

3rd European Pond Conservation Network Workshop

Abstract Book

València, 14th to 16th May 2008

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- EUROPEAN POND CONSERVATION NETWORK

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- LIFE-Nature project “Restoration of Priority Habitat for Amphibians (LIFE05/NAT/E/00060).
- Ajuntament de València
- VAERSA
- TRAGSA

The organization of this workshop in an action included on the LIFE-Nature project “Restoration of Priority Habitats for Amphibians” (LIFE05/NAT/E/00060).

TECHNIQUE SECRETARY



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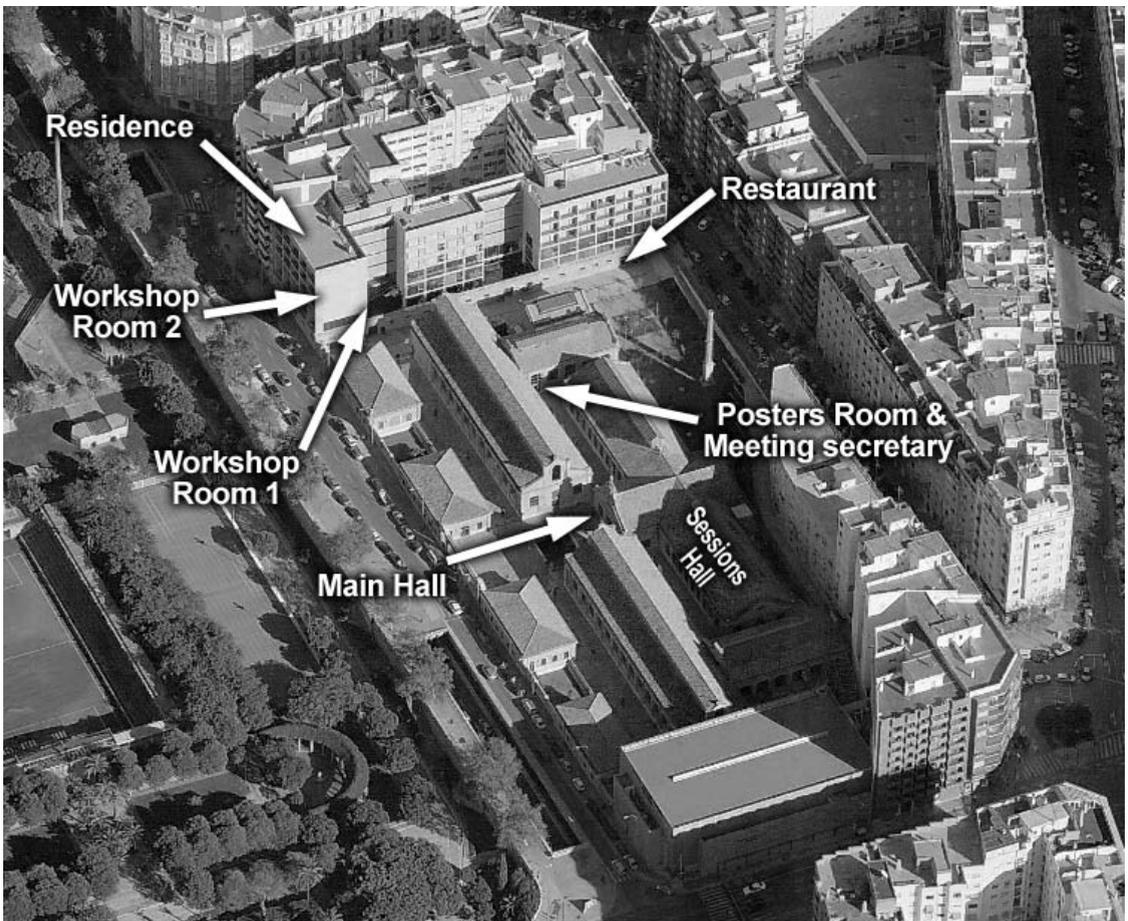
1 GENERAL INFORMATION

Welcome to the 3rd Workshop of the European Pond Conservation Network (EPCN). EPCN meetings provide opportunity to learn about and discuss science, education, and management issues related to ponds throughout Europe. Contributions are expected to yield a multi-disciplinary framework on how to maintain ponds and the biodiversity they host, in a landscape subjected to a wide array of potential stressors such as intensification/abandonment of agriculture, socio-economical pressures, climate change.

The official language of the workshop is English.

1.1 Meeting Site

The workshop (and also the lunches and coffee breaks) will take place at the SPORTS-CULTURAL COMPLEX "LA PETXINA", Paseo de la Petxina, 42; 46008 Valencia (Spain), an ancient slaughterhouse, recently restored and lodging today a Cultural and Sports Center close to the Turia river bed (see map in the web).



(Aerial photo provided for Microsoft Virtual Earth. <http://maps.live.com/>)

1.2 Registration

Reception of participants and documentation delivery will be held at the Posters Room during Tuesday 13th afternoon and Wednesday 14th morning. Meeting secretary will be open in the same place from 08'00 h to 18'00 h along the workshop.

Registration will go on the following day (Wednesday 14th morning) in the Posters Room. Participants will receive their delegate packs when they will be registered.

1.3 Badge

The personal badge you will receive is your entrance ticket to all conference sessions and coffee breaks – remember to wear it during the workshop period.

1.4 Meals

Registration fee includes coffee breaks (from Wednesday 14th to Thursday 15th), closing dinner (Thursday 15th), and Field Trip and meals (Friday 16th). Anyhow you need to inscribe for field trip and closing dinner at the reception if you are interested on.

Lunch of Wednesday 14th and Thursday 15th are not included in the Registration fee. You can get the tickets for it (7,4 €) at the Meeting Secretary. Lunches will be served at the La Petxina Residence Restaurant, nearby the meeting room.

1.5 Internet via wifi

Attendants can get internet access asking for Residence La Petxina Staff. The prices are 1 €/hour or 5 €/24 h.

2 PROGRAMME

TUESDAY 13th MAY

16:00-20:00 Inscription, Accommodation and fixation of Posters

WEDNESDAY 14th MAY

08:00-09:00 Inscription, Accommodation and fixation of Posters

09:00-09:20 Words of wellcome. EPCN Presentation

09:20-10:00 **1st Keynote Conference. John Downing**

Little things mean a lot: the emerging role of small lakes and ponds in the global carbon cycle

TOPIC 1a. Management and Conservation in Practice

Chairmen: Andrew Hull and Nicola Indermuehle

10:00-10:20 **Antonio Camacho, César Borja, María Sahuquillo, Juan Miguel Soria and Eugenio Rico**

Coordinating the Habitats Directive and the Water Framework Directive with focus on the monitoring of the conservation status: The case of Spanish inland ponds

10:20-10:40 **Lionel Sager**

The M-TIP: a Macrophyte based Trophic Index for Ponds

10:40-11:00 **Thomas Kalettka, Gert Berger, Holger Pfeffer, Christin Schütz and Ralf Dannowski**

Effects of management and conservation measures on hydroperiod and water quality of kettle holes with respect to habitat suitability for amphibians

11:00-11:30 **COFFEE BREAK**

11:30-11:50 **Rob Briers, Fiona Culhane and Jill Lancaster**

Long-term changes in invertebrate communities of urban drainage ponds

11:50-12:10 **Nathalie Menetrey and Beat Oertli**

A new multimetric index to assess the ecological status of ponds

12:10-12:30 **Jesús Casas, Santiago Bonachela, M^a Antonia Elorrieta, Francisca Fuentes, Irene Gallego, Emilio González, Melchor Juan, David León, Enrique López, Mariano Paracuellos, Patricio Peñalver, Carmen Pérez, Pedro Sánchez, M^a Dolores Suárez and Julia Toja**

Biodiversity and management of farm ponds in Andalusia (southern Spain): a project presentation

- 12:30-12:50 **Anatoly Peretyatko, Samuel Teissier, Sylvia de Backer and Ludwig Teissier**
Restoration potential of biomanipulation for eutrophic urban ponds
- 12:50-13:10 **Ronald Zollinger and Wilbert Bosman**
LIFE AMBITION - Amphibian Biotope Improvement in the Netherlands
- 13:10-15:10 **LUNCH**
-

TOPIC 1b. Management and Conservation in Practice

Chairmen: Beat Oertli and Régis Céréghino

- 15:10-15:30 **Wilbert Bosman and Ronald Zollinger**
Conservation of the common spadefoot (*Pelobates fuscus*) in the Netherlands: just digging ponds is not enough!
- 15:30-15:50 **Beat Oertli, Sandrine Angélibert and Nicola Indermuehle**
Surrogate for rapid assessment of pond biodiversity: who better than Frogs?
- 15:50-16:10 **Nicola Indermuehle, Sandrine Angélibert, Veronique Rosset and Beat Oertli**
Pond Biodiversity Index ("IBEM"): a new tool for the rapid assessment of biological quality in ponds
- 16:10-16:30 **Pascale Nicolet, Penny Williams and Jeremy Biggs**
Ponds creation on aggregate extraction sites
- 16:30-16:50 **Albert Ruhí, Dani Boix, Jordi Sala and Stéphanie Gascón**
Pioneer macroinvertebrate assemblages in newly created ponds
- 16:50-18:00 **COFFEE BREAK+POSTER SESSION**
- 18:00-18:20 **Dr. Andrew Hull**
Amphibians: A Surrogate Taxa for Pond Conservation?
- 18:20-18:40 **Lucena P., Pardo I., Gascón S., Sala J., Boix D. and Quintana X.**
Relation between environmental factors and crustacean assemblages of coastal water bodies from mainland and islands in the Mediterranean region
- 18:40-19:00 **Liesbet Boven, Els De Roeck, Ann Hulsman, Bram Vanschoenwinkel and Luc Brendonck**
Distribution of large branchiopods in Kiskunság (Hungary) in relation to local habitat and spatial factors and implications for their conservation
-

TOPIC 2a. Pond ecology at different spatial scales

Chairmen: Rosa Miracle and Antonio Camacho

- 19:00-19:20 **Compte J., Brucet S., Gascón E., Boix D., Sala J., López-Flores R., and Quintana X.D.**
Feeding behaviour of different developmental stages of *Daphnia magna* in wastewater conditions
- 19:20-19:40 **Jochen Vandekerkhove, Tadeusz Namiotko, Giampaolo Rossetti, Maria Joao Fernandes Martins, Francesc Mezquita, Olivier Schmit, Roger K. Butlin, Isa Schön and Koen Martens**
Sex and stochasticity: insights from the geographic parthenogen *Eucypris virens* (Ostracoda)
- 19:40-20:00 **F. Arthaud, J. Robin, G. Bornette and D. Vallod**
The structural features of phytoplankton communities in ponds
- 20:00-20:20 **Frédéric Arnaboldi**
A handbook for the management of woodland ponds

THURSDAY 15th MAY

- 09:00-09:40 **2nd Keynote Conference. Luc Brendonck, Bram Vanschoenwinkel, Ann Hulsmans and Merlijn Jocqué**
Living "on the rocks"
- 09:40-10:00 **A. Wezel, M. Flandin, V. Rosset, J. Robin, B. Oertli, S. Angélibert and D. Vallod**
Influence of pond fisheries and agricultural practices on biodiversity in the Dombes region, France
- 10:00-10:20 **Milan Novikmec, Marek Svitok, Dana Fidlerová, Zuzana Hladeková, Alica Troppová and Peter Bitušik**
Benthic communities of alpine ponds in period of recovery after acidification stress
- 10:20-10:40 **Véronique Rosset and Beat Oertli**
Generalized additive models as a tool for predicting local pond diversity response to climate warming
- 10:40-11:00 **Marek Svitok, Igor Kme, Eva Michalková and Peter Bitušik**
Macroinvertebrate assemblages of flooded coal mine subsidences: spatial and temporal variability
- 11:00-11:30 **COFFEE BREAK**

TOPIC 2b. Pond ecology at different spatial scales

Chairmen: Dani Boix and Jeremy Biggs

- 11:30-11:50 **Jeremy Biggs, Penny Williams and Pascale Nicolet**
The role of ponds in providing ecosystem services
- 11:50-12:10 **Olafsson, J. S., Ingimundardottir, G. V. and Sigurdardottir, S. G.**
Macroinvertebrate assemblage in lava formed ponds in NE Iceland
- 12:10-12:30 **Christopher Hassall, Jim Hollinshead and Andrew P. Hull**
Odonata and climate change in pond landscape of north west England
- 12:30-12:50 **Natalia Kuczynska-Kippen and Tomasz Joniak**
Spatial differentiation of physical-chemical parameters and its impact on zooplankton community structure in two types of small water bodies
- 12:50-13:10 **Gianmaria Carchini, Flavia Chiarotti and Federica La Casella**
Relationships between morphological characters and fitness components in three close populations of *Lestes barbarus* (Odonata: Lestidae)
- 13:10-15:10 **LUNCH**
-

TOPIC 3. Temporary ponds

Chairmen: Pascale Nicolet and Olivier Scher

- 15:10-15:30 **Maria Rosa Miracle, Maria Sahuquillo, Keve Kiss, Sara Morata and Eduardo Vicente**
Temporary ponds of Eastern Spain: Limnological typology and human impact
- 15:30-15:50 **Aline Waterkeyn, Patrick Grillas and Luc Brendonck**
Impacts of salinity and hydrology on invertebrate communities in Mediterranean temporary wetlands
- 15:50-16:10 **K. Fahd, A. Arechederra, D. León, M. Florencio and L. Serrano**
Micro-crustaceans of temporary ponds in the Doñana Natural Area (SW Spain): a four-decade record (1964-2007)
- 16:10-16:30 **Díaz-Paniagua, C., Fernández-Zamudio, R., Florencio, M., García-Murillo, P., Gómez-Rodríguez, C., Portheault, A., Serrano, L. and Siljestrom, P.**
Temporary ponds in the Doñana National Park (SW Spain): their role in the conservation of flora and fauna
- 16:30-16:50 **Bagella S., Gascón S., Caria M. C., Sala J., Mariani M. A. and Boix D.**
Identifying key environmental factors related to crustacean and macrophyte assemblages in Mediterranean temporary ponds

16:50-17:10 **Ferchichi H., Daoud-Bouattour A., Gammar-Ghrabi Z., Gammar A.M., Grillas P., Karray M. R., Muller S.D., Rhazi L., Souliemarsche I. and Ben Saad-Limam S.**

Temporary ponds of northern Tunisia: a contribution to the assessment of a new hotspot for plant diversity in the Mediterranean basin

17:10-18:00 **COFFEE BREAK+POSTER SESSION**

18:00-19:00 **WORKSHOPS**

1. *Pond management success stories*
 2. *Linking pond management to scientific knowledge*
 3. *Conservation of habitats for amphibians*
-

19:00-19:40 **3rd Keynote Conference. Mario García-Paris**

Role of Mediterranean ponds preserving high levels of genetic diversity in amphibians

19:40-21:00 EPCN Meeting. Conclusions of the Workshop

21:00-23:00 **Closing Dinner**

23:00-..... Party Night

FRIDAY 16th MAY

08:30 Field trip, visiting some restored ponds, and including boat trip in the Albufera lake and lunch in a typical restaurant of l'Albufera Natural Park

3 INFORMATION FOR ORAL AND POSTER PRESENTATIONS

3.1 Topics

Oral and poster presentations relate to the following topics:

Topic 1. Management and conservation in practice

- Tools, good practices & strategies.
- Inventory of ponds.
- Gaps in fundamental knowledge: questions to fundamental research.
- Social & economic value of ponds, ecosystem services.
- Amphibians, dragonflies or aquatic plants: surrogate taxa in pond conservation?

Topic 2. Pond ecology at different spatial scales

- Parameter selection and multimetric approaches for pond classifications.
- Role of ponds in the landscape.
- Evolutionary and functional ecology of the pond biota.
- Responses to local-global change (from local practices to climate change, changes over time).

Topic 3. Temporary ponds

- Ecology and biodiversity of Mediterranean ponds.
- Threats and responses to disturbance.
- Management-oriented research on temporary ponds.

3.2 Oral communications

The Oral communications will extend for a maximum of 15 minutes each, and 5 additional minutes for dialog. All sessions will be moderated by a Chairman, who can modify Schedule if necessary.

Organization suggest to include a Power Point presentation, in all cases compatible with Microsoft Power Point 2002 (please, if you use a later version, mind export to MPP 2002).

3.3 Poster presentations

There will be two Poster Sessions on Wednesday 14th May and Thursday 15th May in the Poster Room in La Petxina Complex.

- The maximum width for each poster is 100 cm. The maximum poster high is 120 cm. But, we suggest the standard format A0 (841x1189 mm).
- Posters should be easily legible from a viewing distance of 1 m. The title should be at least 2 cm high, with the smallest lettering no less than 0.8 cm high.

- Use an easy-to-read font (Arial, Times New Roman, Verdana or Futura are the more commonly used).
- Underline the author who presents the poster.
- You may wish to prepare at least 20 A4 copies of your poster, making it easier for interested colleagues to read.

4 WORKING GROUPS

In addition to spoken papers and posters at the meeting, there will be three workshops:

4.1 Workshop 1. Pond management success stories

Facilitator: Andrew Hull

Contact: a.p.hull@ljmu.ac.uk

The aim of the workshop is to understand how we measure 'success'. Clearly, **enhancing biodiversity** is a key measure of success but others include:

- Raising awareness and environmental education
- Landscape restoration and design
- Ecological networks
- Involving local communities
- Demonstration projects
- Changing legislation
- ...and many others!

The workshop will be encouraging delegates to 'bring along' success stories at a variety of scales within their particular country/region/locality. This can be in the form of leaflets or perhaps 2-3 slides. The facilitator can be contacted prior to the meeting regarding suitability.

Following the workshop, success stories will be posted on the EPCN website and will also be submitted for inclusion on the RAMSAR website. A long-term working group will be established to consider and include other case studies when they become available for inclusion on both websites.

4.2 Workshop 2. Linking pond management to scientific knowledge

Facilitator: Olivier Scher

Contact: mares@maisondelenvironnement.org

The aim of the workshop is to create a better link between scientists and practitioners to improve the evidence base for pond conservation and management.

Much knowledge on pond management is held by practitioners working "on the ground" and this is not often published or available for others to learn from. On the

other hand, there is relatively little scientific research on pond management, or monitoring to assess the result of management activities.

Scientists and practitioners would both benefit from sharing best practice experiences and knowledge. In this workshop, we will discuss and identify the key issues to develop pond management practices based on a sound scientific basis.

One of the main questions to try and answer during this workshop is:

"How would you improve the flow of information between management and research?"

The workshop findings will be posted on the EPCN website after the meeting.

4.3 Workshop 3. Conservation of habitats for amphibians

Facilitator: Ignacio Lacomba

Contact: lacomba_ign@gva.es

One of the main targets of the LIFE project "Restoration of Priority Habitats for Amphibians" is the implementation of standard techniques of restoration, conservation and management of water bodies to benefit the conservation of amphibians.

The aim of the workshop is to share experiences developed in different areas and discuss actions and techniques that can be applied for conservation and restoration in different typology of water bodies to benefit species with diverse environmental requests.

Although this workshop is quite related to the other two, is specifically directed to the conservation of amphibians.

Some topics to include can be:

- Compatibility of amphibians diversity and traditional ponds use (mainly cattle).
- Experiences (conservation and restoration) developed in different typology of water bodies.
- Experiences of amphibian terrestrial habitats conservation and management.
- Recovery or action plans of amphibians.
- Applied techniques of restoration.

The participants to this workshop may bring or send some material as photos, schemes or short texts. The results and conclusions of the workshop will be posted on the LIFE website after the meeting.

5 ABSTRACTS

5.1 Keynote conferences

Title: Little things mean a lot: the emerging role of small lakes and ponds in the global carbon cycle

Authors: John Downing

E-mail: downing@iastate.edu

Abstract: Until recently, small continental waters have been completely ignored in virtually all global processes and cycles. This has resulted from the neglect of these systems and processes by ecologists and the assumption that ecosystems with a small areal extent cannot play a major role in global processes. Recent inventories based on modern geographical and mathematical approaches have shown that continental waters occupy nearly twice as much area as was previously believed. Further, these inventories have shown that small water bodies dominate the areal extent of continental waters, correcting a century-long misconception that large lakes are most important. The global importance of any ecosystem type in a process or cycle is the product of the areal extent and the intensity of the process in those ecosystems. Several analyses have shown the disproportionately great intensity of many processes in small, aquatic ecosystems, indicating that they play an unexpectedly major role in global cycles. Assessments of the global carbon cycle underscore the need for aquatic scientists to view their work on a global scale in order to respond to the Earth's most pressing environmental problems.

