lou Pourtoun, Borgata Sant’Antonio 17, Ostana (CN)

RIASSUNTI
SESSIONE “COMMUNITY ECOLOGY”
Mercoledì 8 maggio 2019 ore 14.15-16.00, chair: Stefano Fenoglio

[ore 14.15] Macroinvertebrates in riverine systems with different degree of intermittence: influence of community dynamics and environmental variables at different spatial scales

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Streams and rivers are among the most complex and dynamic natural systems, having a fractal and hierarchical organization, with time- and scale-dependent factors affecting community structures. Consequently, the present study has been divided into three sections related to different spatial scales, aiming to disentangle main drivers affecting the distribution of macroinvertebrates. In the first section, we worked at the among-microhabitat level, considering environmental and spatial variables as covariates for community data in geostatistical and variance partitioning models. Then we analysed the structuration of communities among mesohabitats in river segments, evaluating their spatial and temporal variability by means of mixed models. At last, we performed a broad-scale study, focussing on the distribution of organisms among a wide set of streams. All sections have been carried out in watercourses belonging to Northern Apennines (Po River Basin) and in the framework of the project NOACQUA (Prot. 201572HW8F). For microhabitat level we highlighted a dominance of trophic factors in determining the distribution of organisms, but with a significant contribution given by spatial variables. Considering the second section, we found a strong influence of the mesohabitat in structuring communities, with different mesohabitats hosting different and exclusive taxa. Then, for the broad-scale, the hydrological regime resulted to deeply affect macroinvertebrate communities, influencing values of alpha and beta diversity and leading to greater randomness in communities of intermittent streams. All these findings offer insights in the frameworks of biomonitoring, restoration and community modelling since they highlighted the importance of drivers which are often omitted in ecological studies.

[ore 14.30] Investigating structural and functional responses of macrozoobenthic communities to anthropogenic stresses in lowland lotic ecosystems of the Po River valley

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Agricultural landscapes are characterized by the large presence of artificial and natural water courses that should be considered for biodiversity conservation in the era of Anthropocene. Despite their extension, the biodiversity hosted by these ecosystems is poorly studied. River Po delta is a very
productive area in Northern Italy, which is mainly covered by croplands served by a very dense canal network for irrigation and drainage purposes, as well as natural water courses. The aim of this study is to investigate on the macrozoobenthic community hosted by these ecosystems and to identify main environmental parameters affecting benthic macrofauna. Macrozoobenthic communities were analysed in 42 lotic ecosystems of lower part of the Po river valley. 14 environmental descriptors including physical-chemical parameters, surrounding land use and naturalness (artificial/natural types). Both structural (taxonomic community composition) and functional (community trophic groups) characteristics were considered. The results revealed the important roles of ecosystem naturalness and surrounding landscape for the invertebrates’ taxonomic distribution. On the other hand, the analysis of functional attributes highlighted a homogeneity of ecosystem functioning and a functional redundancy of macrozoobenthic communities. Despite the fact that abovementioned descriptors defined the taxonomic distribution, these ecosystems showed a valuable functional resilience capacity. Lowland channels and rivers, particularly the non-artificial ones, can have a conservation value if surrounding territories are managed with non-intensive practices. As agricultural lands cover large surfaces in Europe, natural and artificial water bodies of agro-ecosystems should be regarded with increasing attention for aquatic biodiversity conservation.

[ore 14.45] Negative phototactic response to UVR in cosmopolitan rotifers: a video analysis approach
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Ultra-violet radiation (UVR) is an environmental stressor in several ecosystems and can affect organisms’ survival and reproduction, and community structure. Similarly to other marine and freshwater zooplankton species, rotifers cope with UVR stress adopting preventive behavioral and metabolic mechanisms. However, the demonstration of an immediate behavioral response in rotifers is missing. We investigated the short-term response of rotifers to UVR, by combining video analysis and movement ecology methods, in three common rotifer species: Brachionus calyciflorus, Keratella cochlearis and Keratella quadrata. We recorded the behavior of B. calyciflorus (both sexes), K. quadrata and K. cochlearis (females) exposed to white light (WL), and to intermittent cycles of UVR (30:30 seconds). Individual trajectories were extracted from videos with open-source software. We found that B. calyciflorus females exposed to UVR exhibited strong negative phototaxis with increased swimming speed, and a weak positive phototaxis in males. K. cochlearis and K. quadrata showed a weaker response. Our study reveals a species-specific behavioural response to UVR in rotifers. Furthermore, we highlight how sexual dimorphism in B. calyciflorus does not only occur in morphology and movement, but also in behavioural traits. Our results help to understand zooplankton community dynamics by providing a mechanistic explanation of UVR response in one major zooplankton taxonomic group.
Managing the environment in a pinch: red swamp crayfish tells a cautionary tale of ecosystem based management in northeastern Italy

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Farmlands are globally widespread, and their management should consider both human and environmental needs. In fact, these man-made ecosystems provide subsistence to the human population but are also habitats for plant and animal communities. The worldwide increase of exotic species has affected native communities, but also human activities or health. We used an exploited farmland in northern Italy, where many exotics are present, as a test case for identifying restoration measures based on an ecosystem approach. We focused on red swamp crayfish for its ecosystem engineering capabilities, and examined the factors affecting its invasion success in order to attempt the definition of management strategies. We used multivariate and regression analysis to evaluate the relationships between the red swamp crayfish, water quality, macrophytes abundance, watercourse hydraulics and the fish community. All analyses indicated that red swamp crayfish was less likely to establish in large, deeper and fast flowing waterways, especially when these are deprived of vegetation and less eutrophicated. Based on our results, fish predation was also a significant factor in limiting red swamp crayfish abundance. We thus concluded that a different hydraulic management, which leaves more water in irrigation canals throughout the winter, could be possibly used to slow down or even reverse the invasion process.

Caspian Sea: network mechanics and stress response

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The Caspian Sea, the world largest landlocked sea, has suffered dramatic changes during the past century. Over-fishing, increased pollution from industries and civil discharges as well as invasion of alien species (M. leidyi), have brought the collapse of the kilkas fisheries (a keystone species in the Caspian) and drastic population reductions on multiple species, such as the sturgeons and seals. Identifying the role of different sources of impact, the mechanics that led to the changes in this ecosystem and the role that different species and their interactions played in the system is crucial to shed light on what occurred to this ecosystem. In this respect, we used qualitative modelling to investigate how different perturbations affected, in a causal perspective, the dynamics of the system. The models helped us to predict the response of the species to the various sources of stress as mediated by the feedback in the community structure. The focus, in particular, is on the importance of overfishing of kilkas in the decline of both sturgeon and seals, and how the invasion of the Caspian by M. leidyi might have led the kilkas fisheries to collapse. The preliminary results have demonstrated that the invasion of M. leidyi is a very disruptive event for the system, leading to the fall of multiple species higher in the trophic chain. Through this work, we expect to understand how single and concurrent perturbation on the system have led to the present state and how different proposed solutions might fare.
Fungi are ubiquitous components of microbial assemblages in terrestrial and aquatic ecosystems. Nevertheless, the quantitative relevance and ecological role of fungi in benthic deep-sea ecosystems are still largely unknown. We examined patterns and drivers of abundance, biomass and diversity of benthic deep-sea fungi in three submarine canyons of the Mediterranean Sea (Tricase, Crotone and Squillace). Crotone and Squillace canyons showed significantly higher fungal abundance, biomass and diversity compared to the Tricase canyon, suggesting that proximity to the coast and river inputs are relevant drivers of fungal assemblages. Fungal biomass, abundance and diversity displayed significant relationships with carbohydrates concentrations, which in deep-sea sediments include highly refractory organic compounds. Our findings also reveal that trophic and thermohaline conditions significantly influenced fungal assemblage composition. Overall, these findings suggest that submarine canyons of the Mediterranean Sea can represent hot-spots of abundant and diversified fungal assemblages.

Silica is an essential nutrient and the molar ratio of Si relative to nitrogen and phosphorous is relevant in the eutrophication process of aquatic ecosystems because it determines species composition. Lakes and reservoirs are biogeochemical reactors that recycle, store, remobilize and transform material. However, related to the well-studied N and P, few works have examined factors controlling Si loads, retention and stoichiometry in lakes. In the frame of the project ISEO (Improving the lake Status from Eutrophy towards Oligotrophy - Fondazione Cariplo 2015 - 0241) we analyzed Si, N and P loads and recycling in Lake Iseo. The purpose of this work were: 1) estimation of Si loads and fate and the relation with N and P; 2) evaluation of Si accumulation and recycling in the littoral zone in relation to primary producers activity. Quantification of incoming (3175 ton TSi y\(^{-1}\)) and outcoming Si loads (1178 ton TSi y\(^{-1}\)) suggest that Lake Iseo is a net Si sink and retains 63% of total load, causing a different stoichiometry alteration in summer and winter period. Intact core incubations of different
substrates collected from the littoral zone during the summer vegetative period indicate that the littoral zone mainly recycles DSI to the water column, but the intensity of Si regeneration differs among investigated microhabitats. Bare sediment colonized by benthic microalgae and rooted macrophytes show the highest release (121 µmol m⁻² h⁻¹) while rocky shores colonized by epilithon have the capacity to store Si during the all period (-29 µmol m⁻² h⁻¹).