Title: Living “on the rocks”

Authors: Luc Brendonck, Bram Vanschoenwinkel, Ann Hulsmans and Merlijn Jocqué

E-mail: luc.brendonck@bio.kuleuven.be

Abstract: Temporary freshwater rock pools not only usually house a peculiar fauna; they are also ideal model systems to study ecological and evolutionary processes. In (semi-) arid regions the unpredictable and often limiting rainfall events impose serious time stress on mainly the macroscopic permanent inhabitants, requiring special adaptations not only to bridge the dry periods, but also to make proper use of the often short time suitable for growth and reproduction. The hydroregime (hydroperiod and its variance) is also expected to have a structuring role on diversity at both the level of populations and communities. We herewith summarize our results of more than 15 years of research on temporary rock pools in southern Africa, focusing on anostracans for the specific adaptations and diversity patterns at the level of populations and the invertebrates at the community level. At both levels, we tried to explain observed patterns by disentangling the impact of local and

regional processes in structuring rock pool biodiversity. We made use of a simple hydrological model to reconstruct and simulate rock pool hydroregimes based on long term climate data.

The conditional, quick and partial hatching, early maturation and relatively high fecundity allow rock pool anostracans to build up often vast egg banks that buffer against demographic catastrophes. Besides dispersal in time (diapause) permanent inhabitants in general also disperse in considerable quantities by overflow connections and wind. The resulting population genetic pattern is one of isolation by distance up to about 50 m, above which patterns become rather random. Due to time constraints in ephemeral rock pools, community development is truncated and transition of species is rarely observed. Although situated close to each other, communities in a rock pool metacommunity often reveal a distinct geographical pattern. Local abiotic factors were dominant over spatial ones in explaining community structure and both were acting independently. Of different metacommunity perspectives, a combination of species sorting and mass effects best explained the observed patterns. We demonstrated that both hydroregime and habitat size had unique and shared effects on temporary pool biota and that these effects depended on the dispersal mode of the considered taxa.

Title: Role of Mediterranean ponds preserving high levels of genetic diversity in amphibians

Authors: Mario García-Paris

E-mail: mcnp505@mncn.csic.es

Abstract: Mediterranean landscapes have been shaped and transformed by human use through centuries. Agricultural practices, livestock and human settlements deeply influenced habitat availability and modified the spatial distribution of species. This appears to be particularly evident for aquatic taxa, since water availability changed through time as a direct consequence of human activities. Measuring the impact of these changes through time requires long term data series which are not easily obtainable. An indirect measurement of the impact of changing agricultural practices on Biodiversity can be obtained comparing levels of genetic diversity in a historical perspective.

In this talk I will present large scale phylogeographic data for western Mediterranean amphibians, exemplifying diverse levels of ancient and recent genetic structure. Over this baseline I will discuss the results of a few studies on the genetic structure of local populations based on microsatellite data. One of the obvious outcomes when comparing large scale and local genetic approaches is the key relevance of each isolated pond for the maintenance of levels of genetic diversity.

Ancient Mediterranean agricultural practices required the creation and maintenance of irrigation systems and cattle drinking reservoirs, mostly man made ponds, which held water for long periods of time, and that were used extensively by amphibians. Unpredictability of water availability in Mediterranean climates was overcome by amphibians by using particular reproductive strategies which ensured success independently of water shortage (natural or human mediated), including multiple

metamorphic cohorts per year (*Pelophylax*), or the coexistence of diverse developmental strategies in a single population (*Alytes*). Genetic structure of species which use man-made ponds does not differ significantly from that of species which seldom use them, suggesting that for amphibians, Mediterranean man-made ponds can be considered as relevant as natural ponds for preserving their historical genetic diversity. However, recent changes in agricultural practices, including water management and use of pesticides, herbicides and fertilizers, are challenging the persistence of any kind of suitable ponds. The loss of genetic diversity consequence of those changes is one of the multiple challenges affecting amphibian diversity around the world. A diversity that largely exceeds taxic diversity counts.

5.2 Oral Communications

5.2.1 Management and conservation in practice

Title: Coordinating the Habitats Directive and the Water Framework Directive with focus on the monitoring of the conservation status: The case of Spanish inland ponds

Authors: Antonio Camacho, César Borja, María Sahuquillo, Juan Miguel Soria and Eugenio Rico

E-mail: antonio.camacho@uv.es

Abstract: Two European Directives, the Water Framework Directive (WFD, 2000/60/CE) and the Habitats Directive (92/43/CEE) focus, with respect to aquatic ecosystems, on the achievement of a good ecological status of waterbodies. However, their approaches are different, and conservation managers have difficulties to make compatible some biases, that each Directive introduces, when trying to approach to the concept of good ecological status. Since at least in Spain, resources devoted to monitoring by the implementation of the WFD will be bigger than those of the Habitats Directive (which have many other types of habitats to cover), the optimization of monitoring resources requires a complementary development of the implementation of both EU Directives.

With focus on Spanish inland ponds, we have developed a system of evaluation of the ecological status of these ponds that accomplishes the requirements of both Directives. This system will be adopted by the Conservation Department of the Spanish Ministry of Environment. In this communication we present this system of equivalence of ecological typologies between both Directives as well as an evaluation system that will allow Spanish ponds to have similar criteria with respect of the evaluation of their ecological status regardless of which of these Directives is applied.

Keywords: Ponds, Conservation, WFD, Habitats Directive, Ecological status, Typologies

Title: The M-TIP: a Macrophyte based Trophic Index for Ponds

Authors: Lionel Sager

E-mail: lionel.sager@leba.unige.ch

Abstract: In Swiss ponds, eutrophication represents one of the major threats to the sustainability of biodiversity. Therefore, a biological method to assess the trophic state would be useful for monitoring purpose. Macrophytes have already been successfully used to evaluate the trophic state of rivers and lakes. Considering their potential of colonization and their roles in ponds structure and functioning, macrophytes should be included in any assessment methods as required by the European Water Framework Directive.

Vegetation survey and water quality data of 114 permanent ponds throughout Switzerland permit to define indicator values of 113 species including 47 with well defined ecological amplitudes for total phosphorus in the water. Using indicator values, amplitudes and cover of species, a Macrophyte Trophic Index for Ponds (M-TIP) was computed by site and assessed with the original dataset and a limited validation dataset. The resulting index performs better when considering only species with narrow amplitude while it is more applicable but less accurate when including all species. Despite these limitations, the M-TIP is a valuable and easy tool to define and monitor the trophic state of Swiss ponds and was shown to be reproducible and sensitive to slight changes in phosphorus loading with a validation subset.

Keywords: eutrophication, phosphorus, bioindication, water quality, Switzerland

Title: Effects of management and conservation measures on hydroperiod and water quality of kettle holes with respect to habitat suitability for amphibians

Authors: Thomas Kalettka, Gert Berger, Holger Pfeffer, Christin Schütz and Ralf Dannowski

E-mail: tkalettka@zalf.de

Abstract: Kettle holes are glacially created ponds in young moraine regions. They are important habitats for amphibians, but often impaired by intensive land use. The objective is the characterisation of management and conservation measure effects (mud clearance, buffer strips, change of land use) on hydroperiod and water quality of kettle holes with respect to habitat suitability for amphibians. Infield kettle holes with and without measures have been investigated compared with kettle holes in grassland and forest. 40% of 67 kettle holes did not achieve the minimum flooding duration (July 15), which is necessary for reproduction of amphibian species. Mud clearance of 10 kettle holes has a distinct effect on extension of flooding duration.

Values of O₂, pH, NH₃, NO₂ and heavy metals partly exceed quality limits, especially at infield kettle holes, indicating potential toxic effects on amphibians. In tendency, water quality is improved by each measure alone, combination has the best effect.

Restoration by mud clearance causes higher abundances of larvae and adults of great crested newt (*Triturus cristatus*) correlating with improvement of oxygen availability. Despite of that finding some larvae tolerate lethal oxygen concentrations <2,0 mg/l for fishes over weeks, obviously by early change of respiration from gill to lung.

Keywords: kettle holes, amphibians, hydroperiod, water quality, conservation measures

Title: Long-term changes in invertebrate communities of urban drainage ponds

Authors: Rob Briers, Fiona Culhane and Jill Lancaster

E-mail: r.briers@napier.ac.uk

Abstract: Sustainable Urban Drainage Systems (SUDS) are an increasingly important tool in the treatment of urban drainage, both to treat diffuse pollution and to attenuate pulses of storm water into rivers and other water courses. The ponds constructed as part of SUDS offer potential to support and enhance freshwater biodiversity in urban areas, but the value of the communities supported in SUDS ponds is not well established. Here we report on a longterm study of the macroinvertebrate communities of a series of SUDS ponds which were constructed in 1999 as part of a major development in Dunfermline, Scotland. Invertebrate communities developed rapidly and showed significant temporal change in composition.

Diversity was relatively low and the invasive mollusc *Potamopyrgus antipodarum* was found at very high density in some sites. Community composition was related to levels and variability of nutrients, particularly nitrate, along with dissolved oxygen. The contribution of SUDS ponds to freshwater biodiversity may be limited by the high and temporally variable physico-chemical conditions, as well as invasive species imported with vegetation.

Keywords: biodiversity, management, urban drainage, constructed wetlands

Title: A new multimetric index to assess the ecological status of ponds

Authors: Nathalie Menetrey and Beat Oertli

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Abstract: We propose a biological method to assess the ecological status of small water bodies. Our previous studies demonstrated that metrics linked to macroinvertebrate and amphibian diversity (species or families richness) and to biological/ecological traits were relevant for describing the level of eutrophication. This study focuses on the ecological status of ponds, as reflected by: (1) anthropic stressors linked to land use (natural areas within a radius of 50 m, connectivity, agricultural activities and pastures in the wider catchment, and inhabited areas); (2) descriptor of plant communities (macrophyte species richness); and (3) chemical

measures of nutrients (phosphorus and nitrogen). We investigated the relationships between candidate metrics and site degradation.

A total of 50 candidate metrics were tested including new metrics such as the combined Ephemeroptera, Trichoptera and Odonata family richness (ETO), conservation values or IBEM (the new Swiss pond Biodiversity index). For lowland ponds, the most relevant metrics to distinguish between reference and degraded sites were: Ephemeroptera species richness, macroinvertebrate family richness, EPT (Ephemeroptera, Plecoptera, Trichoptera) family richness, conservation value of Coleoptera and the IBEM. Various metrics combinations have been tested and subsequently the most suitable were integrated into a final index. Finally, this index has been calibrated with independent data to confirm its suitability in and outside Switzerland.

Keywords: macroinvertebrates, bioassessment, small waterbodies, Water Framework Directive, human impact

Title: Biodiversity and management of farm ponds in Andalusia (southern Spain): a project presentation

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Abstract: The Mediterranean climate of Andalusia and its traditional farming activities have determined the proliferation of farm water storages (dams or ponds). Pond construction has exponentially increased after the great agricultural intensification over the last four decades. An inventory carried out by the regional environmental protection agency (CMA) has recorded more than 16,500 water storages with individual surface area >700 m², of diverse types according to the high diversity of farming productive systems in the region. Dams in small streams and off-stream excavations dominate in extensive farming systems, and artificial substrate ponds made of concrete or made waterproof with polyethylene dominate in the more intensive systems.

From 2007 the CMA, through the public company EGMASA, has financed a project aimed to investigate biodiversity and management practices of ponds in Andalusia. The main objectives of this project are: 1) develop and extensive survey to provide baseline data on biodiversity, physico-chemical characteristics, and management practices of the diverse pond types in the region, 2) identify ponds of high biodiversity value to provide the basis for a regional monitoring network of pond conservation, and 3) provide guidelines of good pond management and construction to improve agricultural and environmental functions of these water bodies.

Keywords: ponds, biodiversity, management, Andalusia

Title: Restoration potential of biomanipulation for eutrophic urban ponds

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Abstract: Forty Brussels ponds have been studied between 2002-2007. All the ponds studied turned out to be eutrophic to hypereutrophic (mean TP>100 µg/L). Phytoplankton biomass covered the range from oligotrophic to hypereutrophic conditions, suggesting that other factors than nutrients were responsible for phytoplankton control. Zooplankton community structure and presence of submerged vegetation determined the phytoplankton biomass level and subsequently the ecological quality of a pond. This implied good potential for pond restoration through trophic structure manipulation. Ten ponds prone to the development of high phytoplankton biomass were biomanipulated (fish removal).

The continuous monitoring of these ponds allowed the effects of such biomanipulation on phytoplankton, zooplankton, submerged vegetation and ecological status to be assessed. Fish removal was sufficient to trigger a shift from the turbid to the clearwater state owing to increased zooplankton grazing and submerged vegetation growth. The size of large cladocerans, the most important grazers, appeared to be more important than their number. In the presence of fish, zooplankton was large enough for efficient phytoplankton control only in vegetated ponds providing of refugia from predation. Dense stands of submerged macrophytes could keep phytoplankton biomass low even at very low densities and small size of large cladocerans.

Keywords: Biomanipulation, fish, large cladocerans, macrophyte

Title: LIFE AMBITION - Amphibian Biotope Improvement in the Netherlands

Authors: Ronald Zollinger and Wilbert Bosman

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Abstract: In 2004 the pond conservation project "LIFE AMBITION" was started in the Netherlands. It's main objective is to develop viable meta-populations of five amphibian species named on Annex II (and Annex IV) of the Habitats Directive which will be achieved through restoration and improvement of habitats. These species are also on the national Red List: Great crested newt (*Triturus cristatus*) (vulnerable), Yellow-bellied toad (*Bombina variegata*) (severely threatened), Midwife toad (*Alytes obstetricans*) (vulnerable), European tree frog (*Hyla arborea*) (threatened) and Common spadefoot (*Pelobates fuscus*) (threatened).

During the years 2004 to 2008 the restorations and development of ponds has been carried out. At the start of the project a monitoring took place and this year the first results were gathered of how these measures effected the amphibian populations. Especially, the recovery of a tree frog population in the eastern part of the Netherlands will be discussed.

See also www.life-ambition.com.

Keywords: LIFE amphibians conservation

Title: Conservation of the common spadefoot (*Pelobates fuscus*) in the Netherlands: just digging ponds is not enough!

Authors: Willbert Bosman and Ronald Zollinger

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Abstract: In the Netherlands the common spadefoot reaches the eastern border of its distribution in Europe. The last 15 years the number of populations in the Netherlands has decreased. What are solutions to stop this decline? The presentation gives an overview of methods to manage the habitat, both aquatic and terrestrial of *Pelobates fuscus*.

Keywords: Decline, habitat management, *Pelobates fuscus*

Title: Surrogate for rapid assessment of pond biodiversity: who better than Frogs?

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Abstract: For pond conservation, Amphibians are probably one of the most used taxonomic groups. Regardless of their utility as flagship species, is there evidence to use them as surrogates for the rapid assessment of biodiversity? Previous investigations on pond biodiversity surrogates tend to show that a single group approach can be counterproductive for conservation planning. Nevertheless these studies seldom included Amphibians. We studied taxon congruency in about hundred ponds in Switzerland, with 5 contrasted groups (vegetation V, Gastropoda G, Coleoptera C, Odonata O, Amphibians A). We first used a classical approach of testing correlations across the different species richness.

Gastropoda and Odonata were evidenced as the best surrogate groups. In a second step, we simulated the use of 30 different combinations with the 5 groups for a biodiversity assessment (PLOCH method). Single group assessment resulted in more than 60% of wrong evaluations. Best combinations were VGCA and GCOA (including Amphibians). In a third step, we built five pond typologies with the species assemblages of each group. Low congruency was obtained, confirming that single group approach is not satisfactory. In conclusion, Amphibians are useful as surrogates, but they have to be used together with other groups, never as a single group.

Keywords: Biological assessment, small waterbodies, species richness, taxa congruency, Amphibian, aquatic vegetation, macroinvertebrates.

Title: Pond Biodiversity Index (“IBEM”): a new tool for the rapid assessment of biological quality in ponds

Authors: Nicola Indermuehle, Sandrine Angélibert, Veronique Rosset and Beat Oertli

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Abstract: Supported by legal requirements, nature conservation managers increasingly have to perform rapid biodiversity assessments of freshwater habitats for conservation and monitoring purposes. For ponds in particular, now widely recognized as valuable resources for freshwater biodiversity, standardized assessment methods are thus needed, but still rare.

We produced such a tool for small waterbodies in Switzerland: the Pond Biodiversity Index (“IBEM” in French). This Index relies on a method for assessing the biodiversity in ponds (PLOCH-Method) originally intended for fundamental research. The new IBEM-Method was developed together with future end-users, to meet their needs: simple use, low cost, standardized procedures, modularity and consistency with the legislative framework. Crosstaxon and within-taxon congruencies were assessed with a biodiversity dataset of 60 Swiss ponds. The Index is finally based on the generic richness of four groups (aquatic plants, aquatic Gastropoda, aquatic Coleoptera, adult Odonata) and on Amphibian species richness. Following the assessment methodology adopted by the European Water Framework Directive, the ratio of observed richness to reference-based predicted richness is translated into one of five quality classes for each pond. To facilitate the methods' implementation, a website allows for online calculation of the index, and provides didactical support on both sampling and assessment methodologies.

Keywords: Monitoring, standardization, species richness, small waterbodies, nature conservation, practitioners, applied research, PLOCH method

Title: Ponds creation on aggregate extraction sites

Authors: Pascale Nicolet, Penny Williams and Jeremy Biggs

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Abstract: Aggregates extraction sites offer many opportunities for pond creation and have the potential to greatly contribute to biodiversity targets in the UK. The aim of this study was to promote pond creation on gravel extraction sites in the Lower Windrush Valley (LWV) and to disseminate the results widely to other parts of the UK.

Evidence from existing ponds on restored sand and gravel extraction sites showed that they made a major contribution to site and regional freshwater biodiversity. A total of 20 ponds on restored sand and gravel sites were surveyed for wetland plants and macroinvertebrates. All but two of the ponds surveyed were Priority Ponds under the UK Biodiversity Action Plan, which include criteria related to ecological quality, species richness and rarity.

The main issues identified as barriers to pond creation on aggregate extraction sites in the LWV were related to a general lack of awareness about ponds and pond designs. We addressed these issues by producing the Pond Creation Toolkit which demonstrates how ponds can easily be created on aggregate extraction sites as part of the restoration process or can be retro-fitted following restoration.

Keywords: pond creation, biodiversity value, restoration, aggregate extraction, gravel pit

Title: Pioneer macroinvertebrate assemblages in newly created ponds

Authors: Albert Ruhí, Dani Boix, Jordi Sala and Stéphanie Gascón

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Abstract: Newly created ponds are a management tool proposed in order to reverse the actual tendency of disappearance of water bodies. Composition, structure and individual size of the pioneer invertebrate assemblage was studied in nine Mediterranean newly created ponds, during their first year of flood (September 2006-September 2007). The ponds are located in three different areas of the NE Iberian Peninsula (Baix Ter, Pla de l'Estany and Plana de la Selva) with different main water supplies (a coastal aquifer, a karstic stream and the rainfall, respectively). Invertebrates were collected using a 250 µm mesh size dip-net. Pond physical and chemical parameters were measured in each sampling day.

Among the 82 taxa found, 20% are common in all three areas, while 40% are exclusively found in one area. Four taxonomic groups are dominant (Ephemeroptera, Diptera, Heteroptera and Gasteropoda), although with very different richness. The community structure and the dominant taxonomic group are different for each area. Different trend types concerning taxonomic group abundances have been observed (e.g. maximum abundance of Coleoptera was detected at the beginning of the flood while Odonata increases along time). Community structure parameters, life history traits and trophic strategies have also been analyzed and related to physical and chemical parameters.

Keywords: Newly created pond, macroinvertebrate, pioneer, community structure, biodiversity.

Title: Amphibians: A Surrogate Taxa for Pond Conservation?

Authors: Dr. Andrew Hull

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Abstract: Until recently, pond conservation in Europe has been fragmented and intermittent. By contrast the conservation of amphibians has been more successful and, sine qua non, has had a greater impact upon pond conservation in general, and the pond resource in particular. This paper will argue that there is a need for closer co-operation between the 'pond' and 'amphibian' communities in order to maximise conservation effort. Firstly, the strengths of amphibian conservation effort in Europe will be examined and this will lead on to the identification of a series of Life Nature

projects which, whilst being amphibian focussed, have had a significant physical impact upon the pond resource and the development of public awareness and understanding. From this, consideration will then be given to the negative impact that amphibian conservation can have upon the wider pond resource and overall biodiversity. Finally, it will be argued that there is a greater need for closer co-operation and a development of mutual understanding between the 'pond' and 'amphibian' communities, both locally, nationally and internationally.

Keywords: amphibians; conservation; Life projects; ponds; biodiversity

Title: Relation between environmental factors and crustacean assemblages of coastal water bodies from mainland and islands in the Mediterranean region

Authors: Lucena P., Pardo I., Gascón S., Sala J., Boix D. and Quintana X.