[ore 16.45] Salt water intrusion affects structural and functional characteristics of macrozoobenthic communities in river Po delta (Northern Italy)

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Salt water intrusion affects deltaic areas leading to the salinization of water bodies and thus impacting aquatic ecosystems. The responses of macrozoobenthic communities to such environmental stress was investigated in four arms of river Po delta (Northern Italy) along a salinity gradient. Macrobenthic communities were sampled on 14 sites from 0 to about 22km distance from the river mouth, in two different dates (March and July) corresponding to different seasonal levels of salt water intrusion. Five environmental descriptors were measured (temperature, dissolved oxygen, salinity, water depth and pH). Structural diversity was measured by means of taxonomic diversity indices, while trophic groups and biological traits were assessed to describe functional responses. The results showed that the increase of salinity levels due to the seasonal salt water intrusion lead to significant community simplifications both in terms of structural and functional diversity. Higher values of taxonomic diversity indices were found in the most distant sampling sites, while no clear patterns were observed at mid and short distances to the river mouth. The analysis of functional and biological traits revealed that epifaunal k-strategist species with relative long life cycle and gathering collectors were more abundant in upstream sites. Increasing abundance of infaunal and opportunistic r-strategist species with relative short life cycle increased were observed moving towards the river mouth. Moreover, the comparison of different seasonal results showed that macrobenthic communities cannot recover completely after disturbance. As climate change is expected to exacerbate salt water intrusion, management measures are urgently needed to protect aquatic biodiversity.

[ore 17.00] Nutrient dynamics in lagoon ecosystems: an ecological network analysis approach

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Algal blooms affect chemical and biological quality of estuarine ecosystem, resulting in large biodiversity and economic losses. The mechanisms that determine these phenomena are multiple and interacting. The effective management requires an understanding of the processes that regulate nutrient cycling at the ecosystem scale. To achieve this understanding mass balance modelling and analysis may help. The construction of these models requires identifying all biotic and abiotic ecosystem components, quantifying standing stocks and fluxes by which components exchange nutrients with one another and the outside environment. This leads to a whole system representation made possible by a group of algorithms collectively called Ecological Network Analysis (ENA). The purpose of this project is to analyze, through the ENA, nitrogen and phosphorus cycles in the Curonian and in the Sacca di Goro Lagoons, two eutrophic systems, located in Lithuania and Italy. For each lagoon, a spring and a summer model will be constructed in order to identify the mechanisms
responsible for the algal blooms and the consequences of anoxia. Sampling activity in both lagoons will be conducted to collect data specifically needed to construct the networks. The entire data set will be completed through laboratory investigations and by collecting residual information from the literature. The analysis of ecological networks provides an integrative overview of nutrients circulation and helps to identify key compartments and interactions in N and P circulation. These results will provide relevant management suggestions in order to act specifically on those sources that are quantitatively more important as drivers of blooms.

[ore 17.15] **Impact of microplastics on red corals (Corallium rubrum): a mesocosm experiment**

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Marine plastic pollution is a major environmental issue and the impact on marine life is a growing concern worldwide. The red corals, such as Corallium rubrum, are long-lived, slow-growing species, distributed throughout the Mediterranean Sea and adjacent Atlantic coasts, where can be found between 10 and 800 m depth. Corallium rubrum is a key species for the maintenance of the structural complexity of the Mediterranean habitats, and of their biodiversity and ecosystem functioning. In the present study we tested the hypothesis that microplastics can severely threat the functions of red corals, thus leading to habitat loss on affecting benthic ecosystem functioning. In particular, we performed a mesocosm experiment exposing Corallium rubrum colonies to different concentrations of the most common plastic polymers in marine environment, and assessed their responses in terms of feeding rate, mucus production, physical damage (% of damaged tissue), changes in terms of abundance and composition of microbial assemblages associated with the corals and in gene expression and DNA oxidative damage. In addition, we hypothesized that red corals can be impacted indirectly through the ingestion of prey, which in turn incorporates microplastics, with further implications on trophic webs. Overall, our findings highlight that microplastics can strongly affect Corallium rubrum, hampering a wide range of important functions for the maintenance of its health.
SESSIONE “ALPINE AQUATIC ECOSYSTEMS”

Giovedì 9 maggio 2019 ore 9.30-10.45, chair: Francesca Bona

[ore 9.30] Alpine stream ecosystems under increased influence of rock glaciers

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The present human-accelerated deglaciation is quickly leading mountain permafrost, shrinking at lower rates than glaciers, to have an increasing influence on alpine stream ecosystems. We present a research conducted in the European Alps (Solda valley), aimed at characterising the habitat and biota of streams fed by active rock glaciers, and appraise the hydroecological influence of this evident form of mountain permafrost along the river continuum. We compared rock glacial streams with groundwater- and glacier-fed streams in terms of physical and chemical habitat, benthic invertebrate community, and food web (stable isotope analysis). The rock glacial streams exhibited unique habitat settings, with stable channels and clear waters influenced by permafrost (constantly cold water <1.5°C, high electrical conductivity and high concentrations of major ions and trace elements). Benthic organic detritus, primary production and epilithic biomass exhibited values comparable to non-glacial streams. This abundance of autochthonous resources supported a food web comparable in terms of complexity to those of krenal and glacio-rhithral sites. The invertebrate community was comparable in terms of composition, abundance and diversity to that of non-glacial reaches, but included also cold-stenothermal species. Furthermore, intensive longitudinal surveys of habitat conditions undertaken to assess the glacial influence along the glacier-fed stream revealed a primary role exerted by the rock glacial tributary in shaping water parameters during late summer, revealing a major role of thawing permafrost along the river continuum. Thus, rock glacial streams can be considered as a unique alpine stream habitat, shaping the hydrochemistry, biodiversity and ecosystem functions in deglaciating catchments.

[ore 9.45] Effects of climate change and drying conditions on CPOM processing in alpine streams (NW Italy)

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Lotic ecosystems have been recognized as extremely sensitive to climate change, because of the rising of water temperatures and the disruption of hydrologic cycles. Among rivers, mountain streams are particularly fragile since highest rates of climate change are occurring above the treeline. The aim of
the study was to investigate the functional impact of droughts in three Alpine streams (Po, Pellice and Varaita - NW Italy), that are currently experiencing droughts during the summer season. In particular, using leaf litter bags of chestnut and oak we evaluated the CPOM degradation process in both perennial and recently intermittent reaches, by measuring the following: i) mass loss variations; ii) macroinvertebrate colonization patterns; iii) microbiota communities (fungi and bacteria) involved in the process. We hypothesized that the CPOM decomposition in sites with permanent flow would be driven by a relevant contribution of both macro- and micro-consumers. On the contrary, we expected that CPOM degradation in intermittent sites would be explained primarily by the role of microconsumers. With continued drought conditions and changing CPOM subsidies, the biodiversity, richness and density of colonizer communities could result in altered Alpine stream ecosystems.

**[ore 10.00] The role of confluences in shaping macroinvertebrate communities along the river continuum**

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Ecosystems processes and biodiversity in low order and constrained Alpine streams are usually thought to be affected by the up- to downstream gradient (i.e. the longitudinal connectivity between adjacent river sections), according to the River Continuum Concept (RCC). However, the growing attention on the river network perspective has led a several authors to reject the linear and predictable longitudinal changes of the RCC and support, instead, an idea of streams as discontinuum- or patchy-structured systems. In particular, one of the main criticisms to the RCC is that this theory does not consider the importance of natural discontinuities along a stream’s longitudinal gradient. For instance, confluences (i.e. the junction two intersecting rivers) are typically considered as highly heterogeneous zones in terms of substrate composition, water chemistry and energetic inputs, which support high levels of biodiversity and secondary production.

In this study quantitative samples of macroinvertebrates were collected in eight sites, located on the main stem of the Pellice stream (Northwestern Italy). The variation in the composition and diversity of macroinvertebrate communities was analyzed in relation to different variables, including the substrate composition, distance from the source and distance from the upstream confluence. Although our results generally corroborated the predictions of the RCC, we found that stream confluences significantly affected the taxonomic richness and the abundance of some selected functional feeding groups to a higher extent than the distance from the river source.