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Abstract: Differences in the dynamics of ecological processes between islands and mainland imply different patterns in faunal communities in terms of structure and biodiversity. In order to identify pattern variation we compared crustacean assemblages between islands and the Spanish mainland in the Mediterranean region, and related them to the environmental wetland characteristics. Therefore, 32 (Balearic archipelago) and 36 (Catalonia, NE of Spain) wetlands were sampled during two seasons (winter and spring). A total of 93 crustacean species were identified, 50% were exclusive from mainland systems, whereas 29% were exclusive from islands. Canonical correspondence analyses (CCA) were used to identify environmental variables of importance in determining crustacean assemblages. In the mainland systems identified variables were: conductivity (21%), phosphate (14%), chlorophyll a (14%), dissolved inorganic nitrogen (DIN) (12%) and wetland area (16%).

Otherwise, in the islands the most important variables were: conductivity (25%), temperature (18%), pH (14%) and DIN (13%). Regressions tree models have been used to assess the relationship between crustacean richness (i.e; Cyclopoida, Calanoida, Harpacticoida, Cladocera, Ostracoda, Amphipoda, Decapoda, Isopoda, Tanaidacea and Mysidacea) and the environmental factors (including the island/mainland factor). Only Cyclopoida and Ostracoda were affected by this later one. Cyclopoida was more species rich in the mainland wetlands, while Ostracoda richness was highest in the islands.

Keywords: crustacean, richness, islands, mainland, regression tree

Title: Distribution of large branchiopods in Kiskunság (Hungary) in relation to local habitat and spatial factors and implications for their conservation

Authors: Liesbet Boven, Els De Roeck, Ann Hulsmans, Bram Vanschoenwinkel and Luc Brendonck

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Abstract: Large branchiopods are threatened worldwide by the loss and degradation of their temporary aquatic habitats. A thorough understanding of their diversity and distribution is prerequisite to formulate effective conservation measures. We sampled large branchiopods in 82 temporary pools in Kiskunság (Hungary), belonging to five habitat types, and complemented our field survey with dormant propagule bank analysis. Eleven species were found, with large branchiopods occurring in more than half of the pools. The relatively high diversity, occurrence and co-occurrence frequency of large branchiopods make temporary freshwater pools in Kiskunság of considerable nature and conservation value. Local environmental factors overruled spatial factors in explaining the presence of the most common species.

We conclude that dispersal is most likely not limiting for large branchiopods in our study and that colonization success of different species was differentially affected by local conditions, such as invertebrate predation risk and hydroperiod. Pools in meadows and arable land and wheel tracks contributed most to regional species richness through the presence of rare species and/or considerable between-habitat diversity. To conserve branchiopod diversity, we stress the importance of maintaining high habitat diversity in the landscape and the need to conserve often neglected habitats such as wheel tracks and rain pools.

Keywords: Branchiopoda, conservation, depth, dispersal, species richness, temporary pools, vegetation cover

5.2.2 Pond ecology at different spatial scales

Title: Feeding behaviour of different developmental stages of *Daphnia magna* in wastewater conditions

Authors: Compte J., Brucet S., Gascón E., Boix D., Sala J., López-Flores R. and Quintana X.D.

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Abstract: Although the diet of *Daphnia magna* has been studied extensively, information on how it varies at the different developmental stages is contradictory. Moreover, *Daphnia spp.* have been proposed as a management tool in order to reduce bacteria and other live particles in tertiary wastewater treatment plants such as constructed wetlands. Three field grazing experiments with different nutrient concentrations were carried out in a wastewater treatment plant. In each experiment, the grazing effects of *D. magna* for three different size classes (small, medium and large individuals) were studied. *D. magna* had an omnivorous diet, and it was not always able to significantly remove particles in wastewater effluents. The capacity of *D. magna* to reduce different types of live particles strongly depended on microbial food web structure found in initial conditions. In some cases, an increase of some potential preys, such as bacteria, was found. Indirect trophic cascade interactions by *Daphnia* grazing or competition on the other microbial predators may

cause this increase. Regarding to size, large sizes of *D. magna* were the most efficient at prey consumption although the different sizes classes had similar diets.

Keywords: *Daphnia*, feeding, bacteria, ingestion, trophic cascade, wastewater, ontogenetic diet shift

Title: Sex and stochasticity: insights from the geographic parthenogen *Eucypris virens* (Ostracoda)

Authors: Jochen Vandekerckhove, Tadeusz Namiotko, Giampaolo Rossetti, Maria Joao Fernandes Martins, Francesc Mezquita, Olivier Schmit, Roger K. Butlin, Isa Schön and Koen Martens

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Abstract: Sexuality prevails in the animal kingdom, despite the cost of males. This 'paradox of sex' can be resolved on an evolutionary timescale by referring to the potential of sexuals to adapt and to slow down the accumulation of deleterious mutations, but these environmental and mutational hypotheses fail to explain the short-term persistence of sexuality. According to Bell (1982), the immediate advantage of sex is that it allows the exploration of a broader array of ecological niches when compared to clonal reproduction (tangled bank hypothesis). Getz (2001) added a temporal component to this idea in his demographic stability hypothesis. He developed a model that shows that in stochastic environments the relatively high extinction rate of asexuals due to their limited resource utilization competence, can allow sexuals to compensate for the cost of males. Using the geographic parthenogen *Eucypris virens* as a model organism, we empirically test the ideas of Bell and Getz. First, we show that sexuality is the dominant mode of reproduction in highly stochastic environments (short hydroperiod ponds), both on a continental and a local scale. And via lifehistory experiments we compare the variation in ecological responses between sexual and parthenogenetic lineages.

Keywords: paradox of sex, temporary ponds, ostracoda, ecology, life-history, distribution

Title: The structural features of phytoplankton communities in ponds

Authors: F. Arthaud, J. Robin, G. Bornette and D. Vallod

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Abstract: The aim of the study was to delineate the structural features of phytoplankton communities in fish farming ponds, and try to link them to the nutrient content of the pond, which was used as a proxy of their potential productivity. For this purpose, the phytoplanktonic communities of thirty ponds located in the Dombes wetland, France, have been sampled weekly from mid-April to mid-October. Water quality was also controlled simultaneously by analysis of standard physical and chemical parameters.

The plankton biomass (ie realized productivity) allows discriminating several types of ponds, from those with a low productivity during all the sampling season to those

that present a very high productivity all the time. Water, but not substrate nutrient content was correlated to realized planctonic productivity. Pond biodiversity was described through the relative abundance of taxa, ranging from ponds strongly dominated by one taxon, to others with many taxa equitably present. The distribution and relative abundance of phytoplanktonic taxa in ponds are related to phytoplankton biomass. This work demonstrates that a rather great diversity of situations occur among ponds. It suggests that, despite the connectivity between ponds and the rather similar management practices, the agri/aqua-cultural uses could lead to contrasting diversity patterns.

Keywords: phytoplankton communities, biodiversity, productivity

Title: A handbook for the management of woodland ponds

Authors: Frédéric Arnaboldi (Translation: Dorine Pasqualini)

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Abstract: Office National des Forêts (O.N.F.) assists with the management of ponds in France. For almost fifteen years now, an effort has been made to preserve these aquatic areas: creation of reserves including ponds which are valuable in terms of natural heritage. These aquatic sites are not only protected, but they are carefully managed. Objectives include ensuring the preservation of remarkable species and habitats, restoring aquatic spaces and also preserving the natural dynamics in, for example, woodland peat ponds. Ponds management techniques are often based on: (i) clearing out the surrounding crop, (ii) maintenance of the structure of the pond, (iii) working on the slopes and the depth of water, (iv) water supply of pond and water stock by cleaning out the neighbouring streams and the pond itself.

These techniques have been gathered together in a handbook published in 2007. It shows the different methods of restoring, preserving and maintaining woodland ponds. The handbook also highlights new opportunities which are offered by pond management, notably the role of ponds in preserving the water supply and in providing water storage facilities in woodlands.

Keywords: Ponds management-techniques forest

Title: Influence of pond fisheries and agricultural practices on biodiversity in the Dombes region, France

Authors: A. Wezel, M. Flandin, V. Rosset, J. Robin, B. Oertli, S. Angélibert and D. Vallod

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Abstract: The Dombes region is characterised by about 1100 ponds located in an agricultural area with pastures, fields and forests. The system is based on an alternation of fish farming (mainly carp) and grain farming on the same unit of land. This particular form of alternation may increase biodiversity of animal and plant species in the ponds and around. A research project started in 2007, analysing physical-chemical water and pond sediment parameters, phytoplankton, macro-

invertebrates, dragonflies and ducks. It has been enlarged since autumn 2007 in analysing also macrophytes, amphibians, land use and habitats around the ponds. In this presentation the holistic approach of the project and some first results from the 33 ponds studied in 2007 will be presented. Six different types of land use patterns could be classified in the respective watersheds of the ponds and five clusters of land use within a 100 m distance from the ponds. Dragonfly species number was 33, among them one species protected by the Fauna-Flora-Habitat directive. A preliminary exploration of relations between species richness and environmental variables was accomplished. Ponds range from eutrophic to hyper-eutrophic, but so far no significant relations between cropped area and nitrogen and phosphorus concentration of the pond water could be found.

Keywords: agricultural land use, dragonfly, eutrophic, hyper-trophic

Title: Benthic communities of alpine ponds in period of recovery after acidification stress

Authors: Milan Novikmec, Marek Svitok, Dana Fidlerová, Zuzana Hladeková, Alica Troppová and Peter Bitušík

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Abstract: Study of recovery of freshwater ecosystems after acidification stress belongs to actual topics of current limnology research. Tatra Mountains have been exposed to the strongest effect of acidification pollutants for more than a half of century. The changes in water chemistry have appeared in the beginning of the 1990s as a consequence of a large drop in the emission of sulphur and nitrogen compounds. Thus, biological recovery of the Tatra ponds could be expected. We compared benthic communities sampled on 12 ponds of the both Slovak and Polish part of the Tatra Mts. in 2000 and 2004 in order to study biological processes of reversal from acidification. Communities were dominated by Chironomidae (Diptera) and Oligochaeta. Analysis revealed predominant effect of altitude and acidification status on their structure. The results suggest that changes in species composition (at least of some of the ponds) are related to biological recovery after acidification stress. Validity of the Tatra Acidification Index (TAI) was evaluated. Study was supported by the grant VEGA (1/4334/07) and Slovak Water Management Enterprise, s.e.

Keywords: alpine ponds, acidification, recovery, Tatra Mts., Slovakia

Title: Generalized additive models as a tool for predicting local pond diversity response to climate warming

Authors: Véronique Rosset and Beat Oertli

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Abstract: Climate warming will be responsible for numerous shifts in geographical species distributions and abundances which may lead to species-level extinctions. Regional and local diversities are likely to be significantly impacted. Ponds may play

a central role as sentinel systems in local assessments. The influence of different environmental variables on local pond biodiversity and the potential response of macroinvertebrates, amphibians and aquatic vegetation species richness to climate warming were evaluated in a hundred Swiss ponds with Generalized Additive Models. Temperature is the key factor determining local pond diversity. Climate warming will cause a clear increase in local pond diversity, especially in mountain areas. Local Coleoptera richness, for example, will increase from 2 to potentially 4 species in alpine ponds until year 2100. These predicted increases of local richness will be partly due to the northward expansion of the geographical range of southern species, coupled to the upward expansion of lowland species. In addition, extinction events of cold stenothermal species might happen but to a smaller rate than colonisation events.

The richness predicted in this study are potential values, giving the baseline of what should occur. Further research is needed to understand better the consequences of global change on additional variables important to pond diversity, like for example hydrology and natural hazards.

Keywords: ponds, global change, predictive model, species richness, environmental variables

Title: Macroinvertebrate assemblages of flooded coal mine subsidences: spatial and temporal variability

Authors: Marek Svitok, Igor Kme, Eva Michalková and Peter Bitušík

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Abstract: Diversity and structure of pond macroinvertebrate assemblages has not been extensively studied, particularly in Slovakia. Thus, we focused on relatively dense pond system created by the subsidence of an underground coal mine in an agricultural landscape. Sampled ponds covered a range of sizes and physico-chemical conditions. Moreover, ponds varied in age from one to nineteen years that allowed us to assess temporal variability in assemblage characteristics. Geographical position and pond age appeared to be the predominant factors influencing the composition of the macroinvertebrate assemblages. The older ponds were characterised by the presence of larvae *Corynoneura*, *Cryptochironomus* and *Glyptotendipes* (Chironomidae) while the assemblages of younger ponds typically contained mayfly *Caenis robusta*, chironomid *Procladius* and other species. Pond age was involved in the most parsimonious model explaining variation in taxonomic richness. Young ponds supported more diverse assemblages than older ponds. This study was co-funded by grant VEGA (1/4334/07), Faculty of Ecology and Environmental Sciences (I-07-028-00) and Slovak Water Management Enterprise, s.e.

Keywords: ponds, macroinvertebrates, distribution, temporal variability, Slovakia

Title: The role of ponds in providing ecosystem services

Authors: Jeremy Biggs, Penny Williams and Pascale Nicolet

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Abstract: If we want to protect and increase ponds and their biodiversity in Europe we need to use all the tools at our disposal. The role that ponds play in providing “ecosystem services” is one of these tools. New estimates of the global abundance of small waterbodies show that small waterbodies make up a high proportion of all standing waters. Together these ponds form networks that can play a major role in providing five major types of ecosystem service: flood prevention, water storage, nutrient and other pollutant mitigation, carbon sequestration and biodiversity protection.

This paper reviews recent development in understanding the role of ponds in providing ecosystem services. We also assess the potential benefits of creating new ponds to fulfil such purposes, and how likely they are to bring associated biodiversity gains. The importance of ponds in delivering ecosystem services has recently been highlighted in the new Pond Manifesto published by the European Pond Conservation Network

Keywords: pond management, biodiversity, flood control, carbon sequestration, pollution amelioration

Title: Macroinvertebrate assemblage in lava formed ponds in NE Iceland

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Abstract: In some of Iceland’s extensive lava fields, wetlands and ponds have evolved forming a unique ecosystem. The spatial heterogeneity of such ecosystems is visible and can be verified in their macroinvertebrate assemblage. An extensive wetland area, with vast amount of ponds of various formations, surrounds the eutrophic Lake Myvatn, in North East Iceland.

Most of these ponds are water filled depressions or pseudo-craters, and are a consequence of a volcanic eruption over 2200 years ago. A research project on these ponds was carried out 2001-2003. The two main objectives of this study were to assess and quantify the spatial and temporal diversity of macroinvertebrate communities and to isolate factors which might explain a great diversity of species composition. Samples, by sweep-netting, were collected from over 40 ponds in a cluster of over 200 ponds, once or twice every summer.

The sampling emphasised the plankton, epifauna on macrophytes and sediment surface. On every sampling occasion physical and chemical variables were obtained, as well as trapping fish. The results will be discussed in the context of the two main objectives of the research.

Keywords: lava, ponds, macroinvertebrates, community structure

Title: Odonata and climate change in pond landscape of north west England

Authors: Christopher Hassall, Jim Hollinshead and Andrew P. Hull

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Abstract: The Odonata (dragonflies and damselflies) exhibit both an aquatic and a terrestrial life history stage and the need for a water body in which to breed places constraints on distributions and dispersal. As distributions shift in response to changing climate, the persistence of species will depend on the availability of suitable habitat through which to disperse. Definitions of habitat preferences have proved elusive, since species vary widely in their requirements. In addition to uncertainties concerning the suitability of different habitats, changes in the distributions of freshwater bodies may also occur due to climate change.

We report on two related studies: (i) a metapopulation study using fine-resolution mapping data to predict changes in pond distribution and subsequent impacts on spatial connectivity and odonate persistence; and (ii) a multivariate analysis of odonate habitat requirements using an extensive dataset collected for 488 ponds during the Pond Life project (1995-1999).

The findings show that the pond landscape of north west England retains high spatial connectivity on the scale of odonate and amphibian dispersal even with a substantial loss of ponds. This resilience means that the region will continue to facilitate range expansions and shifts in distribution even under extreme pond loss. From the multivariate analysis some stenotopic odonate species are highlighted, for whom specific habitat requirements reduce the connectivity of habitat

Keywords: Odonata, dragonfly, habitat requirements, range shift, ponds, multivariate statistics, landscape permeability

Title: Spatial differentiation of physical-chemical parameters and its impact on zooplankton community structure in two types of small water bodies

Authors: Natalia Kuczynska-Kippen and Tomasz Joniak

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Abstract: Small water bodies surrounded by forests or fields create a biogeochemical barrier, which effectively restricts the free migration of mineral and organic substances. Aquatic vegetation, creating specific microecosystems, where seasonal changes in the chemical conditions reflect the dynamic balance between organisms and the environment is a stabilizing factor. The paper presents the results of an examination of water chemistry and its impact on zooplankton community structure in 10 small water bodies (mid-forest, midfield).

The analysis included stands located in the unvegetated zone as well as among different ecological types of aquatic vegetation. A feature of water bodies was the great quality and quantity differentiation of mineral and organic substances – in the first group of ponds mainly colour dissolved organic carbon (CDOC) occurred, while in the second group DOM relating to a non-humic organic matter inflow dominated.

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Keywords: physical-chemical analysis, rotifers, crustaceans, macrophytes

Title: Relationships between morphological characters and fitness components in three close populations of *Lestes barbarus* (Odonata: Lestidae)

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Abstract: Survival and mating success are two components of fitness that have often been thought to be related with several individual characteristics. Among these SIZE and Fluctuating Asymmetry are the most frequently investigated, and many studies have been done on adult Odonata, because of their well known behaviour and the facility with which they can be observed, caught and measured. We investigated these relationships in three close populations of another odonate species, *Lestes barbarus*, whose longer pre-reproductive period allows the time for the selection to act, and whose philopatry allows us to measure the effect. Furthermore, we also investigated relationships between male mating success and SIZE, FA, thorax and total weights and their ratio. Our results have shown that there were no uniform effects of the selection on the three populations, but there were different effects on some of these both before and during the reproductive period. These results show that the morphological characteristics can affect natural selection in different ways even in populations very close to each other and in apparently similar environmental conditions. This might explain why a lot of studies on relationships between SIZE, FA and fitness performances, usually done on a single population, have so often given contrasting results.

Keywords: Survival, mating success, selection, size, fluctuating asymmetry, Lestidae

5.2.3 Temporary ponds

Title: Temporary ponds of Eastern Spain: Limnological typology and human impact

Authors: Maria Rosa Miracle, Maria Sahuquillo, Keve Kiss, Sara Morata and Eduardo Vicente

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Abstract: A study of thirty temporary freshwater ponds located in Eastern Spain was carried out for two successive years (2006 and 2007). They differed in morphology (size, depth, type of soil), in the length of wet phases and human impact. Triangular diagrams based on nutrient ratios (TP:TN:SRSi) and on

biovolumes of main planktonic/semiplanktonic algal and microinvertebrate groups are used to explore the influence between nutrient stoichiometry and planktonic/semiplanktonic communities. In some of the ponds clay turbidity was one of the major factors influencing these triple ratios and may play role in the transport and utilization of terrestrial organic matter. Pond typology was further extended to algal and microinvertebrate species composition and biodiversity. Groups obtained from species associations were well related with type of soil/alkalinity, depth/water permanency, extension of flooded area and macrophyte cover/water transparency. Human impact was evaluated by including land use variables in over all multivariate statistical analysis. Trampling, a simple visual variable indicating cattle pressure, was positively associated with mineral turbidity, nutrients, chlorophyll and negatively with depth, macrophyte cover and diversity, among others. Study supported by UE and GVA (LIFE05/NAT/E/000060).

Keywords: temporary ponds, nutrient ratios, turbidity, hydroperiod, biodiversity, phytoplankton, zooplankton, trampling

Title: Impacts of salinity and hydrology on invertebrate communities in Mediterranean temporary wetlands

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Abstract: For a field survey 30 temporary wetlands, differing in salinity and hydroperiod, were selected on the nature reserve of Tour du Valat in the Camargue (France). Sampling was conducted every two months to study the present spatio-temporal state of the invertebrate communities (macroinvertebrates and zooplankton). We showed that dispersal was not limiting and that species sorting was the dominant structuring process of invertebrate communities, with hydroperiod and salinity being the key factors shaping the invertebrate communities in these wetlands. Global change and intensive water management are expected to alter the hydrology and salinity of wetlands, which could have a strong impact on the community structure and lead to the extinction of specialized, often endangered species. A mesocosm experiment was designed to study the impact of these expected changes in wetland phenology by exposing a pooled egg bank of temporary wetlands to a range of hydroperiod and salinity regimes. By studying these wetlands we hope to contribute to a better knowledge of the communities in temporary Mediterranean wetlands, but also to gain information regarding the conservation of these unique habitats.