**[ore 10.15] Innovative methodology for the definition of "real time" Ecological Flow, within the assessment process for the release of hydropower withdrawal licenses in Aosta Valley (POSTER)**

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For the determination of minimum instream flow (MIF), today better defined as Ecological Flow (EF), hydropower (HP) plants must release from dams, Aosta Valley public administration is testing an innovative methodology to satisfy both electricity production environmental protection and landscape safeguard.
This methodology doesn’t establish a fixed MIF values to be released downstream each water diversion, but it uses the multi criteria analysis (MCA), already described in Vassoney et al. 2017, within the European Project SPARE, and gives the opportunity to define real time EF, calculated as variable percentages of natural flow rate upstream of the dam. This is possible because the methodology requires to hydropower companies to install and validate hydrological monitoring systems upstream and downstream their withdrawal points to considering watercourse natural discharge, withdrawn water amounts and flow releases. Discharge values are clearly displayed in real time at the withdrawal point, shared among HP plant managers, regional river authority and stakeholders and useable also for official controls. During technical meetings various EF scenarios are analyzed, proposed both by the HP company and different stakeholders coordinated by public Regional river authority. So far EF values have been often defined as monthly averages including MIF values and additional releases calculated as a percentage of the real time natural flow rate upstream the dam. These EF values follow with good approximation natural flow patterns of Alpine rivers and allow maintaining good environmental and hydro-morphological conditions, also in water bodies affected by withdrawals.

[10.20] Advancing tools for the assessment of ecological flow in rivers (POSTER)

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Alpine streams are widely affected by hydrological and morphological alteration caused by impoundments and water abstractions for hydropower generation. Flow management in Italian regulated rivers is based on minimum flow quantification according to the Ecological flow (EF) approach as defined by decree n. 30/STA, 13.02.2017. To include the EF approach to meet the Water Framework Directive (WFD, 2000/60/EC) requirements, in Italy the STAR_ICMi, based on benthos macroinvertebrate, is one of the biological index currently adopte (a multimetrix index). Several critics have been raised about the reliability of this method for application in alpine regions, based on its scarce effectiveness in measuring alterations of the flow regime. The purpose of the PhD project is to understand which alternative approach can effectively assess flow alterations of using the macroinvertebrate community. To propose a new index, we will: i) investigate the current existing methods that keep in account the relationship between the biota and the flow regime; ii) evaluate the most common models to identify factors that influence the response of the benthic communities to specific hydrological gradients. The final goal is to develop index/ices based on biological and hydrological data, both from field and monitoring programs, which are specifically sensitive to hydrological alterations, to determine and monitor ecological flows.

[10.25] Investigating the recovery of benthic communities after a supra-seasonal drought in two Alpine rivers (POSTER)

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Water scarcity is one of the most relevant threats for rivers around the world, given the combined effects of large-scale climatic factors (i.e. Global Change) and local-scale anthropogenic pressures (i.e.
water abstraction and damming) on water supplies. Also “historically perennial” watercourses, like Italian Alpine rivers, now are shifting from permanent to intermittent systems. For instance, in July 2017, due to a severe summer drought, the lower sections of the Pellice and Po rivers (North-western Italy) dried completely and the surface water resumed only at the beginning of January 2018. Here we present results on the recovery of stream macroinvertebrates in the Pellice and Po rivers after a supra-seasonal drought. From January to March 2018 a total of ten sampling sessions were carried out, following the rewetting phase, and the temporal patterns in diversity, density and taxonomic composition of benthic communities were investigated. Our results show significant differences between the two rivers: in the Pellice river the macroinvertebrates recovered over the time. On the contrary, we found that even after seventy-three days from the water return macroinvertebrate communities did not reach a full recovery in terms of composition and structure in the Po river. Given the increasing frequency of the hydrological extremes in rivers, including water scarcity, this study provides important information on the resilience of benthic communities to drought in Alpine rivers. This work was supported by the project PRIN Bando 2015 prot. 201572HW8F Progetto “No Acqua”.

[ore 10.30] Response of benthic invertebrate biomass to small- and large-scale factors in Alpine rivers (POSTER)

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Benthic invertebrates are a key component of the biodiversity of rivers as they colonize all the aquatic habitats associated to the riverine ecosystem. Moreover, acting as intermediate consumers, macroinvertebrates play a fundamental role in the energetic dynamics of rivers. For example, herbivorous and predaceous taxa exert an important top-down control on the primary producers and the populations of benthic organisms respectively, while shredders invertebrates are involved in the organic matter processing. At the same time, macroinvertebrates are the preferred food items for the higher trophic levels, including both aquatic and terrestrial species. As a consequence, the biomass of benthic invertebrates can be considered as a helpful indicator of the ecosystem functioning and integrity, and several authors recommend its adoption for river biomonitoring. However, this variable is still scarcely included in field studies and discrepancies on the results exist in literature because of the stream-specific differences. Here we present preliminary results on the relationship between the benthic invertebrate biomass and several environmental factors, including hydraulic conditions, basin-related characteristics, water chemistry and reach-scale factors. Data were collected during a large-scale survey (PRIN “No Acqua” project) encompassing 15 Alpine streams (Piemonte, Italy); this experimental design allowed us to evaluate the variability in biomass under natural conditions, avoiding the influence of river-specific conditions. Our results show that the biomass of macroinvertebrates in Alpine streams is strongly influenced by a combination of small-, reach- and large-scale factors, like the availability of organic matter, the composition of the invertebrate communities and the concentration of nutrient. This work was supported by the project PRIN Bando 2015 prot. 201572HW8F Progetto “No Acqua”.

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SESSIONE “ENVIRONMENTAL MONITORING AND CONSERVATION”
Giovedì 9 maggio ore 14.30-17, chairs: Alberto Doretto e Laura Gruppuso

[ore 14.30] Polystyrene microbeads’ uptake and toxicity in the freshwater model zebrafish (Danio rerio)

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One of the most discussed issue concerning microplastic contamination in the aquatic environment regards organisms’ uptake and its correlated effects. Several studies show a microplastic bioaccumulation in the digestive tract, while few ones underline a particles distribution in other tissues. Furthermore, microplastic uptake and related ecotoxicity are often investigated one by one, without providing a clear link between accumulation and biological effects. The present study aims to investigate the microplastics’ ingestion, tissue distribution and toxicity in the freshwater model zebrafish (Danio rerio). Embryos were exposed for 48 hours to polystyrene microbeads (PM) with a dimension of 0.5 μm. PM uptake and distribution were evaluated through the observation of embryos’ sections with confocal microscopy, while the potential ecotoxicological effects were assessed with a suite of biomarkers. Moreover, since microplastic mainly lead to sublethal effects on organisms, we decided to monitor the behaviour of embryos using the DanioVision videotrack system, performing a locomotor activity test in response to light-dark transitions. Imaging observations showed PM inside the gut and migrating outside the intestinal epithelium, and they provided the evidence of alternative uptake routes, such as fish lateral line (neuromasts) or respiratory system (gills). Biomarkers’ results suggested a slight toxicity of PM, specifically the induction of SOD activity and the inhibition of COX activity were the only significant effects. Exposure to PM did not significantly affect embryos’ locomotor activity. Such results could be due to the short exposure time and/or the selected endpoints. Additional studies will be addressed on the interaction between microplastics, associated contaminants and aquatic organisms.

[ore 14.45] Following the fate of microplastic along the Ticino River, Italy

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The Ticino river is known to be one of the cleanest and natural rivers in northern Italy. However, little is known about its microplastic (MP) pollution. Unlike marine MP pollution, freshwater studies are still few and studies on freshwater organism are very scarce. In this study we aim to identify and report the abundance, composition and fate of MPs along the Ticino river by sampling surface water (Neuston trawl, mesh size 0.06 and 0.28 mm), subtidal sediment (Van Veen grab), macroinvertebrates (kick-sampling method) and fish (Silurus glanis). Sampling sites are situated between Lago Maggiore and the estuary near the Po river and include sampling directly downstream of waste water treatment plant (WWTP) locations as potential main input of MP. By analysing the size, shape, abundance, distribution and polymer type (applying FT-IR spectroscopy) of the sampled microplastic the research will
contribute to the demonstration of predictable patterns in microplastic characteristics along the river. Therefore, we will be able to give indications on their origin and former use. Moreover, MP found in macrozoobenthos and Silurus glanis can be an indication of MP transfer within the foodweb. This study represents the first in Italy investigating the occurrence of MP over the length of a river, not only from water and sediment samples, but also related to biota. First results of MP concentration in sampled media will be presented in the conference. In addition to the implications of the results, also the applicability of the used sampling, extraction and analytical technique will be assessed.