Keywords: Salinity, hydroperiod, invertebrate community structure, Mediterranean temporary wetlands

Title: Micro-crustaceans of temporary ponds in the Doñana Natural Area (SW Spain): a four-decade record (1964-2007)

Authors: K. Fahd, A. Arechederra, D. León, M. Florencio and L. Serrano.

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Abstract: The Doñana Natural Area includes a large array of wetlands with the highest degree of environmental protection in Spain, and so it has long attracted many studies. We present a cumulative list of zooplankton taxa (Copepods and Branchiopods) based on a collection of 19 publications (1964-2007) and 4 unpublished studies. Eighty-one taxa have been recorded in a set of 68 ponds (46 cladocerans, 15 cyclopoids, 8 diaptomids, 5 harpacticoids and 7 large branchiopods), and a similar number of taxa in 37 sites spread over the Doñana marshland. A non-metric MDS ordination produced a smooth gradient from ponds to marshland. The lack of discrimination among pond sites was not due to a large number of cosmopolitan species, but to a random distribution of a large number of low-occurrence uncommon species (53% of taxa at <10% of occurrence). Low-occurrence uncommon species shared a relevant part of cumulative richness (>30%) in ponds that gathered a large number of samplings. Along the last four decades, these ponds have been subject to large environmental changes that could explain this high cumulative richness. Some of these changes have fluctuated (conductivity, water transparency, growth of macrophyte beds) while others were directional (invasive species, desiccation).

Keywords: Cumulative richness, fluctuations, desiccation

Title: Temporary ponds in the Doñana National Park (SW Spain): their role in the conservation of flora and fauna

Authors: Díaz-Paniagua, C., Fernández-Zamudio, R., Florencio, M., García-Murillo, P., Gómez-Rodríguez, C., Portheault, A., Serrano, L. and Siljestrom, P.

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Abstract: An extensive system of temporary ponds exists in the Doñana National Park with more than 3000 water bodies during wet years. They are located on sandy soils of aeolian origin where water persistence is favoured by the presence of an argilic semi permeable horizon and by a relict clay-rich sandy layer. Temporary ponds can be classified across a wide hydroperiod gradient. Most ponds are filled during autumnal or winter rains, and persist up to late spring or summer, while others are formed in spring and others may persist through summer. Eight of the 11 amphibian species of this area require temporary ponds for breeding. More than 90 species of macroinvertebrates have been recorded, coleopterans (48 taxa) and heteropterans (21 taxa) being the richest taxonomic groups. Several zooplankton species are endemic to this kind of habitats, such as the copepod *Dussartius baeticus* and the rotifer *Lecane donyanensis*. The vegetation confers a singular heterogeneity to these aquatic microhabitats, with at least 20 emergent macrophytes and 12 floating macrophytes species.

The conservation value of these ponds is highlighted by the large variety of protected and/or rare species of flora and fauna, which are favoured by a high pond abundance and connectivity.

Keywords: temporary ponds, conservation, aquatic fauna, aquatic vegetation

Title: Identifying key environmental factors related to crustacean and macrophyte assemblages in Mediterranean temporary ponds

Authors: Bagella S., Gascón S., Caria M.C., Sala J., Mariani M.A. and Boix D.

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Abstract: In order to identify key environmental factors which affect crustacean and macrophyte assemblages, six temporary ponds were monitored at three times throughout 2007 in Sardinia. Crustaceans were sampled using a 20 cm diameter dip-net. Macrophyte abundance was assessed along permanent transects. A dataset was created with pond water physical-chemical parameters and a number of different characteristics of the ponds, landscape and land uses. Canonical Correspondence Analysis revealed that the following key environmental factors were related to crustacean structure assemblages: total area of the wet habitat system in which the pond is included (22% of the total variance), altitude (19%), hydroperiod length (11%), distance from the nearest pond (9%) and quantity of dissolved inorganic nitrogen (8%). Macrophyte structure assemblages were affected by the grazing animal species (cattle=18% and sheep=11%), substrate (granitic=9%), pond area (8%) and total area of wet habitat system in which the pond is included (12%). The latter is the only factor which was identified as relevant for both macrophytes and crustaceans.

The Co-inertia analysis revealed that the fitting of macrophytes specific cover and crustacean assemblages was 11% and that the significant axes of the analysis explained 60% of the crustacean assemblages variance.

Keywords: CCA, Co-inertia analysis, hydroperiod, land use, landscape, water characteristics

Title: Temporary ponds of northern Tunisia: a contribution to the assessment of a new hotspot for plant diversity in the Mediterranean basin

Authors: Ferchichi H., Daoud-Bouattour A., Gammar-Ghrabi Z., Gammar A.M., Grillas P., Karray M. R., Muller S.D., Rhazi L., Souliemarsche I. and Ben Saad-Limam S.

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Abstract: Despite the recent awareness of the importance of temporary ponds, these ecosystems are still poorly recognized, notably in Tunisia, and their biodiversity's value is not yet established. The presented work represents a first step for current biodiversity assessment of Tunisian temporary ponds in order to achieve the first detailed characterisation of the flora of these habitats. Botanical surveys, conducted in 2006-2007, lead to find numerous and diversified temporary water bodies, among which the richest were selected for botanical and ecological studies. Several rare and endangered species, including two new species for Tunisia, *Crassula vaillantii* and *Pilularia minuta*, were notably found. Given the conservatory importance of *P. minuta*, we initiated in 2007 the monitoring of its demography and distribution within the Sejenane plain (Mogods Hills), as well as palaeoecological

investigations in order to explore the past dynamics of its population, estimated around at least 10 pools. Our study aims at assessing ecological requirements, historical dynamics and modern threats concerning this species, in order to design appropriate conservation measures. The results moreover should help to clarify the biogeographical significance of the plant communities of temporary ponds of northern Tunisia and should contribute to assess the new hotspot for plant biodiversity of “Kabylias-Numidia-Kroumiria”.

Keywords: Temporary ponds, Northern Tunisia, plant diversity, rare species, *Pilularia minuta*, threats, conservation

5.3 Posters

5.3.1 Management and conservation in practice

Title: Priority habitat restoration: mediterranean temporary ponds

Authors: P. Pablo Ferrer, Inma Ferrando, Emilio Laguna, Elena Estrellés, Francisco Marco and Antoni Marzo

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Abstract: In the framework of Interreg IIIB MEDOCC community initiative, the project SEMCLIMED (Climate Change Impacts on the Mediterranean flora and restoration actions) is devoted to the study of the impacts of new climatic conditions produced by climate change on some wild flora of the Mediterranean basin. This initiative, composed by 15 partners from different Mediterranean countries, is coordinated by the Research and Experimentation Forestry Centre of the Generalitat Valenciana (CIEF). The CIEF, together with the Valencia University Botanic Garden, takes part, in the so-called phase IV “actions on the field”, in the restoration and recovery of the Mediterranean temporary pond “Lavajo de arriba” (located in Sinarcas, Valencia), which obtained the status of flora microrreserve in 2001. The structural base of the habitat was evaluated, structural species were defined and a recovery programme was developed, which included recollection, characterization and inclusion on germoplasm banks of seeds and spores, as well as propagation material and plant culture to carry out revegetation activities which will take place after the necessary topographic modifications for the restoration of the natural structure of the pond.

Keywords: restoration, temporary ponds, Sinarcas, climate change, SEMCLIMED

Title: Toward an Inventory of small wetlands of Rome Province (Lazio, Italy)

Authors: Valentina Della Bella, Corrado Battisti, Roberto Argano and Carlo Angeletti

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Abstract: The Province of Rome is the most densely populated and one of the largest provinces of Italy. Ponds and small still waters are widely distributed in the Province territory, even though they represent isolated fragments surrounded by a matrix of anthropogenic habitats. By the light of their high value for biodiversity conservation and the sharp decline in their number, in 2007 the Rome Province decided to start setting up an Inventory of small wetlands of own territory. The priority is given to wetlands of coastal area, subjected to major human impacts and needing of urgent restorations. An intensive field work is scheduled for the identification of these small patchy habitats, which usually are not mapped through GIS-based cartographic and aerial photographs survey. Detailed datasheets of each inventoried wetland will be filled up with geographic coordinates, field and aerial photos, characteristic of water body (size, typology, hydrologic cycle), surrounding land use, name of land owner and bibliographic references of studies carried out on the biotope. The Inventory will represent an essential instrument for planning specific restoration actions, researches at different hierarchic level (ecosystem, population, community: e.g., area-species relationship for different guilds and taxa), and conservation strategies at landscape scale.

Keywords: remnant wetlands, isolation, Inventory, conservation, management, planning

Title: Biomonitoring of heavy metals in fishpond littorals – their content in aquatic snails, reed stems and bottom sediments

Authors: Jan Sychra, Olga Elechovská, Zdeka Svobodová and Oldrich Sychra

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Abstract: Higher heavy metals input to wetlands can cause serious changes in the ecosystem functioning. Nevertheless, metals cycles and their content in particular components of fishpond ecosystems in central Europe are still not well known. There exist some papers on metals contents in fish tissues, especially in common carp (*Cyprinus carpio*) or in bottom sediments, which mostly describe the situation in pond profundal zone. However, shallow littoral parts with presence of macrophytes are often the most productive zones within the ponds. The aim of this study was therefore to find some new possible bioindicators of heavy metal stress in fishpond littorals. For this purpose, great pond snails (*Lymnaea stagnalis*), stems of common reed (*Phragmites australis*) and littoral bottom sediments were collected on 18 fishponds in two regions of the Czech Republic. These samples were analyzed for Cd, Hg and Pb content. In this paper, the importance of heavy metals in littorals under seminatural conditions and the impact of environment pond characteristics on their content in snails, reed and sediments are discussed. The recorded values can serve for comparison with values from more contaminated wetland localities in further studies. This study was supported by the Ministry of Education of the Czech Republic (projects no. MSM 6215712402 and MSM 0021622416).

Keywords: heavy metals, Cd, Hg, Pb, littoral, bioindication, *Lymnaea*

Title: Species richness of filamentous algae and submerged macrophytes in farm ponds of Andalusia (southern Spain)

Authors: Irene Gallego, Pedro Sánchez, Jesús Casas, Francisca Fuentes, Melchor Juan, David León, Patricio Peñalver, Carmen Pérez and Julia Toja

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Abstract: The intensification of agriculture over the last four decades in Andalusia has determined an exponential increase of water demand and consequently a proliferation of farm ponds, which may serve as new habitats for aquatic biodiversity. During spring 2007 an extensive biotic and abiotic survey of 120 ponds throughout Andalusia was carried out. Ponds were selected to cover a wide range of types of construction, management and water quality. We present preliminary results on species richness of filamentous algae and submerged macrophytes and their relationship with pond type and physico-chemical variables. A total number of 19 species of submerged macrophytes and 21 species of filamentous algae have been recorded. The most frequent genera of macrophytes were *Potamogeton*, *Chara*, *Myriophyllum* and *Najas*. Moreover, the most frequent genera of filamentous algae were *Cladophora*, *Spirogyra* and *Oedogonium*. Species richness of both groups decreased towards eastern Andalusia. This spatial pattern may be related to a decreasing degree of naturalization of ponds to the east, depending on the pond type and management. Multivariate analyses show that the cover of submerged macrophytes was negatively correlated with macronutrients in water, planktonic chlorophyll a and suspended solids. Ponds dominated by charophytes show the lowest concentrations of chlorophyll a.

Keywords: Submerged macrophytes, filamentous algae, farm ponds, species richness

Title: Chironomid based classification of reservoirs: comparison of schemes

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Abstract: In freshwater resource management, subjects (waterbodies) are often classified into categories with similar climate, physical and biological properties. Well-defined ecologically homogenous classes of subjects can be managed under similar management practices. Classification was applied in many programs designed for bioassessment of streams, however standing waters received considerably less attention. Seventeen man-made reservoirs in Banská Štiavnica (Slovakia) mining region were sampled using Chironomid Pupal Exuviae Technique. We compared the applicability of the a priori and a posteriori classification schemes for describing the pattern of chironomid assemblages. Analysed set of data offered little support for the utility of the morphological classification. In contrast, geographical classification was strong and effectively partitioned chironomid assemblages into three distinct categories. Reservoirs clustered in different geographical groups shared, on average, fewer than 40% of their chironomid

species. The effectiveness of geographical classification was supported by the results of a posteriori classification scheme. This study was co-funded by grant VEGA (1/4334/07), Faculty of Ecology and Environmental Sciences (I-07-028-00) and Slovak Water Management Enterprise, s.e.

Keywords: Chironomidae, classification, pupal exuviae, man-made reservoirs, Slovakia

Title: Comparison of two standardised methods for assessing pond biodiversity (PLOCH-IBEM and NPS). Case study in a pond of Ramsar site “Grande Cariçaie” (wetlands of Lake Neuchâtel; Switzerland)

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Abstract: Given the important role of ponds in maintaining biodiversity, new standardised assessment methods have been developed. We compare here PLOCH (Switzerland) and NPS (England) methods on a pond of the “Grande Cariçaie” wetlands (Lake Neuchâtel). We investigated: (i) the biological quality assessments (plants, macroinvertebrates), (ii) the species richness, (iii) the pros and cons of the protocols and their compatibility, (iv) the investment and competences required.

The comparison underlined moderate differences in species richness as gathered through the two methods. Furthermore, the same biological quality score (using 5 classes) was obtained with both methods. Investment has been estimated to 50 h for PLOCH and between 50 (expert) and 70 h (generalist) for NPS. Both sampling methods seem to be appropriated to be used elsewhere in Europe, but NPS for smaller waterbodies (< 2000 m²) than PLOCH (until 5 ha). High heterogeneity in the spatial distribution of fauna or flora seems to be a restrictive factor for PLOCH, leading to an underestimation of diversity, whereas skills requirements limit NPS potential users. The assessment tools associated with each method have a restricted geographical range of use (Switzerland or England). To be used elsewhere, these would need local adaptation (expert knowledge or mathematical modelling).

Keywords: Ponds, assessment and monitoring methods, biological quality

Title: LILAZ project: a pilot study funded by Regione Lazio to verify the potential of Odonata as biological control agent against mosquitoes

Authors: Antonio Ruggiero, Marco Di Domenico, Stefano Cerioni, Cecilia Silvestri and Gianmaria Carchini.

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Abstract: As mosquitoes require water to breed, ponds are considered systems favouring mosquito's presence and infestations which in turn threaten public health and quality of life. In Italy, mosquito's infestations create social and economic problems and millions of EURO are used for their control every year. Integrated

control programs consider prevention, hygiene good practises and biocontrol agents, while they limit the use of chemicals which are destructive to environment. Scientific evidences suggest that in ponds with diversified communities mosquitoes populations are controlled by predator taxa, this fact represents an opportunity for integrated control programs. In fact ponds as systems, and natural predators as biocontrol agents, may be used against mosquitoes at landscape and community level respectively. In 2007, Regione Lazio funded the project "Libellule (Odonati) per la lotta biologica contro le zanzare – LILAZ" to investigate the potential of Odonata as biocontrol agent against mosquitoes. This study is carried out by Università "Tor Vergata" in collaboration with the SME Cypraea, and it will analyse the economic value of possible positive results. The aim of this communication is to share ideas and experiences, to ask for critics and feed-backs and to plan possible collaborations for future projects dealing with this topic.

Keywords: Pond, ecosystem services, invertebrate, integrated control, diversity

Title: Human uses and the conservation of Mediterranean temporary ponds

Authors: Josep Mascaró Pons, Mònica Allès Marqués, Irene Estaún Clarisó, Eva Cardona Pons, Pere Fraga i Arguimbau and Joan Juaneda Franco

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Abstract: The conservation of Mediterranean temporary ponds in the island of Minorca has been related to human uses since prehistoric times. This situation changed in the 70's decade with the decline of rural activities and the introduction of new agricultural techniques. Most of the temporary ponds are facing important threats due to these changes in farm activities. Some specific problems reported are the destruction of traditional dry stone walls that protect the inundation area from over frequentation by cattle or, on the other hand, the overgrowth of bushy vegetation due to a lack of grazing. Aiming to get a long term conservation of this priority habitat, the "LIFE BASSES" project is promoting restoration actions in the temporary ponds of the island. These initiatives are not only a simple work of reconstruction, but they include also the signature of agreements with farmers and landowners and also awareness information about the ecological and ethnological importance of this habitat.

Keywords: Temporary ponds, Minorca, traditional uses, restoration, conservation

Title: Raising social awareness of conservation and management of Mediterranean temporary ponds in Minorca

Authors: Mònica Allès Marqués, Eva Cardona Pons, Josep Mascaró Pons, Irene Estaún Clarisó, Pere Fraga i Arguimbau and Joan Juaneda Franco

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Abstract: Despite their ecological and scientific importance, Mediterranean temporary ponds are little known by most of the people. Their small size and the unattractive appearance of most of the biota inhabiting them are among the main

reasons for this lack of public consciousness, which is a serious threat to the long term conservation of this habitat. It is well known that social awareness is a main milestone for any successful environmental management. For these reasons an important number of actions included in the LIFE BASSES project aim to get people involved in the project objectives. These actions range from mass media communication to educational activities like guided tours to an artificial pond created for didactic purposes, or an itinerant exhibition through all the villages of the island. Some of these actions have been developed from the first stages of the project and some positive results have been reported like an increasing concern about the habitat or the landowner collaboration in conservation activities.

Keywords: Temporary ponds, Minorca, social awareness, conservation

Title: Contribution of standing waters to regional aquatic biodiversity: the case of water beetles in south-east of Spain

Authors: F. Picazo, A. Millán, J. L. Moreno, J. Velasco and J. De las Heras

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Abstract: South-east of the Iberian Peninsula and, particularly, the province of Albacete is a recognised area of high aquatic biodiversity being water beetles one of the most known faunal groups contributing to that biodiversity. Standing waters are diverse in this region including small water body types: fresh, saline, temporary, permanent, karstic, endorheic and artificial. Despite this habitat diversity, no attempt has been done in order to analyse the contribution of those standing waters to regional biodiversity. In this study we identified which of the 218 species recorded in the regional check-list were found in standing waters, which species were exclusive of them (not occurring in running waters), and which habitats showed the highest conservation value. Finally, we highlight the most threatened species and the main impacts disturbing these habitats.

Our results showed that standing water bodies hold the 58.3% (127 species) of the regional species pool, 56 of them lacking in running waters. Freshwater ponds contributed with the highest richness (72.4%, 92 species), and saline water bodies contributed with the most singular and threatened species: *Nebrioporus baeticus*, *Ochthebius tudmirensis* and *Ochthebius irenae*, three Iberian endemisms. Other rare and threatened species were *Gyrinus suffriani*, *Hydaticus seminiger* and *Graphoderus cinereus*.

Keywords: water beetles, standing waters, biodiversity, conservation

Title: Introduction and radio-tracking of European pond turtle population (*Emys orbicularis*) in a restored habitat of the Valencian Community, Spain

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Abstract: The study was realized in the "Marjal de Rafalell i Vistabella" (Massamagrell), a coastal wetland of the Valencia Community situated 10 km to the

north of Valencia City. The restoration realized in 2006-2007 consisted mainly of the creation of a pond connected with the existing ditches network. Once checked for good ecological state and the absence of competitive species (*Trachemys* spp.), 26 individuals of *Emys orbicularis* were introduced on July 2007. 4 of them were tagged with transmitters (2 males, 2 females, one of them gravid). The radio-tracking was followed from the introduction date to December, twice or three times a week. Very good localization results were obtained which allowed analysis of several behaviour elements: habitat use, home range, nest zone, hibernation zone, migration routes, and rates of activity according to the period of the year. All the tagged individuals showed a similar behaviour in their movements through the same ditch toward the south. They surprisingly arrived relatively synchronized at the same zone and about the same date for the hibernation period (inside and outside of water). At present, more radio-tracking data are being collected to complete a year life cycle.

Keywords: Pond restoration, *Emys orbicularis*, radio-tracking, home range, hibernation zone

Title: Contribution of Integrated Constructed Wetlands (ICWs) to catchment biodiversity and river water quality - A case study in Ireland

Authors: Gustavo Becerra, Rory Harrington and Mary Kelly-Quinn

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Abstract: This paper investigates the contribution of Integrated Constructed Wetlands (ICWs) to catchment biodiversity and river water quality in the Anestown River, Co. Waterford, Ireland. ICWs are a surface-flow type of constructed wetland used to treat wastewater from farms, principally slurry and farmyard dirty water. Each system consists of a series of ponds that are planted with emergent plants and in which the water depth is controlled.