[ore 15.00] **Seafood salad - only two ingredients needed: mussels and contaminants**

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In the past, the Flekkefjord’s fjord (Norway) suffered the inputs of several hazardous contaminants, including heavy metal, PCBs and PAHs, due anthropogenic and industrial activities. Previous monitoring studies revealed a dangerous contamination level, resulting in the inclusion of this fjord in the list of the 18 Norwegian sites of National interest for recovery. Therefore, in 2018 the municipality of Flekkefjord started a recovery action of this area, planning siphoning and dredging of bottom sediments. Despite the good intention of the recovery program, resuspension of sediments can happen, transferring contaminants to the water column. In order to monitor the consequences of the recovery operations, the present study was aimed at performing a biomonitoring survey of Flekkefjord’s fjord using *Mytilus edulis* as sentinel organism. Three sites were selected in the part of the fjord closest to the city (Byfjorden) and two in the outer part (Lafjord) as a reference site. Mussels were placed in Flekkefjorden just before the beginning of recovery survey and were sampled five times (from June to December) at two different depths (5 and 15 mt). Trends of different contaminant classes, including heavy metals, PCBs, PAHs, PBDEs, OCs and PFASs, were measured in mussel soft tissues through liquid chromatography-high resolution mass spectrometry (HPLC-HRMS) and a QuEChERS extraction followed by gas chromatography-tandem mass spectrometry (GC-MS/MS) methods. Results from the study showed the changes in contamination levels of the fjord and were useful to estimate the potential risk for human population of Flekkefjord due to seafood consuming.

[ore 15.15] **Zooplankton as a useful biomonitoring tool for organic pollutants: the case of sub-alpine Italian lakes**

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Zooplankton is a heterogenous group of organisms which differ in body size, metabolic rates and ecological roles but, as community, is fundamental for the transfer of matter and energy from the base to the upper levels of food webs. Also pollutants could be transferred along food chains and zooplankton is undoubtedly a key route for POPs biomagnification. Moreover, zooplankton reacts more rapidly to changes in POPs concentration in water than fish for their short life span and their fast equilibrium with water.

In this work we measured the concentrations of organochlorine compounds (DDT and PCBs) and perfluoroalkyl substances (PFASs) in crustacean communities of the main sub-alpine lakes (Maggiore,
Como, Iseo, Garda), compared them to highlight differences and evaluated the importance of zooplankton as a tool for biomonitoring. We sampled every season for 2 years (2017-2018) with plankton nets from surface layer to 20 m depth. Samples were divided for the analysis of the different compounds. The results show that there are differences between seasons and lakes for OCs compounds, and differences between lakes for PFASs. Zooplankton results as an important tool for biomonitoring of pelagic areas of lakes thanks for its ease of sampling and analysis and because could reflect changes in environment rapidly and in limited space.

[ore 16.00] **Trends of habitat suitability in the fen raft spider Dolomedes plantarius** (Clerck, 1757) (Araneae: Pisauridae) in the perspective of the update of the IUCN Red List assessment

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Wetlands are increasingly subjected to degradation, mostly due to human-driven changes in water regime, eutrophication and pollution. Human pressure on wetlands is considered the most important factor causing the decline of the great raft spider, *Dolomedes plantarius* (Clerck, 1757), a semi-aquatic spider closely associated with standing oligo-mesotrophic water. This Eurosiberian species is locally rare and declining over much of the range. Accordingly, several European countries considered this species threatened with extinction and mentioned it in Regional Red Lists or legal protection acts. In 1996, the species was classified as **Vulnerable** in the IUCN Red List of Threatened Species, but despite the increasing pressure on European wetlands, the assessment on the conservation status of *Dolomedes plantarius* has never been updated. Here we provide an updated frame of the existing knowledge on the distribution of this rare spider species throughout its geographic range, with a particular focus on the Italian populations. On this base, we modeled the potential present and future distribution via Ecological Niche Modeling by means of the newly developed R package **red - IUCN redlisting tools**, using both climate and land cover variables. On the basis of our results, we provide an estimation of the current and predicted Extent of Occurrence (EOO) and Area of Occupancy (AOO), paving the way towards the update of the IUCN status of this species.

[ore 16.15] **Trophic requirements and feeding rates of Mediterranean Cold-Water Corals (POSTER)**

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Cold-water coral ecosystems are hot spots of biodiversity and require special efforts of protection in the light of the increasing human pressure and global climate change. However, protection alone can be insufficient to reverse pervasive habitat degradation in the deep sea and restoration actions are urgently needed. Restoration of degraded deep-sea coral reefs can be based on transplantation of nubbins of cold-water corals (CWCs), following their maintenance in appropriate laboratory conditions. In the present study, food preferences of CWCs were investigated to establish the optimum feeding conditions to rear CWCs in captivity. To do so, colonies of *Desmophyllum pertusum*, *Madrepora oculata* and *Dendrophyllia cornigera* collected during different oceanographic campaigns were nourished in aquaria with 4 different food sources: nauplii of *Artemia salina*, the green algae
Tetraselmis, two species of rotifers (Brachionus plicatilis and B. rotundiformis) and frozen Mysis. A comparable total biomass from each food source was provided two times a week for D. pertusum and M. oculata and three times a week to D. cornigera. Our results reveal that Mysis followed by living Artemia are the preferred food items for all the coral species investigated and indicate that the maintenance of controlled environmental conditions and the provisioning of Mysis also during the transportation are essential factors for maintaining deep-sea corals in captivity.