Results showed a high contribution of ICW ponds to the overall catchment biodiversity, which highlighted the enormous biodiversity enhancement potential these systems exhibit in an agricultural landscape context. In addition, the hydrochemical results showed that median values for most hydrochemical parameters were generally below the regulation limits. However, intermittent pollution seemed to be a feature of the catchment and was confirmed by the macroinvertebrate community analyses. In general, the pollution detected was largely from sources other than ICW outputs. Finally, results on fish indicated a patchy distribution of trout which was related to both water and habitat quality. This information can be used in future management plans to address issues relating to catchment biodiversity as well as river water quality.

Keywords: constructed ponds, wetlands, catchment biodiversity, macroinvertebrates, water quality

Title: Succession of aquatic macroinvertebrate communities in a new creation coastal pond

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Abstract: The present study was carried out in Cal Tet's pond, which was created in 2003 as a compensation for the loss of natural habitats in the Llobregat's delta river (Barcelona, Spain). The aquatic macroinvertebrate communities were sampled monthly from May of 2004 to July of 2005. We examined the deepest zone of the pond using a Van Veen Grab Sampler (quantitative samples). This area was spontaneously colonized by different species of *Chara* in 2003 and they disappeared at the beginning of our study. In the spring of 2004 the helophyte *Phragmites australis* was planted along the margins of the pond. We examined the macroinvertebrates attached to the helophyte using a quantitative method (Kornijów's and Kairesalo's sampler). We completed the analysis with semi-quantitative samples of the littoral area using a sweep-net (250µm mesh).

Although the Chironomidae were the more abundant and diverse taxa in all the samples, there were significant differences between the habitats. The succession of taxa was linked to the changes experienced by the habitat conditions along time.

Keywords: sucession, macroinvertebrates, new colonization, chironomids, coastal ponds

Title: Combat of the Pumpkinseed sunfish (*Lepomis gibbosus*)

Authors: Wilbert Bosman and Jeroen van Delft

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Abstract: A case study about the irradiation of a Pumpkinseed sunfish (*Lepomis gibbosus*) population in a pool where nine amphibian species breed, including *Triturus cristatus* and *Pelobates fuscus*. The pumpkinseed sunfish is a non-native species for the Netherlands and is a big threat for native faunal species in isolated ponds, pools etc.

Keywords: *Pelobates fuscus*, *Triturus cristatus*, *Lepomis gibbosus*, irradiation pool

Title: Conservation of native pond fishes —How is the growth and condition of native crucian carp *Carassius carassius* affected by feral goldfish *C. auratus*

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Abstract: Ponds are important ecosystems for some native fish species (e.g. crucian carp *Carassius carassius*) but also can be the release sites for unwanted pet fish, especially the Asiatic cyprinid, goldfish *Carassius auratus*. Despite its long history of introductions in Europe, and its demonstrate adverse genetic impact on crucian carp, the biology and the ecological impacts of introduced goldfish remain little studied. To address this, we examined growth in crucian carp and goldfish in quasi-natural ponds of Epping Forest (London, England), both in sympatry and allopatry.

The growth trajectories in allopatry and sympatry revealed much faster growth of goldfish in sympatry than allopatry. Crucian carp growth trajectories were similar in allopatry and sympatry but in sympatry crucian body condition values were significantly higher (t-test, $P < 0.001$) than in allopatry. These results may simply reflect differences among ponds in food availability, with goldfish-only ponds coincidentally having greater resources, or alternatively that co-existence incites these congeners to maximize growth potential, with associated ramifications for reproductive output. The implications for crucian carp conservation are discussed.

Keywords: illegal releases, acclimatization, ornamental non-native fish, threatened native fish

Title: Community Pond Warden Scheme for Lancashire (UK)

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Abstract: There is great enthusiasm for ponds amongst the general public, and volunteers and community groups are a vital means of solving many local pond problems. The Community Pond Warden Scheme for Lancashire, in the north west of England, is a two year pilot project that empowers local people, communities and organisations to conserve Lancashire's important pond landscape.

The scheme aims to tackle the issues of inadequate data, lack of awareness, pond loss and degradation, and a misunderstanding of ponds, by publicising ponds, running surveys, helping people fund and carry out pond creation and management projects, and providing training, advice and information. The Project Officer, based in Lancashire, visits sites, gives talks, holds events, and works closely with local people, as well as working with policy makers, and influencing local and regional conservation strategies.

People are enthusiastic to get involved, and the scheme has been instrumental in instigating many new pond creation and management projects, and improving the biodiversity benefits and success of other projects. As the pilot scheme draws to a close, it leaves a legacy of increased awareness and real on-the-ground improvements of Lancashire's Pond landscape, and the lessons learnt from this work are important.

Keywords: pond warden, volunteer, community, survey, pond creation, pond management, awareness

Title: Nutrient loading in eutrophic urban ponds

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Abstract: In/out budgets of 9 eutrophic ponds from the Woluwe River catchment (Bruxelles, Belgium) showed that all the ponds act as sinks of dissolved inorganic

nitrogen and 7 out of 9 ponds act as sources of phosphorus (P), owing to soluble reactive phosphorus (SRP) release from the sediment. Nutrient fluxes at the water - sediment interface were assessed with 39 incubations in benthic chambers in light and dark conditions. NH_4^+ was released from the sediment in 34 cases out of 39. SRP was released in 36 cases out of 39. When present in the water column, NO_3^- was consumed. On bare sediment, NH_4^+ and SRP fluxes were very highly significantly correlated. These fluxes are positively significantly related to the Secchi depth of the months preceding the flux measurement. Fresh organic matter mineralisation determines the availability of inorganic nutrient in the water column. Historical pollution could however be important for P fluxes.

The measurement of the P release rate allows the ponds with the highest internal loading rate to be identified. This has important management implication as it can be used as an objective criterion for the selection of ponds in need of sediment removal for their ecological quality restoration.

Keywords: Nutrient loading, phosphorus, nitrogen, flux

Title: A preliminary assessment of Important Areas for Ponds (IAPs) in Wales

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Abstract: The Important Areas for Ponds (IAPs) project in Wales was set up to identify, and so help protect, networks of the most important ponds for their biodiversity. It is a first test of this new targeted approach to pond conservation in the UK. IAPs are geographical areas which support significant numbers of High Quality Ponds (HQPs). These ponds are identified using a standard set of biological criteria similar to those used to identify Priority ponds under the UK's Biodiversity Action Plan and using available data held by a wide range of pond stakeholders.

Six areas which have important concentrations of ponds of high conservation value were identified as IAPs. Five further areas, which are likely to support significant concentrations of HQPs but which are currently data deficient, were identified as potential IAPs (pIAPs). The IAP assessment is now being disseminated widely to raise awareness of the importance of ponds in Wales, and to help address data gaps. This work also provides a preliminary framework to deliver the UK's Pond Habitat Action Plan in Wales. Specifically, the results of this study will help target pond conservation measures, particularly practical 'on the ground' conservation actions such as pond management and creation.

Keywords: Ponds, Important Areas for Ponds, distribution, conservation, biodiversity

Title: Valuation of the diversity of aquatic macroinvertebrates in galician (NW Spain) ponds included in the natura 2000 network

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Abstract: Wetlands are among the world's most productive environments, but these ecosystems are endangered due to their fragile nature and because of human pressure. The necessity of protecting terrestrial and aquatic ecosystems stimulate the creation of the Natura 2000 Network and the approval of the Water Framework Directive. Galicia (NW Spain) has a great heritage of wetlands included in the Natura 2000 Network as Sites of Community Importance. To evaluate the conservation state of the different habitats of the stagnant waters, a study of the wetlands was raised from the inventory and monitoring of the invertebrate communities (project financed by the Xunta of Galicia, PGIDT06 RFO31001OR). 21 of the 23 Sites of Community Importance that contain ponds were sampled in 2007, including 30 ponds in all. Semiquantitative macroinvertebrate samples were taken in spring and summer using an entomological net of 500 μm mesh. We also studied the main physical and chemical parameters of the water (temperature, conductivity, pH, oxygen, TDS, and some nutrients). Currently, we have identified 93 different aquatic macroinvertebrate taxon in the spring samples.

Keywords: Natura 2000 Network, macroinvertebrates, wetlands, Galicia

Title: The french pondscape: state of the art

Authors: Olivier Scher

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Abstract: How many ponds are there in France? Answering this huge question, related to the small size of ponds (i.e. waterbodies less than 0.5 ha, in France), was one of the main goal pursued by the French pond network, Pôle-relais Mares et Mouillères de France, since its creation. If this objective is not already reached, surveys conducted at the country scale by our regional partners (nature association, regional and local authorities, etc.) involved in the network, help to draw an updated picture of the French pondscape.

To date, we estimate that a minimum number of one million ponds can be suggested in France with the main concentrations found in plain areas and the smallest numbers in mountains and Mediterranean areas. Moreover, plenty of them appear to be abandoned often in relationship with the loss of their traditional use. These new data combined with observations on the importance of ponds for biodiversity should help us identify and suggest good practices for their conservation.

Keywords: pondscape, France, state of the art

Title: "Ullals Project": Recovery of a priority habitat in l'Albufera Natural Park

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Abstract: "Ullal" is the local name of ponds originated by natural freshwater springs. Due to the extremely high quality water, a great number of different plants and

animals species are present, most of them endemic and/or endangered. In addition, Calcareous fens with *Cladium mariscus* (one of the Priority Habitat included in the Habitats Directive of European Union), are found surrounding these pools.

The main objective of the LIFE Project is the recovery of these priority habitats. Recovery and reintroduction actions of species included in European Directives (*Valencia hispanica*, *Kosteletzkya pentacarpa*, *Emys orbicularis*,...) are also being carried out. The project has contemplated actions such as land acquisition of fields surrounding the "ullals", wetland restoration works and activities in support of the recovery of associated species of fauna and flora. Also naturalistic use and educational and scientific activities are being promoted. The LIFE Project has represented a cost of 1.061.972 €, in which European Union has contributed 75%. Prior to the project execution, surface and water quality of "ullals" had diminished due to anthropic actions, including inflows of water containing chemical compounds. Also signs of debris could be found on the ponds and activities like fishing or hunting were not controlled.

Keywords: freshwater springs, pond, restoration, reintroduction

Title: Macroinvertebrate diversity in farm ponds of Andalusia (southern Spain): effects of substrate and water quality

Authors: Francisca Fuentes, Jesús Casas, Irene Gallego, Melchor Juan, David León, Patricio Peñalver and Julia Toja

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Abstract: The agricultural intensification in Spain over the last four decades has determined the desiccation or eutrophication of many continental aquatic ecosystems, with the concomitant biodiversity loss. On the other hand, farm water storages have increased exponentially, particularly in the more intensive areas, which, paradoxically, may have a non-negligible role for aquatic biodiversity conservation. An extensive physico-chemical and biodiversity survey was carried-out during spring 2007 on 120 farm ponds all over Andalusia. In this study we present preliminary results on macroinvertebrate diversity of 20 of these ponds that were selected to represent a wide range of environmental variables and types of construction.

A total of 44 macroinvertebrate families were identified in the 20 ponds studied. The most frequent taxa in this set of ponds were: Chironomidae, Corixidae, Oligochaeta, Libellulidae and Caenidae. Ponds with natural substrates showed higher macroinvertebrate diversity compared to ponds made of concrete or made waterproof with polyethylene. However, in ponds with artificial substrates when submerged macrophytes were present macroinvertebrate diversity increased significantly. Ponds filled with treated wastewaters showed the lowest macroinvertebrate diversity, virtually reduced to Chironomidae.

Keywords: Macroinvertebrates diversity, pond substrate, water quality, Andalusia

Title: Pond management and water quality for irrigation in greenhouse areas of Almería (southeast of Spain)

Authors: Melchor Juan, Santiago Bonachela, M^a Antonia Elorrieta, Francisca Fuentes, Irene Gallego, Carmen Pérez, Pedro Sánchez and Jesús Casas

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Abstract: More than half of the ponds referenced by a recent pond inventory of Andalusia (CMA, JA, 2007) are concentrated in greenhouse areas of Almería and are used for supplying drip irrigation systems. These systems require good quality water, especially concerning the presence of abiotic and/or biotic particles that may cause clogging problems. Most farmers use biocides, mostly copper sulphate, to avoid this problem. Other spreading technique is covering the pond with plastic screen-nets to minimise biotic activity. Both techniques potentially impair pond biodiversity. We present some preliminary results on the effects of these management techniques on water quality for irrigation based on a field survey of 60 ponds. Pond management was characterized throughout farmers' interviews. Our results show that pond covering was effective to reduce suspended solids, except when ponds were filled with recycled wastewaters. The application of biocides did not always result in a significant reduction of suspended solids. On the contrary, ponds with submerged macrophytes subjected to biocide applications showed significantly higher concentrations of suspended solids compared to those ponds not treated or slightly treated with biocides. A few farmers showed a sound empirical knowledge about the use and management of submerged macrophytes to improve water quality.

Keywords: irrigation ponds, management, water quality for irrigation, Almería

Title: The ecological importance of cripto-wetlands to develop biological conservation strategies

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Abstract: If the current classification of wetlands is so varied that the essence of a wetland has been lost, do not be said as for the cripto-wetlands. Thus, in the majority of the plans of management of temporary ponds, marshes or small ponds, cripto-wetlands are not considered. Our studies demonstrate that the general handling of an aquatic system can be improved substantially contemplating the functional characteristics of the cripto-wetland that could have associated. Sometimes management plans does not turn out to be so efficient for lacking this ecological base.

Keywords:

Title: Monitoring pond breeding amphibians according to the EU-Habitats Directive

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Abstract: According to Article 17 of the EU-Habitats Directive, monitoring programs for all species listed in Annexes II, IV and V are obligatory for member states. In the province of Salzburg (Austria), pilot projects for two pond breeding amphibians, the agile frog (*Rana dalmatina*, Annex IV) and the crested newt (*Triturus cristatus* superspecies; Annex II and IV) have been launched this year. Methods and first experiences are presented and discussed.

Keywords: Amphibia, EU-Habitats Directive, monitoring, *Rana dalmatina*, *Triturus cristatus* superspecies

Title: Life-history of a Mediterranean motorway stormwater pond

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Abstract: In Europe, environmental legislation urges motorway companies to control road runoff water by building stormwater detention ponds. These ponds were firstly designed to control water flow during rainstorms, to catch contaminants from road runoff water and to confine pollution in cases of exceptional contamination. One of these detention ponds (GRA) was studied for six years for its chemical and biological parameters. Built in 1996, this pond was designed to catch runoff from a 3.1 ha area (capacity of 1200 m³). In previous studies, we pointed out its high aquatic richness and discovered a large paedomorphic population of Palmate newt. Recent surveys highlighted the presence of dense meadow of charophytes and the appearance of pioneer helophytes, sign of a natural succession dynamic. We also observed a low sediment thickness, reflecting turbulent conditions, and its enrichment by trace metals confirming the role of the pond as a pollutant sink.

The repairing of GRA pond is planned for the end of 2008 because of watertightness loss and global deterioration. This maintenance operation, consisting of a new plastic membrane deposit, will lead to a huge disturbance of the pond ecosystem. This example clearly highlights the technical function of stormwater detention ponds that can not be confused with a role of substitution habitat for wildlife.

Keywords: stormwater pond, motorway, technical function, management

Title: Waterbodies restoration and its effect on amphibian populations

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Abstract: One of the main objects of the Life-nature project Restoration of Priority Habitats for Amphibians (LIFE05/NAT/E/000060) is the amphibian populations recovery. First results on waterbodies restoration and its colonisation by amphibians are here shown. Original morphology of waterbodies and rainfall water inputs have been restored. Once impacts have been eliminated Iberian Parsley Frog is the first amphibian to come back, followed by the Natterjack Toad and the Common Toad. Iberian Ribbed Newt, a less mobile species, has colonised a restored waterbody after few months.

Keywords: LIFE project, amphibian populations, waterbodies restoration

Title: Advances on the Life-Nature Project "Restoration of Priority Habitats for Amphibians"

Authors: Ignacio Lacomba and Vicente Sancho

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Abstract: Advances on the Life-nature project Restoration of Priority Habitats for Amphibians (LIFE05/NAT/E/000060), started in 2006, are here presented. Actions developed till now are: (i) Establishment of 9 new faunal reserves for amphibians and other 10 under process, (ii) Owners subsidies for waterbodies restoration, (iii) 36 water points restored within 15 sites of the Natura 2000 Network, (iv) Development of a Mediterranean waterbodies restoration handbook, (v) Monitoring of the limnology and of the plant and amphibian communities, (vi) Launching of an awareness raising campaign -workshops and lectures- (vii) Participation on several international meetings and symposiums, and (viii) Organisation of the 3rd European Pond Conservation Network Workshop.

Keywords: Natura 2000, LIFE-nature, waterbodies

Title: Inventory of the temporary pools of the province of Benslimane (Morocco) by remote sensing and implication for their conservation

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Abstract: Morocco knew these last decades an important demographic pressure and a strong use of its natural resources, of which the temporary pools named locally "dayas". These environments, very abundant and very varied in Morocco are known for their biodiversity, notably in species to high patrimonial interest. Benslimane province has an important number of temporary pools between Rabat and Casablanca, two big megapoles. Due to this geographical situation, Benslimane province is confronted to a high demographic pressure that leads to a partial or total degradation of its temporary pools. The efficient conservation of these temporary submerged environments biodiversity needs an appropriated protection and management. Thus, the goal of this research is to follow the evolution of temporary pools number and surface in Benslimane province between 1955 and 2001. So,

available cartographic informations such as Théron and Vindt's 1/200 000 Casablanca-Rabat vegetation map (1955), and two Landsat images (1987 and 2001), have been used. Results of this diachronic study are then discussed in the viewpoint of sustainable management and conservation of these threatened ecosystems.

Keywords: Morocco, Benslimane province, temporary pools, remote sensing

Title: The role of fishes in the ecology of mediterranean ponds

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Abstract: This work covers several research issues on different aspects of fish trophic ecology in Mediterranean shallow lakes and ponds. First, the feeding ecology of the Iberian endemic fish *Chondrostoma arcasii* and the introduced *Gambusia holbrooki* was studied experimentally by means of bifactorial mesocosm experiments performed in two shallow lakes, testing different nutrient concentrations and fish population densities. The fish communities inhabiting some shallow Spanish Mediterranean coastal lakes were also investigated. Gut contents were analysed to determine the foraging pattern of each species and the influence on the lake food web. For the Albufera Lake (Spain), an exhaustive historical review of the ichthyofauna data is presented, together with fishery records. Finally, experimental results were studied about the effect of fish density and nutrients on the epiphyton of a shallow lake (lake Sentiz, León). The role of direct and indirect effects of fishes and the importance of their dietary features are stressed as key factors for understanding the causes that control epiphyton and food web structure of the study shallow lakes. Fishes affected biodiversity, quality and water transparency. Restoration of eutrophic shallow lakes must involve control of nutrient inputs and fish communities, with adequate policies for fish and plant management and conservation.

Keywords: trophic, food web, mesocosms, indirect effects

Title: From Pond Emergency to Pond Fashion: an international case-study of pond marketing in Trieste

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Abstract: Ponds around Trieste has been managed for centuries, assuming also ethnographic value. After 1950 their number started quickly to decline. To protect these habitats, in 1965, began the first pond project, with the publication (by the Trieste Natural History Museum) of the catalogue of local wetlands. So, in those years, the first European group for pond study and protection has been founded in Trieste.

In 1974 was achieved the first restoration of a pond with the only aim of protecting its biodiversity. The Trieste Natural History Museum conservation plan consisted of:

(i) pond restoration, (ii) eradication of alien species, (iii) pond construction -testing different materials-, (iv) reintroduction of autochthonous species, (v) popularisation and environmental marketing, (vi) research and monitoring.

In 2001 the Museum started a course in: "Conservation and Management of Small Freshwater Wetlands". Every year around 30 people attended the course and now, thanks to them, similar initiative of pond protection are spreading in Italy (Friuli Venezia Giulia, Liguria, Emilia Romagna, Piemonte) and trough the borders to Slovenia and Croatia. In Trieste the awareness of pond protection is nowadays so spontaneous widespread that it become a sort of "fashion" out of scientific control, with some interesting but doubtful results.

Keywords: pond awareness divulgation, conservation, Trieste

Title: Zooplankton diversity in farm dams of Andalusia (Southern Spain)

Authors: D. León, J. Toja , P. Peñalver, F. Fuentes, J. Casas, I. Gallego and M. Juan

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Abstract: Agricultural intensification has increased in Spain for the last four decades. This has determined changes in territory, such as the increase of irrigated land and creation of farm water storages (farm dams). They have a wide range of flooding due to natural or human causes, but their management is unknown because they belong to private properties and their use is not monitored. An extensive physical-chemical and biodiversity survey was carried-out during spring 2007 on 120 farm dams all over Andalusia. Then, 30 sites were selected for an intensive seasonal sampling up to 2009. Preliminary results of zooplankton diversity and spatial ordination patterns are shown.

Many natural wetlands have historically been studied, but nothing we know about these recent reservoirs. The objective of this work is to evaluate their diversity and contribution to a future conservation network in order to preserve the whole potential of wetlands biodiversity.

This study belongs to a project of the Andalusia Water Agency that aims to provide guidelines for the sustainable management of farm dams and to include some of them in a network strategy for pond conservation. The universities of Seville, Almeria and Granada are responsible for the study together with EGMASA.

Keywords: farm dams, zooplankton, Andalusia, management

Title: EPCN: Reviewing the network

Authors: Andrew Hull

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Abstract: The third meeting of the European Pond Conservation Network in Valencia provides an opportunity to review the growth and development of the network since its formation in Geneva in 2004. In addition to delegate information,

which has been compiled from workshop attendance lists, the Keywords provided by all presenters for their verbal and/or poster presentations have been examined in order to identify areas of research interest and changing trends in European pond conservation.

Keywords: EPCN workshops research trends

Title: Multi-group diversity partitioning in a pond complex at Tommelen (Hasselt, Belgium) and effects of pond management (dredging)

Authors: De Bie T., Colson L., Declerck S., Denys L., Vanhecke L., Vanormelingen P., Villena M., Ercken D., Vyverman W., Van der Gucht K., Boudewijn G., Brendonck L., Martens K. and De Meester L.

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Abstract: Recent research results have demonstrated that small aquatic ecosystems contribute disproportionately to regional biodiversity, largely because of their high beta-diversity. Understanding the factors that determine overall diversity of an area is crucial for the development of conservation strategies. We present some first results of a survey that was carried out in ponds of the bombcrater field Tommelen to unravel and compare patterns in alpha- and beta-diversity for a wide array of organisms (from bacteria to amphibians) as well as for hydrochemical and physical factors. Due to the high number of ponds of similar age in a restricted area, we are able to determine the variables that are associated with alpha- and beta-diversity, independent of pond age or biogeographical differences, on a spatial scale that is relevant to many pond restoration projects. This pond complex also provides ideal opportunities to evaluate the effects of pond management on a number of replicated systems. One of the most applied management techniques is dredging to prevent ponds from filling in due to natural succession. A number of ponds in Tommelen will be dredged at the end of 2008 after which its effects on the composition and diversity of biota will be assessed and compared to non-managed systems and to the pre-management situation.

Keywords: alpha-diversity, beta-diversity, dredging, pond complex

Title: Restoring of ponds as landscape elements and habitat for amphibians in Estonia

Authors: Riinu Rannap and Lars Briggs

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Abstract: The crested newt (*Triturus cristatus*) is found mainly in Northern and Central Europe. Despite a widespread distribution, this newt species has declined considerably during the latter part of the 20th century in all of Europe, primarily due to the loss of suitable habitats. Large amounts of small freshwater bodies have disappeared or decreased their ecological value due to the loss of their historical function and the changed landscape use. The rationalised agriculture of the present days is less interested in ponds, thus ponds have been filled in, stocked with fish,

polluted, mismanaged, desiccated etc. not only in Estonia but elsewhere in Europe. The degradation of pond landscape has been followed by the rapid decline of several amphibian species in Estonia, the crested newt and the common spadefoot toad (*Pelobates fuscus*) among others. To save the small and isolated populations of the crested newt and spadefoot toad from extinction, a LIFE-Nature project "Protection of *Triturus cristatus* in the Eastern Baltic Region" was launched in 2004.

Since then approximately 200 ponds have been restored and created in Estonia. The crested newt has colonized 52.2% and the spadefoot toad 13.6% of all the managed ponds in three years (2005-2007).

Keywords: habitat loss, *Triturus cristatus*, *Pelobates fuscus*, colonization of ponds

5.3.2 Pond ecology at different spatial scales

Title: Zooplankton diversity in relation to the degree of isolation

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Abstract: The theory of island biogeography predicts that the number of species decreases with geographical isolation and increases with island size. Here, we present evidence for an opposite effect of isolation on cladoceran species richness in a set of disjunct pond habitats.

The mechanism that underlies this pattern is caused by differential dispersal capacities of keystone species that directly or indirectly alter the species richness of the target group. The probability of finding fish communities in isolated ponds tends to be low, which is in line with the expectations from the theory of island biogeography. Submerged vegetation, however, is often more abundant in such water bodies. As a consequence of the absence of fish and the presence of high abundances of vegetation, the richness of zooplankton is higher in isolated than in non-isolated ponds. These results demonstrate that single-species meta-population approaches may be misleading in understanding the potential effects of isolation or habitat fragmentation. A meta-community approach that takes ecological interactions into account is necessary to increase insights in patterns of species richness in a gradient of isolation. Our results also indicate that overall biodiversity, at the regional scale, is highest if one includes pond systems that strongly vary in the degree of connectivity.

Keywords: Isolation, dispersal limitation, connectivity, keystone species

Title: Occurrence of Leeches (Hirudinea) in different Types of Water Bodies in Northeast Germany (Brandenburg)

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Abstract: Data of the leech fauna (Hirudinea) in Northeast Germany (state Brandenburg) are presented and compiled in a preliminary checklist including historical findings as well as new records provided by UWE JUEG. In the studied area, 16 of 24 known leech species in Brandenburg are found. Studies are focused on leeches in pondlike temporary kettle holes in comparison to other types of water bodies. *Dina lineata* (O. F. MÜLLER, 1774) is the characteristic species of the kettle holes, well adapted to extreme conditions of the wet-dry-cycle and strong eutrophication. *Erpobdella vilnensis* LISKIEWICZ, 1925 so far has not been found in ponds and kettle holes, but surprisingly reproduced like *Dina lineata* after total mud clearance.

Unexpectedly, the endangered species *Hirudo medicinalis* LINNAEUS 1758 (FFH-guideline of European Union) occurs in semi-permanent kettle holes in the intensively used agricultural landscape. *Erpobdella octoculata* (LINNAEUS, 1758) is the most common species in all water body types studied. Fourteen accompanying leech species have been observed, but only *E. nigricollis* (BRANDES, 1900) is relatively closely connected to *E. octoculata* (steadiness >40%).

Keywords: kettle holes, leeches, Hirudinea, Brandenburg, Germany

Title: Ecological assessment of Mediterranean ponds (north Iberian plateau) using macroinvertebrates

Authors: Cristina Trigo-Domínguez, Camino Fernández-Aláez and Francisco García-Criado

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Abstract: Fifty-five macroinvertebrate metrics were tested for their response to pond condition in 41 ponds of Northwest Spain to develop a preliminary multimetric index for ecological assessment of Mediterranean flatland ponds. Stressor specific response of individual attributes to eutrophication and habitat condition was also investigated to identify differences in the responses of metrics to single stressors and elucidate how this might affect the performance of the final index. Several combinations were tested using discrimination efficiency (25th percentile of slightly impaired sites for metrics decreasing with perturbation and 75th percentile of slightly impaired sites for metrics increasing with perturbation) and Mann Whitney U-test with Bonferroni adjustment ($P < 0.001$). The final index comprised five measures (generic richness of Chironominae, generic richness of Dytiscidae+Odonata+Tanypodinae, relative richness of Chironomidae, % Macropelopi and Shannon index) and discriminated between acceptable (good) and unacceptable (moderate) conditions with more than 85% efficiency. Moreover, all the five measures included in the final index showed unidirectional responses to eutrophication. In contrast, the effect of habitat alteration was less clear. Interestingly, none of the functional groups (e.g. % predators and % collectorgatherers) were sensitive to degradation.

Keywords: Multimetric index, human-induced perturbation, macroinvertebrates, Mediterranean ponds

Title: A typological approach to maximize efficiency of regional biodiversity sampling in ponds

Authors: Angélibert S., Auderset Joye D., Juge R., Lachavanne J. B. and Oertli B.

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Abstract: Ponds are numerous throughout Europe but they differ very much in terms of abiotic characteristics and associated biocenosis. Therefore, a pond typology for a comprehensive conservation of pond biodiversity appears imperative. We used Self-Organizing Map algorithm (SOM) to visualize the species richness of Coleoptera, Odonata, Gastropoda and Amphibia in relation to environmental variables in 80 ponds scattered throughout Switzerland. Each site was characterized using 16 physico-chemical and landcover variables chosen among 100 available. Firstly, the sites were classified according to the environmental variables. Two major clusters of sites corresponded to altitudinal and lowland ponds. Altitudinal ponds were divided into 2 clusters according to water transparency.

Lowland ponds were divided into 3 clusters according to forested surrounding and water transparency. Secondly, the species richness was examined on the SOM trained with environmental variables. Not surprisingly, there was a gradient of richness from altitudinal to lowland ponds. Among lowland ponds, cluster characterized by a low forested environment, high water transparency and high percentage of submerged vegetation tend to have the highest species richness except for amphibians. Finally, representative species for each cluster were specified. This study allows the development of a Swiss pond typology, used to maximize the efficiency of biodiversity sampling.

Keywords: invertebrate, amphibian, species assemblages, species richness, small waterbodies, nature conservation

Title: A 50 years of Cladocera and macrofossil assemblages dynamics of a shallow lake in the Duero's Basin

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Abstract: The aim of this study was to observe the long-term changes produced in a shallow lake of the Duero's basin using the cladocerans and macrofossil composition. An 80 cm sediment core from Sentiz were collected in July 2006. In the field, the core were sectioned horizontally into 2 cm thick slices. Subsamples were analysed for ^{210}Pb , ^{226}Ra and ^{137}Cs . A total of 40 sections of the Sentiz core were prepared for taxonomic identification of cladocerans. Previously, in each section the presence of macrofossils remains was wrote down. *Chydorus sphaericus* was the most abundant specie in the all core. Other especially important species were *Graptoleberis testudinaria*, *Alonella nana* *Alona rectangula* and *Alona guttata*. Three decreases of the diversity and richness were observed: since 1968 to 1974, 1981-1993 and since 2001 to 2006. These decreases were accompanied of an increase of dominance of *Chydorus sphaericus*. A decrease of the diversity of

macrofossils was appreciated in the same years too. These results probably were due to intense changes in the environmental conditions as the drought period produced since 1980 to 1995 in Spain.

Keywords: paleolimnology, cladocera, shallow lake

Title: Biogeographical diversity of *Ruppia* in saline ponds and lagoons along the western Mediterranean coast

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Abstract: *Ruppia* taxa are widespread in saline habitats across Europe. Coastal lagoons are mostly dominated by a dense submerged vegetation of *Ruppia*. The diversity and distribution of *Ruppia* taxa across Europe is not well known. In European flora's mostly two species are recognized, namely a diploid *Ruppia maritima* and a tetraploid *Ruppia cirrhosa*. In the EUNIS database of the European Environment Agency, only two *Ruppia* species are considered for the biodiversity list of Natura 2000, Corine habitats and Biogenetic Reserves. However, the variability in reproductive features, clonal growth and life cycle strategies assume that more *Ruppia* taxa occur in Europe.

We investigated >20 *Ruppia*-dominated lagoons and ponds in a western Mediterranean transect from southern Spain (N.P. Doñana) towards France (Camargue) for their diversity in chloroplast DNA. At least 10 haplotypes could be detected and a nested clade analysis revealed the relationship between these chloroplast variants in a geographical context. Mostly one haplotype occurred in each pond or lagoon (more rarely 2 or 3), however neighbouring waterbodies can contain different *Ruppia* strains, thereby increasing the local diversity. It is emphasized that correct identification of evolutionary significant units will be helpful in interpreting and comparing ecological and ecophysiological studies on *Ruppia* dominated vegetations.

Keywords: Saline ponds *Ruppia* Diversity

Title: The unseen majority: population dynamics of some non-insect pond invertebrates

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Abstract: Many models used to predict the consequences of conservation strategies require life history data. While great emphasis has been laid on insects, little is known about the life histories of invertebrates such as annelids, gastropods or cnidarians. However, these species can disproportionately contribute to pond communities in quantitative terms, when compared to dragonflies or beetles. We studied the life histories of four dominant invertebrates (*Hydra* sp., *Tubifex tubifex*, *Helobdella stagnalis* and *Radix labiata*) in two unimpacted ponds, and we compared our results to those previously obtained for insects.

Contrary to most insects which exhibited fast seasonal cycles, the four species occurred throughout the year in the ponds (one or two generations per year) and represented 1.4-46% of the mean annual density, depending on the species and microhabitat type. Secondary production was high, representing 4.8 to 180 mg dry weight/m²/year on average, but could reach 3795 mg/m²/year in some microhabitats (e.g. *R. labiata* in macrophytes). Noninsects contributed most to the overall seasonal changes in invertebrate abundance, and changes in non-insect densities were similar among ponds. Thus, overlooking those species with least conservation priority might lead to biased perception of the functioning of pond invertebrate communities.

Keywords: Life history, secondary production, population dynamics, community structure

Title: Habitat heterogeneity and trophic interactions shape the response of biotic communities to human-induced perturbation

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Abstract: The effects of local and catchment variables, particularly biotic interactions, habitat heterogeneity, water chemistry and land-use, on the composition of biotic communities of 39 ponds located in northwest Spain were investigated to determine the best predictors of community structure. Samples for macroinvertebrates, zooplankton, phytoplankton, fish and water chemistry were collected once in the summer of 2003 or 2004. In addition, morphometry and several catchment variables were estimated using GIS (geographical information system). There was a significant, albeit weak, effect of catchment variables on macroinvertebrates. Moreover, macroinvertebrate assemblage structure exhibited a quadratic relationship to eutrophication, resulting from several land use practices at the catchment scale, such as tillage. In contrast, the structure of phytoplankton and zooplankton assemblages did not change significantly with catchment variables and was mainly determined by factors acting at the local scale, especially habitat heterogeneity and biotic variables. The results highlight the importance of habitat heterogeneity and trophic interactions in understanding the response of biotic communities to human-induced alterations.

Keywords: Habitat heterogeneity, biotic interactions, catchment, local scale, eutrophication, Mediterranean ponds

Title: Biodiversity of waterbird communities in southwestern French gravel pits

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Abstract: Man-made ecosystems provide a variety of resources that have economic values while they may contribute to biological diversity on a local-regional scale. We assessed the influence of habitat age, surface area, macrophyte cover, and connectivity on the waterbird assemblages of gravel pits in a highly anthropized area (SW France). We identified 39 species, among which 11 were rare. The Self-Organizing Map (SOM, neural network) was used to classify eleven pits according to species occurrences, to calculate the probabilities of presence of species, and to bring out habitat conditions that predict assemblage patterns. There was positive influence of macrophytes on waterbird species richness. Larger pits did not support more species, but species richness increased with connectivity, and species-poor assemblages were subsets of richer assemblages. The age of the pits did not influence assemblage composition and species richness. Gravel pits are useful to the reproduction of many waterbirds, but the lack of fundamental knowledge needed to implement management plans limits their ecological value. We suggest that there is an opportunity to enhance the contribution of abandoned gravel pits for the conservation of waterbirds (and probably other taxa, e.g., amphibians, insects, or plants) in urban landscapes.

Keywords: Waterbirds, artificial wetlands, species richness, urban biodiversity, macrophytes, connectivity

Title: Bacteria and protozoa in Mediterranean ponds and wetlands

Authors: Ana Conty and Eloy Becares

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Abstract: Bacteria and ciliates studies are of great interest in the functioning of ponds and wetlands in the Mediterranean. High temperatures and production, isolation, and fluctuant water bodies in the Mediterranean makes microbial components of food web a potential key factor in these ecosystems. Almost no data is available on the abundance and biomass of bacteria, flagellates and ciliates in freshwater Mediterranean wetlands and ponds. This study focused on these groups and their relation to the following variables: nutrients, chlorophyll a, fish (presence/absence), and submerged plant abundance. About 30 ponds and wetlands (from 0,1 to 23 ha) were studied for two years in the Castilla-León region (Spain). Results showed that ciliates and bacteria ranged from 10 to 70% of the total plankton biomass depending on their nutrient level. Ciliates reached record densities among other studies on shallow lakes.

Fish presence and PVI affected total biomass distribution but proportions were kept similar in all cases. Microbial components proved to be important part of the planktonic biocoenoses in ponds.

Keywords: bacteria, protozoa, ciliates, flagellates, zooplankton, nutrients

Title: Assessment of macrophyte community metrics in the determination of the ecological condition and trophic state of Mediterranean ponds

Authors: Pozo Cuevas, R., Fernández-Aláez, C. and Fernández-Aláez, M.

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Abstract: Macrophyte vegetation of 51 ponds situated in the Duero river basin (North Iberian Plateau) was studied with the goal of selecting metrics that respond clearly to perturbation and that should be included in a multimetric index to assess the ecological condition of Mediterranean ponds. A total of twenty metrics representing several aspects of the structure of macrophyte communities (cover, richness, diversity) were selected as potential metrics. In order to assess the ability of the metrics to discriminate between the different categories of ecological condition (high, good, moderate, poor, bad) and trophic state (<50, 50-100, 100-300, 300-600, >600 µg/L), box and whisker plots and ANOVA were carried out. Cover metrics were more correlated with trophic state and ecological condition classes than richness metrics. The results showed a strong overlap mainly between the intermediate classes, so we decided to combine the ecological condition classes for the purpose of evaluating the strength of metrics to differentiate between slightly impaired and perturbed sites.

Total cover, PVI, hydrophyte richness and Shannon diversity were marked as potential metrics for implementing a multimetric index, as they varied with perturbation, were not redundant ($R < 0,8$), showed high discrimination efficiency and significant differences between slightly impaired and degraded ponds.

Keywords: Macrophytes, Mediterranean ponds, ecological condition, trophic state, metrics, multimetric index

Title: Macroinvertebrates of astatic ponds in Central Italy: a functional analysis

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Abstract: Invertebrate macrofauna of 21 astatic ponds in Central Italy were studied in order to detect the relationships between environmental parameters and functional aspects (feeding guilds, habit traits and resistance to drought) of the communities. Macroinvertebrates were collected in three contrasting mesohabitats (macrophyte beds, littoral sediments, central sediments). The functional characteristics did not differ greatly between temporary and permanent ponds. In contrast, as regards the mesohabitats, collector-gatherers, burrowers and Group 1 of Wiggins et al. (1980) were more abundant in the sediments, whereas scrapers and shredders, sprawlers+climbers and swimmers+divers, and Group 4 of Wiggins et al. (1980) occurred abundantly in the macrophyte beds. As reported in a previous study on the same ponds, the hydroperiod seemed to affect the taxonomic composition and abundances of the macroinvertebrates. On the contrary, these results suggest that it was an unimportant factor in governing community functional aspects, which appeared more influenced by substrate types within ponds. Moreover, the direct relationships between taxonomic diversity and functional diversities corresponded to a good partitioning of the ecological resources among taxa to maintain the ecological complexity in the ponds. Our results suggest that all

mesohabitat types should be sampled to obtain a better knowledge of the pond ecology functioning.

Keywords: macroinvertebrates, functional feeding groups, habit traits, Wiggins *et al.* groups, functional organization

Title: Flight activity of water beetles in a semi-permanent wetland – seasonal dynamics and effects of environmental variables

Authors: Jan Kleka and David Boukal

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Abstract: We are studying various aspects of the structure and spatiotemporal dynamics of a water beetle community (Insecta: Coleoptera) in an alder carr in the Vrbenské rybníky NR in South Bohemia (Czech Republic). A part of this project is a research of the flight activity based on data from a light trap (years 2002-2006, 55 species of water beetles of six families, n=29250). Flight activity (nr. of specimens collected per night) is the highest in summer and major peaks coincide with periods of rapid desiccation. Key factors influencing short-term oscillations of the total abundance and species composition are air temperature and wetland water depth. Significant changes in the relative abundance of species and families are occurring during the season. There is also higher proportion of females and immature adults in light trap samples than in samples collected by other methods directly in the water. This suggests higher affinity of females to dispersal by flight and considerable tendency of water beetles to disperse just after emergence. Due to high temporal resolution and coverage of several years period our results deepen so far fragmentary knowledge of the seasonal flight activity of one of the dominant groups of water insects.