[ore 16.20] Water characteristics before and after realization of a hydraulic structure for ecosystem restoration in the Valle di Gorino (POSTER)

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Eutrophication phenomena affects aquatic environments and begin with an excessive nutrient enrichment, which is unsustainable for the ecosystem. The decomposition processes of the exceeding organic matter determine an oxygen consumption which leads to the establishment of hypoxia and anoxia phenomena.

Water monitoring activities carried out within the project LIFE AGREE - coAstal laGoon long teRm management - LIFE13 NAT/IT/000115, before and after the construction of a hydraulic structure in the locality Traghetto, described the outcomes of ecological restoring efforts in the Valle di Gorino. Samplings were carried out in the Valle di Gorino and in the arm of the Po river (Po di Goro arm), that flows into the lagoon. The input of nitrates from the Po arm during autumn and winter periods influences the entire Valle di Gorino, while in spring and summer seasons this effect is not evident but subsists and probably exerts a conditioning effect of the trophic state of the lagoon and its evolution towards dystrophy.

The construction of a hydraulic structure in the locality Traghetto and the management control are strategic for the salinity regulation and ecological restoration of the lagoon.
SESSIONE “POPULATION ECOLOGY AND GENETICS”

Giovedì 9 maggio ore 16.45-17.30 chair: Alexandra Muresan


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Global change accelerates extinction rates dramatically and it poses an additional threat to water security. Wetlands are one of the most threatened ecosystems. In order to understand how water availability influences species distribution and habitat use, we used *Lycaena dispar* as model species because it i) is a hygrophilous butterfly species restricted to wetland habitats ii) is a threatened and protected species iii) lives in a mosaic of habitat dominated by rice paddy areas and iv) is an oligophagous species. We hypothesized that *L. dispar* distribution is influenced by water scarcity and that distinct generations show a different habitat use. We investigated the long-term survival of the species under water scarcity scenario keeping into account the effects of predicted changes in rice cultivation.

We chose two areas in the North-West Po river plain with different climatological characteristics and within each area, we identified four habitat types in function of water availability (rice paddy, rice paddy with canal, ecotonal site, natural spring sites) and randomly chose sampling transects (120 sites) within a 500x500m UTM cell grid. In order to understand which variables influence *L. dispar* distribution, we planned to use occupancy models using egg numbers to define *L. dispar* presence and hostplant, nectar density, vegetation structure, and water availability as covariates. We will endeavor to predict future butterfly distribution changes in relation to different climate scenarios (HadCM3; Mitchell, 2004) in a 1x1km UTM cell grid.

[ore 17.00] Genetic structure of *Phoxinus* spp. (Teleostei: Cyprinidae) in western Po River basin identified as locus typicus of *Phoxinus lumaireul* (Schinz, 1840)

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European minnows (*Phoxinus* spp.), a complex of at least 15 cyprinid fish species, have a wide distribution range covering entire Eurasia. Among these, *Phoxinus lumaireul* (Schinz, 1840) represents an endemic species of southern Europe populating north Adriatic basins. Its *locus typicus* is localised in Po River probably in its western plain part, where is recorded both in large lowland Po River tributaries and in cold alpine lakes. The aim of this study is to test if the distinct ecological features of *P. lumaireul* acted in shaping its genetic signature, especially at local scale. 158 minnows from 5 lowland rivers and 12 alpine high-altitude lakes were sampled in western Po River basin. Phylogenetic tree, minimum spanning network (MSN) and population genetic structure were analysed sequencing mitochondrial DNA cytochrome oxidase I (COI). Preliminary results reported few widespread haplotypes shared in both lowland and alpine lakes, while three haplotypes resulted exclusively in an Alpine lake (Viana Lake). Through the phylogenetic tree reconstruction, two exotic species were
detected in six alpine lakes, evidencing potential phenomena of translocation from a contiguous minnow species (*P. septimaniae*), native to the Mediterranean France basins, and from *P. csikii* widespread in central European and in the southern Balkan basins flowing into North Sea and Black Sea, respectively.

Comitato Organizzatore

Stefano Fenoglio, Dipartimento di Scienze e Innovazione Tecnologica, Università del Piemonte Orientale.
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