Keywords: flight, dispersal, seasonal dynamics, desiccation, Coleoptera

Title: The body size distribution of chosen species of Rotifera in different types of small water bodies in the Wielkopolska region

Authors: Anna Basinska, Monika Cichocka, Natalia Kuczynska-Kippen and Kasper Swidnicki

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Abstract: Small water bodies are often characterised by specific macrophytes species composition and different level of predation and this may also have an effect on the body length and shape of rotifer specimens. The main aim of the study was to determine the relation of rotifers representing different body size, towards specific kinds of pond (mid-forest, pastoral and man-made) and to three kinds of hydromacrophytes (nymphaeids, elodeids and helophytes) as well as comparatively to the open water zone. Five species of a wide range of distribution in various ecological habitats were analysed: *Anuraeopsis fissa*, *Brachionus angularis*, *Filinia longiseta*, *Keratella cochlearis* and *K. quadrata*. The examined water bodies differed in respect to fish presence. Morphometrical analysis of specimens of particular

rotifer species showed that both the type of water body relating to different land use in the catchment area as well as microhabitat type significantly influenced their size and shape. E.g. *Anuraeopsis fissa*, whose specimens were significantly smaller in ponds with a strong anthropogenic impact, were found to be largest among stands of helophytes and smallest within the open water zone.

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Keywords: zooplankton, rotifers, ponds, body size

Title: Characterization of the zooplankton community of three peridunar ponds with different hydroperiod in L'Albufera Natural Park (Valencia, Spain)

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Abstract: “Malladas” is the local name for peridunar ponds in L'Albufera Natural Park (Valencia, Spain). These are small ponds mainly filled with rain water and some of them have been recently restored. To study and compare the effect of hydroperiod on zooplankton in these ponds we have selected three of them: one permanent, one with short hydroperiod and one with longer hydroperiod. We sampled the three sites fortnightly from November 2006 to July 2007. We measured conductivity, temperature, dissolved oxygen, nutrients concentration and chlorophyll a concentration, and at the same time, we took quantitative zooplankton samples using a 35 µm mesh-size filter. The results showed great differences in the composition and abundance of zooplankton. The permanent pond presented the highest species richness (67 species), dominated throughout the period by planktonic rotifers. The most temporary pond had the lowest richness (21 species) with great temporary changes: at the beginning, littoral rotifers dominated, then cladocerans increased (mainly *Daphnia magna*), and finally planktonic rotifers (*Hexarthra fennica*). This was the only pond where anostraceans (*Tanymastix stagnalis*) appeared. The pond with long hydroperiod (40 species) was first dominated by planktonic rotifers (*H. fennica* and *Polyarthra dolichoptera*), and latter by littoral rotifers and cladocerans (mainly *D. curvirostris*)

Keywords: peridunar ponds, richness, temporality, zooplankton

Title: Characterization of the aquatic macroinvertebrate community of Ullal de Baldoví (Sueca, Valencia, Spain)

Authors: Juan Rueda, Francesc Mezquita and Anna Valentín

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Abstract: The aquatic macroinvertebrates community in a salty lagoon supplied by oligohaline spring water, locally known as “ullal”, has been characterized. The main purpose has been to evaluate the interest of this community from a biological point of view and to determine the effect, on the macroinvertebrate community

development, of an environmental recovery project, aimed at restoring the degraded ecosystem.

The interest of this study relies on the fact that the “ullal” presents a high richness of aquatic macroinvertebrate. Up to a total of 81 taxons were found (15 of them belonging to Class Ostracoda), distributed into 6 phyla, 24 orders and 57 families. Three endemisms are located, *Dugastella valentina*, *Palaemonetes zariquieyi* and *Melanopsis tricarinata* (this last in the Iberian Peninsula context). *Leptocheirus pilosus*, an amphipod from the family Aoridae, has been identified for the first time in continental waters of Valencian Community. In addition, some scarce and rare species in continental waters were captured: *Acroloxus lacustris*, *Plumatella sp.*, *Ferrissia clessiniana*, *Echinogammarus pacaudi*, *Gammarus aequicauda*, *Cyathura carinata*, *Lekanesphaera hookeri*, *Proasellus sp.* and *Heterotanais oerstedii*.

Values of Shannon Diversity Index (from 1.59 to 3.35) were the expected in these systems. According to a nutrition index based on nutritional groups, the system under study is classified as “diversified trophic net” in an “habitat under stress tendency”.

Keywords: aquatic macroinvertebrate, spring water, richness

Title: Benthic diatom diversity of coastal permanent ponds along a gradient of human impact in a Mediterranean eco-region

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Abstract: Mediterranean coastal areas are characterized by heavily transformed landscapes and an ever-increasing number of ponds are subjected to strong alterations and climate changes. Benthic Diatoms are widely used as indicators, but still little is known about the diatom communities of ponds. The main purpose of this work is to carry out an analysis of benthic diatom communities of permanent ponds, selected along a gradient of anthropogenic pressures, in order to identify community indicators (taxa and/or metrics) useful to evaluate the effect of human impacts. With this aim, we sampled epipelagic diatoms of five undegraded ponds, selected as “reference sites”, surrounded by woodlands and in a good conservation status, and 15 ponds in agricultural landscapes and with different levels of human alteration along the Tyrrhenian coast of central Italy. Our analysis revealed a substantial difference among diatom communities of reference ponds and degraded ponds. The former are characterised by the presence of several species belonging to genera, such as *Pinnularia sp.*, *Eunotia sp.*, nearly absent from impaired ponds. This first result suggests that the analysis of diatom communities may constitute a valuable tool to assess the ecological status of this type of water body, complying with the Water Framework Directive 2000/60/EC.

Keywords: algae, Bacillariophyceae, lowland ponds, environmental

Title: Sediment characterization of ponds in the Dombes wetland region, France

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Abstract: The Dombes area is a specific French wetland region located on a large tableland with a glacial geological origin. The dominant type of soil is clay loam with no or only a few calcareous parts. More than one thousand of ponds take place in the central part of this area. Traditional practices based on alternation of fish farming and crop farming in the ponds allow enriching this decalcified and poor soil. Fertilization and liming have also been regularly used, both on ponds and cultivated soils. All these practices can influence the physico-chemical characteristics of ponds sediment and water. We analysed 30 ponds in 2007. Sediment samples were collected in April and October and water samples weekly from mid-April to mid-October. The results show contrasting situations, from ponds sediments with a very low content of exchangeable phosphorus (0.08 g/kg), nitrogen (0.6 g/kg), organic carbon (7.7 g/kg), and at the opposite, ponds sediments presenting a high content of those elements (0.66, 4.1, 43.7 g/kg respectively). A positive correlation between the orthophosphate content in water and exchangeable phosphorus content in the sediment is observed. Data collection in 2008 and 2009 on further 60 ponds will allow a more complete analysis.

Keywords: pond, phosphorus, nitrogen, organic carbon, aquaculture, agricultural practices

Title: Analysis of amphibians populations in Enguera: Valencia, Spain

Authors: Guillem Pérez De Lanuza, Maria Virginia Escribano Escribano, Pablo Illera Jiménez, Francisco Ceacero Herrador, Carlos Lafita López, Jaime Madrigal García and Ramón Gómez Calabuig

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Abstract: The purpose of this study is to determine the amphibian feasibility of different species and populations that live in a set of artificial ponds located in the immediate area of the Valencian town of Enguera (Valencia, Spain). This is to find out which species are here, and to check if the restoration of the ponds have been positive for the survival of these amphibians populations, through the population control of the different species. To begin with, the species studied are: *Pleurodeles waltl*, *Alytes obstetricans*, *Discoglossus jeanneae*, *Bufo calamita*, *Pelobates cultripes*, *Pelodytes punctatus*, *Bufo bufo*, *Rana perezi*.

Study supported by UE and GVA (LIFE05/NAT/E/000060).

Keywords: Amphibians populations, Enguera

Title: Ranavirus disease in British gardens - what do we know from the general public?

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Abstract: Since the late 1980s, it has been discovered that garden frog populations in Britain have been affected by ranavirus disease. Frogs suffering from disease display a variety of symptoms ranging from no obvious symptoms or lethargy to lesions of the skin, break down of limbs or internal haemorrhaging. The commonly sited "Red Leg" is one of a range of symptoms. The Frog Mortality Project has been monitoring the outbreak of disease in Britain since its discovery in the late 1980s. Froglife, as the main project contact point, has now collated hundreds of reports from the general public amounting to thousands of frog deaths in garden ponds. From this information, it has become apparent that the south-east of England is a hot-spot area for disease outbreaks. In order to identify potential agents responsible for the spread of the disease, we also collated reports from gardens located within areas where healthy frog populations persist. This includes the information on spawn introduction, habitat characteristics and chemicals used in gardens. This report presents the results of basic analyses of the distribution of ranavirus and the above mentioned factors.

Keywords: garden ponds, ranavirus, citizen science, Frog Mortality Project

Title: Changing Biodiversity in the Cheshire pond landscape: some preliminary findings

Authors: Andrew Hull, Jim Hollinshead and Jonathan Guest

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Abstract: Between 1995 and 1998, the EU funded Pond Life Project surveyed over 500 ponds in the county of Cheshire in northwest England. In 2006, fifty of the same ponds were resurveyed to assess the degree of stability and change over the previous years. The methodology employed in 2006 replicated that used in the original survey together with the services of the same fieldworker. In addition to survey of plants, amphibians and invertebrates, each pond was mapped and photographed on both visits and notes concerning surrounding land use were also recorded on both occasions. The preliminary results showed that whilst records of aquatic plant species had decreased by 9%, invertebrate scores had improved with an average of over 41 species per pond in 2006 compared to just over 31 per pond in 1995/96. Finally, in terms of amphibian presence, the 50 ponds chosen for a second visit in 2006 all had *Triturus cristatus* present when first surveyed in 1995/96. However, the return visit revealed that only 38 ponds still had the species present. At this stage, these headline figures represent little more than a preliminary analysis and more detailed work will soon be undertaken to assess the degree of stability and change over the ten year period.

Keywords: Pond Life Project; Cheshire; biodiversity; longitudinal study

Title: High biodiversity of crustaceans in a temporary pond (Lavajo de Sinarcas, East Spain): Community trends and threats

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Abstract: Lavajo of Sinarcas is a temporary pond flooding a basin of 4 ha; hydroperiods vary between years from three to nine months. Bimonthly samples were studied covering different microhabitats (plankton, littoral and shores), during a year (2007) with a rainy spring, to understand crustacean distribution and succession. The results showed high diversity; up to 4 large branchiopods (*Magrebestheria maroccana*, *Triops cancriformis simplex*, *Branchipus cortesi* and *Branchipus schaefferi*), 3 calanoids (*Hemidiaptomus ingens*, *Diaptomus cyaneus* and *Mixodiaptomus laciniatus atlantis*), 2 cyclopoids, 1 harpacticoid and 9 cladocerans were found to coexist in one sampling day. Samples taken in years with different hydroperiods (since 1988) and in a nearby pond, made permanent after human intervention, were also studied to compare community structure. Threats due to activities and land uses in its adjacent surroundings have been identified. Over these years we observed more than a ten fold increase in conductivity which is clearly associated to salt de-icing in the nearby road. The pond is surrounded by vineyards and cereal fields, which promote high soil erosion and visible impacts of fertilizers and pesticides and it is also affected by cattle trampling. Eutrophication has favoured an excessive development of filamentous metaphyton. Some measures to protect this pond are discussed.

Keywords: Temporary ponds, biodiversity, community structure, hydroperiod, large branchiopods, copepods, cladocerans

5.3.3 Temporary ponds

Title: Degradation determines rotifer community structure and nestedness patterns in a remnant, agricultural, temporary pond complex

Authors: David G. Angeler, Olga Viedma and Miguel Alvarez-Cobelas

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Abstract: Propagule banks of temporary wetlands are important biodiversity stores and they offer potential for assessing ecological integrity and the impacts of anthropogenic stress in these little studied but severely threatened ecosystems. In this study we used an outdoor microcosm design to determine the relationship between rotifer communities and environmental variables that develop from rewetted sediments. Our study area is a remnant wetland complex located in the Campo de Calatrava, an agriculturally exploited area in central Spain. Total rotifer densities were higher in large wetlands with higher turbidity, while the opposite was true for Shannon-Wiener biodiversity. This suggests that small wetlands serve as rotifer

biodiversity hotspots in the study area. Redundancy analysis and nestedness analysis showed that variables reflecting trophic state conditions acted as a surrogate of anthropogenic stress that eliminated sensitive species from the communities. Depauperate rotifer assemblages composed of stress-tolerant taxa were nested subsets of species-rich communities from less degraded ponds, but species distribution patterns were not related to wetland size because small wetlands either were the least impacted or the most degraded.

Results suggest that small ponds in the study area should receive priority in conservation and degradation mitigation programs to maintain local and regional rotifer diversity.

Keywords: Local contamination, environmental control, community ecology, wetland integrity, distribution patterns, species sorting

Title: Plant communities of southern Portugal Mediterranean Temporary Ponds

Authors: Vasco Silva, Carla Pinto-Cruz and Maria Dalila Espírito-Santo

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Abstract: The Mediterranean Temporary Ponds are a priority habitat type according to the European Union Habitats Directive. These seasonal wetlands are subjected to extreme and unstable ecological conditions due to the annual alternation between the flooded and dry phases. The ephemeral character of the flora also explains why these ecosystems have been poorly studied and documented.

In order to overview and typify plant communities of this habitat in southern Portugal, a dataset of surveys from 40 ponds in 5 different locations was compiled. Supported by numerical analysis, a phytosociological classification of the pond communities was made. Results reveal that the temporary ponds studied present a similitude regarding to plant community distribution along the habitat ecological gradient. The length of flood phase seems to be the main driver for plant communities succession along the year. In the centre of the deepest ponds, with the longest period of inundation, mostly plant communities rank into the class Phragmito-Magnocaricetea. The next vegetation belts show characteristic communities of Isoeto-Nanojuncetea. The intermediate belt contains species like *Isoetes setacea*, *Lythrum borysthenicum*, *Juncus pygmaeus*, *Eryngium corniculatum* and *E. galiodes*. The peripheral zone is characterized by the dominance of *Isoetes histrix* and several annual rushes.

Keywords: ephemeral wetland habitats, amphibious vegetation, classification

Title: Mediterranean temporary ponds in Minorca: threats and conservation status

Authors: Pere Fraga i Arguimbau, Josep Mascaró Pons, Mònica Allès Marqués, Irene Estaún Clarisó, Eva Cardona Pons and Joan Juaneda Franco

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Abstract: Mediterranean temporary ponds are well known for their high ecological value. This lies mainly in a high concentration of biodiversity and singularity. But at the same time this habitat is highly sensitive to any threat, even being apparently of low intensity. Small size and strong dependence on rainfall make that just a simple land uses change or any variation in land morphology can cause its destruction. Rainfall pattern combined with the existence of impermeable soils determines a rich representation of this habitat in Minorca, both in number and in types. Until about 30 years ago these habitats were seen as useful by farmers as natural freshwater sources for the cattle, thus they had an economic interest and really there was compatibility between human uses and habitat conservation. With the abandonment of farm activities and the traditional agricultural techniques, their interest has decreased strongly and their conservation is now heavily threatened. This work explores the main threats this habitat is facing in the island of Minorca and establishes a ranking estimation of its conservation status.

Keywords: Temporary ponds, Minorca, threats, conservations status

Title: Parasites and bacteria as microbial indicators of pond quality

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Abstract: Preliminary studies in natural wetlands from northern Spain have observed an increase in the abundance of parasites in fishes and anphibia. The spread of exotic parasites distribution due to the climate change and the increase in water-mediated pollution and other stressors makes lakes and wetlands potential reservoirs and dispersal cores for highly resistant pathogens (e.g. helminths eggs). Many of these parasites could be sensitive indicators of eutrophication and provide important information on environmental stress, food web structure and function, and biodiversity. Main objective of this work was to evaluate the abundance and diversity of parasites (helminth eggs) and clostridia in the sediment of several ponds with different level of eutrophication. Both groups showed a relationship with eutrophication level although not significant in all cases. Use of ponds by cattle and sheep or higher densities of resting birds seems to be much more related to microbial indicators than nutrient concentration by itself.

Keywords: Helmiths, *Clostridium*, faecal indicators, ponds, nutrients, ecological quality

Title: Hydrochemical characteristics of Mediterranean Temporary Ponds in Western Crete. Water pollution and hydrologic threats from human activities and climate change

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Abstract: 'Mediterranean Temporary Ponds' (M.T.P.) is a priority habitat (Natura code: 3170) according to Annex I of the Directive 92/43/EEC. This substantially

vulnerable habitat hosts rare and endemic species but is under significant pressures mainly due to human activities such as farming, expansion of urban areas and touristic development. A Life-Nature project initiated in 2004 in the island of Crete (www.life-medponds.gr) aiming to conserve the MTP habitats in 5 Natura 2000 sites. Amongst other activities a hydrologic and a water quality survey has been conducted to examine the hydrochemical status of the habitat and understand the various interactions between the biota and the fluctuations of physical factors. The results of the particular studies indicated significant temporal fluctuations in nutrient concentrations in all the study sites assigned to various human activities that have been identified for each site such as urban sewage disposal, overgrazing and unsustainable fertilizer applications. The water quality status of the ponds in most of the sites was medium to good while in a particular pond was classified as bad. Regarding the MTPs' hydroperiod, direct impacts from human activities (such as poor water management and cattle watering) have been identified in 2 sites while climatic changes will significantly decrease the flooding duration up to 60% of its current value. Therefore, short term restoration and long term conservation measures should be progressively applied in most of the sites to tackle both the contemporary threats from human activities and the potential future impacts from climatic change.

Keywords: Temporary ponds, water pollution, priority habitat, Crete

Title: Vascular flora as a basis for classification of Mediterranean temporary ponds in Minorca

Authors: Pere Fraga i Arguimbau, Josep Mascaró Pons, Mònica Allès Marqués, Irene Estaún Clarisó, Eva Cardona Pons and Joan Juaneda Franco

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Abstract: The singularity of vascular flora is a main trait of Mediterranean temporary ponds. The extreme variation between inundation and drought means that only some well adapted plant species are capable to live in this habitat. Moreover, these changes favour cyclic variations in flora composition in short time intervals. At the same time, the vegetation depends on other factors like geology or soil structure. Temporary ponds show a high diversity of types in Minorca, due to geological and landform diversity. For an effective and successful long term management is necessary to establish a classification method. A provisional classification based on geology and geomorphology was made within the "LIFE BASSES" project with the aim to rationalize the actions of the project. At this moment could be interesting to see how coherent is this classification with all the biodiversity data gathered through the project development. As an example we expose here the results referring to the vascular flora.

Keywords: Temporary ponds, diversity, Minorca, vascular flora, classification

Title: Experimental survey of the competition between a clonal species and a rare species of the Mediterranean temporary pools

Authors: Mouhssine Rhazi, Patrick Grillas, Laïla Rhazi, Frédéric Médail and Anne Charpentier

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Abstract: *Scirpus maritimus*, a clonal species, is locally invasive into Mediterranean temporary pools where it threatens rare plant species such as *Isoetes setacea*. The competitive advantage of *S. maritimus* on *I. setacea* has been studied in controlled conditions. The goal of this experiment was to assess the role of the environmental conditions in the output of the competition between *Scirpus* and *Isoetes*, notably the hydrology and soil richness.

In this purpose, *Isoetes* has been cultivated alone (3 plants/pot) and in mixture with *Scirpus* (3 individuals per species). The experiment was run with 5 replicates, on 6 types of sediment (gradient of richness in sans/silt/clay) combined with 3 hydrological treatments (flooded, wet and dry). The competitive advantage of *Scirpus* was measured as the ratio of the production of *Isoetes* in mixture versus monoculture. The results showed that *Isoetes* was always outcompeted by *Scirpus*. However, the competitive advantage of *Scirpus* on *Isoetes*, was more related to hydrology than to soil richness. In wet and flooded conditions the competitive advantage of *Scirpus* was very high; it was much smaller in dry conditions. These results are discussed in the perspective of management and conservation of rare pool species.

Keywords: competition, *Scirpus maritimus*, *Isoetes setacea*, temporary pools, hydrology, soil

Title: An experimental study of the recolonization process in vernal pools following disturbance: preliminary results

Authors: Btissam Amami, Laila Rhazi, Siham Bouahim, Patrick Grillas, Mouhssine Rhazi and Serge D. Muller

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Abstract: Research was conducted in 2006-2007 in a vernal pool in western Morocco (the forests of Benslimane) to study the dispersal of plants and understand different species' ability to colonize empty patches (sterilized). Nine pairs of intact plots (0.5x0.5m) and sterilized plots (sterilized at high temperature) were established at 3 locations along the topographic gradient of the pool. For each plot, the vegetation cover and the species richness were measured in 2006-2007.

The preliminary results showed that soil sterilization had a strong impact on the vegetation. The species richness and the cover of vegetation was significantly lower in the sterilized plots than in the control (intact) plots. The first species that appeared after sterilization were clonal, perennial plants (*Scirpus maritimus* and *Eleocharis palustris*) which colonized through runners and rhizome elongation. These species

usually dominate at intermediate depth. Annual species were scarce during this first very dry year. This preliminary results suggest that recolonization after disturbance is slow, patch size dependant and implying short scale dispersal, Results could have been different during a wet, more productive. The vegetation surveys will be maintained in 2007-2008 and results discussed in the perspective of the sustainable management and restoration of temporary ponds.

Keywords: Temporary pools; Richness; vegetation community; Recolonization

Title: Relationship between macrophyte composition, environmental conditions and life-history traits in mediterranean temporary ponds (Doñana, sw Spain)

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Abstract: Doñana National Park (SW Spain) presents a complex system of temporary ponds. They are located on sandy soils and are filled when the water table rises during autumnal or winter rains. Water may persist up to late spring or summer depending on pond location and depth. The heterogeneity of these ponds favoured the presence of a wide variety of hydrophytes. We investigated the determinants of wetland vegetation in a selected ponds of this Mediterranean European protected wetland. The understanding of local species composition will facilitate management tasks to favour the conservation of this complex ephemeral wetland system. We analyzed hydrophyte species richness and abundance in relation to some predictor variables related to habitat structure (area, shape, distance to the nearest pond and isolation), physical environment (chemical water characteristics and permanence of water) and some disturbances observed (human influence and proximity of paths). We use multiple regression and multivariate analyses to test it.

We also studied whether local species composition is influenced by different life-history traits. We focused our interest in traits related to dispersal ability and seed bank characteristics, which could be favoured with the connectivity and permanence characteristics of the ponds. We test these hypotheses using generalized lineal models and multivariate approaches.

Keywords: Habitat structure, life-history traits, physical environment, species richness

Title: Impact of physical soil disturbance on the vertical distribution of seed banks and the above ground plant community composition in a Mediterranean temporary pond (Western Morocco)

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Abstract: Moroccan temporary ponds are regularly visited by cattle and wild boars, causing strong disturbance of the surface soil. We experimentally studied the impact of this disturbance on the vertical distribution of the seed bank and the above ground plant community composition in a temporary pond (Benslimane Forest) in Western Morocco in 2006-2007. From the edge to the centre of the pond we created 8 undisturbed and 8 disturbed (man-made ploughing) plots (120 cm x 120 cm). In each plot, we took 4 soil samples (cylinders of 4 cm diameter and 4 cm depth). Each sample was then divided into 4 slices of 1 cm (64 samples in total) and incubated in the laboratory for germination. The vegetation cover on the entire parcel was measured at 4 dates (March to June) and the total seed bank density was calculated for each soil sample.

The results show that soil disturbance (1) has a significant impact on the vertical distribution of the seed bank, which no longer showed stratification between surface sediment and depth compared to witness (2) reduces the vegetation coverage, but does not significantly affect its total species richness (3) changes the community composition, promoting typical temporary ponds species, including perennials.

Keywords: Temporary pools; disturbance, plant community, Morocco

Title: The impact of climatic fluctuations on the species composition and the dynamics of plant communities in Mediterranean temporary pools (western Morocco)

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Abstract: In the Moroccan Cork-Oak forests, the numerous temporary pools are very important sites for biodiversity. They are submitted to important anthropozoogenic pressure and to rainfall fluctuations which have a strong impact on the vegetation. The inter-annual vegetation dynamics and water levels has been studied during 11 years on 1 pool of the Benslimane forest (1997-2007) on quadrats evenly spaced along transects.

The results show a predominance of annuals species distinguished in two types (characteristic of temporary pools and opportunists). The species composition of the vegetation of the pool was contrasted between dry and humid years. This inter-annual vegetation dynamics closely depends on hydrology. Dry years thus encourage the expression of opportunistic (terrestrial) species which strongly regress during humid years. No negative interaction between annuals and perennials could be shown, which suggests that competition is not a major factor in the richness of these communities. The intensity of the drought and flood stresses related to climatic fluctuations seems to be the main factors controlling the specific composition of vegetation of this unstable habitat.

Keywords: temporary pools, inter-annual dynamic, plant community, hydrology, Morocco

Title: Microdistribution of macroinvertebrates in a temporary pond in Central Italy

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Abstract: In April 2005 we collected macroinvertebrates in five microhabitats (littoral sediments, central sediments, *Ranunculus* spp., *Spirogyra* sp., *Juncus effusus*) of a temporary pond in the Presidential Nature Reserve of Castelporziano near Rome with the purpose to determine the physico-chemical differences among the microhabitats and the microdistribution of macroinvertebrate community in the pond. N-MDS performed on physico-chemical data showed a marked difference between central sediments and other substrates according to a gradient of dissolved oxygen and pH in the water and total P and N, organic matter and organic C, sand and silt+clay contents in the sediments. N-MDS performed on all taxonomic groups and on the species of most important group separately (Odonata, Coleoptera, Heteroptera and Diptera Chironomidae) showed a clear dissimilarity occurring between the assemblages living in submerged and/or emergent macrophytes and those found in the other substrates. The highest number of taxa and their densities occurred in the macrophyte beds, confirming the role of vegetation to favour high biodiversity in ponds because of its stable and well oxygenated conditions. These results led to highlight the importance of the knowledge of species microdistribution in ponds for management and conservation purposes because a high microhabitat diversity can support a high faunal diversity.

Keywords: spatial microdistribution, physico-chemical characteristics, macroinvertebrates, species richness

Title: The invertebrate community of small rain rockpools from València (Spain), with special reference to Ostracoda

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Abstract: One hundred rain rockpools distributed over a limestone area of 65 Ha of Rafelguaraf (València, Spain), with an average pond surface of 0.3 m² (range 0.01-5.6m²) and depth of 8 cm were sampled during the wet season between November 2006 and May 2007 in order to evaluate the invertebrate diversity of such small seasonal habitats in a restricted area. Water conductivity varied between 100 and 600 µS cm⁻¹ and pH between 7 and 9.5. In total, we observed 32 different taxa (mainly invertebrates, plus one species of anuran), with an average of 3 taxa per sample and a maximum number of 8 taxa in one site. The most common taxa were Ceratopogonidae dipterans, ostracods and cyclopoid copepods. A detailed study of the ostracod community resulted in the determination of nine different species or morphotypes. The most frequent genus was *Heterocypris*, and among these, *H. bosniaca* Petkowski et al. 2000 was the most common species, found in 40% of the samples. This high number of populations in the area is remarkable, because *H.*

bosniaca was described recently from the Balkans and until recently it was only known from that area and Israel.

Keywords: seasonal rockpools, invertebrates, Ostracoda, Spain

Title: Impact of grazing on the richness of plant communities in the Mediterranean temporary ponds in W-Morocco

Authors: Siham Bouahim, Laïla Rhazi, Ibtissam Amami, Sahib Narjis, Patrick Grillas, Mouhssine Rhazi and François Mesleard

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Abstract: In Morocco, temporary ponds are a hot spot for biodiversity. They are widely used by the local population for grazing. The effects of grazing on biomass and richness of plant communities in temporary ponds have been studied on six ponds in western Morocco (forests of Benslimane): three non-grazed (hunting reserves) and three grazed by cattle and sheep. The vegetation has been studied by the method of quadrats along fixed transects for each of the ponds from 2006-2007 (March, May and June). The biomass was measured by cutting the vegetation within the plots distributed between the center and the periphery of ponds. The preliminary results show that both grazed and non-grazed ponds have an intra annual dynamic of plant communities, substituting aquatic and amphibious species with terrestrial species in the summer.

The biomass produced was significantly variable between dates and was more important in non-pastured ponds. The total species richness did not differ between pond types; however, the relative contribution to the total species richness of obligate-pond species was significantly higher in grazed ponds. This suggests that grazing in temporary ponds, maintains species richness and limits the competition between species. Therefore grazing is a recommend technique for sustainable management of temporary pond habitats and their unique biodiversity.

Keywords: Temporary ponds, Grazing, Biomass, Richness, Biodiversity, Sustainable management.

Title: Temporal variation of macroinvertebrate assemblages in temporary ponds from the Doñana National Park (SW Spain)

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Abstract: Macroinvertebrate assemblages of 20 temporary ponds with different hydroperiod were monthly studied during a dry and a wet year. A total number of 117 different taxa were recorded out of which 32 taxa included both larvae and adult (149 categories in total). Pond richness ranged from 33 to 99 categories. *Anisops sardeus*, *Cloëon* spp., *Corixa affinis* or *Gerris thoracicus* were the most abundant and frequent taxa recorded during the whole flooded period. In contrast, *Agabus didymus*, *Hydaticus leander*, *Lestes macrostigma* or *Asellus aquaticus* were rare,

being collected only in one survey. Coleoptera larvae, mainly Dytiscidae, were mostly recorded in spring, and adults had the maximal abundance at the beginning of pond desiccation. At this time, pond richness was generally maximal. A high increase in Heteroptera abundance occurred at the end of the desiccation period. Despite short-hydroperiod ponds occasionally reached high diversity (Shannon-Wiener), the maximum cumulative diversity occurred in long-hydroperiod ponds. The spatial ordination (NMDS) of the monthly macroinvertebrate abundance was similar during both years despite rainfall was very different. It is likely that each taxa life-cycle had a large influence in the succession of the macroinvertebrate community.

Keywords: temporary-ponds, macroinvertebrates; richness; diversity; succession

Title: Drainage basin land uses and amphibians' richness in south-eastern Spain ponds

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Abstract: In the last decades amphibians have suffered a drastic decline of their populations. The most mentioned reason that explained this population decrease is the habitat alteration and destruction. As a consequence of their life-cycle, amphibians are not only affected by the aquatic habitat degradation but also by the alteration in the drainage basin. However, the studies to determine the drainage basin factors affecting aquatic ecosystem structure (richness) are scarce. In this study, the effect that different factors obtained from twenty-one ponds in the Alto Guadalquivir region (south-eastern Spain) has on amphibians' richness has been studied. Aquatic and drainage basin characteristics, such as conductivity, depth, wetland size, altitude, hydrologic regime, drainage basin size and different land uses (forest crops, scrubland, urban areas, agriculture and pasture uses) have been used. The results show that amphibian richness is influenced noticeably by the land use in the drainage basin.

Keywords: Amphibians' richness, Land use, Drainage basin

Title: Spatial pattern or habitat characteristics: which explain better large branchiopod assemblages? - a case study from the Iberian peninsula

Authors: Stéphanie Gascón, Margarida Machado, Jordi Sala, Luís Cancela da Fonseca, Margarida Cristo and Dani Boix

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Abstract: The distribution of large branchiopods (Crustacea: Anostraca, Notostraca and Spinicaudata) is complex to assess due to the ephemeral nature of its habitat, the environmental variability, and the erratic occurrence of the species in a regional scale. Temporary pond networks of two different areas located in geographical extremes of the Iberian Peninsula were sampled (NE Spain and South Portugal). 4 anostracans, 1 notostracan and 1 spinicaudatan were recorded from NE, whereas 7

anostracans, 1 notostracan and 2 spinicaudatans were recorded from SW of Iberian Peninsula (only 4 species were found coincident).

In order to quantify the variability due to spatial pattern or habitat characteristics a variation partitioning analysis was performed. Principal coordinates using PCNM analysis were calculated from geographical coordinates, after distance matrix adjustment, and the significant predictors were used in the variation partitioning. Habitat characteristics used in variation partitioning were water permanence, depth, surface, altitude, salinity, turbidity, substrate, and submerged vegetation cover.

Keywords: spatial pattern, habitat characteristics, PCNM, large branchiopods, Mediterranean temporary ponds

Title: Pseudo-isolation, Environment Change and Biodiversity of Upland Ponds

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Abstract: The temporary upland ponds of central Wales are structurally and biologically unique within the principality. They are a little studied system and have not been classified with respect to other types of pond within the UK. Some of their defining features include their ephemerality, geology, shallow depth, species assemblages and the presence of a distinct ecotone around the water's edge within which nothing but grass will grow. In biological terms they are not dissimilar to temporary ponds in the New Forest since they share a number of characteristics such as permanence and depth as well as the UK Red Data Book and UKBAP priority species Pilwort (*Pilularia globulifera*) and the Fairy shrimp (*Chirocephalus diaphanus*). The recent addition of 'Ponds of High Ecological Quality' to the UKBAP list of priority habitats could see the ephemeral pools of central Wales recognized as a priority habitat in their own right. The project will examine the unique physical and *biological* nature of these ponds and how this is maintained; the degree of interrelatedness (pseudo-isolation) as a result of biological vectors and the degree to which environmental change will impact the habitat.

Keywords: Temporary, central Wales, Geology, Ecotone, Pilwort, Fairy Shrimp, Ephemeral, Pseudo-isolation

Title: Water dynamics model for temporary ponds

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Abstract: A model of the water dynamics for temporary water ponds has been developed taking into account the parameters of the watershed and the pond, the rain pattern and the potential evapotranspiration pattern. This model predicts the amount of water retained into the soil of the watershed and into the pond, in real time, and therefore, when a pond is going to be dry.

It is then possible to calculate the number of days that it is going to be dry, per year, or how much will last the water in a particular pond after a rain. Sensibility of the state variables to the differences on the parameters and the initial values has been tested. The most striking results are that the amount of water (measured as % of total) on the pond depends only on the field capacity of the watershed, the maximum depth and the shape of the pond, and it is not affected by the watershed area or the pond area. Also, the number of days without water (per year) depends only on the maximum depth and shape of the pond. Analysis for different shapes is also made.

Study supported by UE and GVA (LIFE05/NAT/E/000060).

Keywords: Model, Temporary pond, water dynamics, pond depth, watershed, pondshape

Title: Limnological comparison between two mountain ponds with different hydroperiods

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Abstract: With the present study we compare the biodiversity and community structure of Rotifera and Crustacea living in two mountain freshwater ponds: Laguna de Bezas and Laguna de Rubiales. These two ponds are located five kilometers apart at a similar altitude (c. 1200 m.a.s.l.) and landscape on the Iberian Mountains of Teruel (Spain). However, Bezas is semipermanent (only dries in exceptionally dry periods), while Rubiales is temporary, drying out periodically. In addition, they show important differences in other limnological traits: Bezas has transparent water, harbours a high density of fishes (*Cyprinus carpio*, probably introduced), and submerged macrophytes, whereas Rubiales has an elevated turbidity, no macrophytes nor fishes and is surrounded by a dense littoral cover of helophytes. These differences seem to affect drastically their aquatic fauna: rotifers are dominant in the zooplankton of Bezas (mainly composed of *Hexarthra mira* and *Keratella quadrata*), while Rubiales is dominated by microcystaceans (Calanoid copepods and cladocerans) and contains typical temporary water species of macrocrustaceans, such as *Streptocephalus torvicornis* and *Triops cancriformis*. Ostracods are nearly absent in Bezas, whereas the ostracod community of Rubiales is rich and variable, dominated by species of the genus *Heterocypris*, *Eucypris*, *Ilyocypris* and *Herpetocypris*.

Keywords: Rotifera, Cladocera, Copepoda, Ostracoda, Spain, Hydroperiod

Title: The quillworts of the Sardinian Mediterranean temporary wet habitats

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Abstract: The identification of temporary wet habitats referable to the codes 3120 and 3170* of the Habitats Directive is mainly based on some target species among which the quillworts are the most relevant. Nevertheless, species of *Isoetes* are

notorious for the difficulties they present in identification. In this study, some key distinctive characters of the *Isoetes* species of Mediterranean temporary wet habitats of Sardinia were identified and their indicator role for the identification of the habitats was specified. Morphological studies have allowed to point out the distinctive characters among *Isoetes histrix* Bory, *I. gymnocarpa* (Genn.) A. Braun and *I. duriei* Bory which were previously confused, mainly because the phyllopodia shape was suggested as a useful character for their identification. We found that the mega and microspores ornamentation and the megaspore size were highly reliable characters for their identification. *I. velata* A. Braun subsp. *velata* and *I. tiguliana* Genn. can be recognized on the basis of the basal margin of leaves, ligule shape, megaspores size and ornamentation.

The priority habitat 3170 is indicated by the amphibious *I. histrix*, *I. gymnocarpa* and/or *I. duriei*. The aquatic *I. tiguliana* and *I. velata* subsp. *velata* are indicators of the habitat 3120.

Keywords: *Isoetes*, Habitats Directive, megaspores, microspores

Title: Effects of the intense summer evaporation and the filling up after drought on the water chemistry in some Mediterranean temporary ponds

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Abstract: An analysis was carried out of changes in the mineral content, ionic composition and nutrient concentration as a result of intense summer evaporation in 15 temporary ponds situated in north-west Spain. The effect of the filling in autumn of ponds which had completely dried during summer was also assessed. The intense summer evaporation and the filling up in autumn of ponds produced a significant rise in total ion concentration. However, these two processes had differing effects on ion composition. Chloride and sodium were the ions most directly involved in the increase in mineralisation associated with intense evaporation. On the other hand, pond refilling in autumn after the summer drought resulted in an increase of practically all ion forms, although the greatest increases were found in sulphates. Intense evaporation had a differential effect on nutrient content. Nitrate levels did not rise significantly, but in some ponds the concentration of orthophosphate increased forty-fold compared with registered values for the previous period. In addition, pond refilling after total drought produced a significant rise in nitrate levels, however, the same effect was not observed for orthophosphate.

Keywords: ionic composition, nutrients, temporary ponds, evaporation, drought

Title: Monitoring the invasion of the aquatic bug *Trichocorixa verticalis verticalis* (Fieber, 1851) in Doñana (SW Spain)

Authors: Margarita Florencio, Hector Rodríguez-Pérez, Carola Gómez-Rodríguez, Andy J. Green, Carmen Díaz-Paniagua and Laura Serrano

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Abstract: Exotic species represent a menace for biodiversity conservation. In the case of freshwater ecosystems, it comprises one of the two most important anthropogenic impacts. We present data from seven years (2001-2007) to evaluate the presence of the exotic corixid *Trichocorixa verticalis*, a native from the Atlantic coast of North America, in the water bodies of Doñana National Park and its surroundings. We have collected data from different sorts of water bodies: natural and artificial ponds, temporary and permanent ponds, temporary shallow lakes and temporary natural marsh. The species was already present in our samples from 2001, whilst the earliest published record in the area is from 2004. In some localities with breeding populations (mainly artificial ponds), *T. verticalis* is outcompeting indigenous corixids (*Paracorixa concinna*, *Sigara lateralis*, *S. stagnallis*, *S. scripta*, *S. selecta*, *Micronecta scholzi* and *Corixa affinis*). Meanwhile in other localities only vagrant adults occurred, mainly in natural ponds. However, during the last year we found *Trichocorixa verticalis* individuals in more locations than ever before, suggesting that a colonization of the area is now in progress.

Keywords: *Trichocorixa*, corixid, Doñana, exotic species

Title: Temporary ponds typification according to vegetation structure and topography in the Comunidad Valenciana

Authors: Joan Pedrola Monfort and Alfonso Garmendia Salvador

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Abstract: Temporary ponds in the Comunidad Valenciana present a great variety of topographic forms and vegetation structures. This variability should be very important for amphibians and other faunal elements and that's why we have typified using cluster analysis with different variable types: topographic variables, vegetation structure variables and aquatic and shore species abundances. Several results suggest that groups obtained for the different variable types are not related. Classification of temporal ponds by species is not possible, because each pond is very different to the rest, and therefore each pond behaves as a different group. On the other side, when using vegetation structure variables or topographic variables, typification is very clear and characterized very well the variability of temporal ponds. Surprisingly, groups from both classifications are not related, neither between of them or with the species distribution.

In fact, no one of the topographic variables analyzed is correlated with any of the vegetation structure variables, neither with the abundance of any species. Correlations have only been found for *Dittrichia viscosa* and the abundance of trees and shrubs on the shore and on the other hand for *Chara vulgaris* and the abundance of aquatic plants.

Study supported by UE and GVA (LIFE05/NAT/E/000060).

Keywords: Vegetation structure, pond topography, aquatic vegetation

Title: Identification, localization and typification at different scale of the priority habitat Mediterranean temporary pools: a case study in the Apulian region (Italy)

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Abstract: Temporary pools have been less studied in Italy than in Mediterranean Europe. Moreover no specific study is devoted to the identification and typification of this habitat in Apulia (southern Italy). This work aims to provide the information necessary to identify Mediterranean temporary pools habitat, to characterize them from an ecological approach, to improve their understanding and to give a support for their conservation. We describe a methodology to find and classify these habitats using some variables, at different spatial scale; to understand the status of conservation in which they are, measuring the hemeroby index of buffer landscapes and we propose a suitability map for these habitats developed using geographic information system (GIS). Only 7 sites were indicated by Rete Natura 2000 census, after transposing Habitat Directive in Italy. Thus to fill this gap we started searching other sites, helping with detailed bibliographic informations, choosing some variables for their identification. We have examined some ecological characteristics for their classification and for the creation of a suitability map in the landscape and evaluated the status of conservation in which they are using the hemeroby index. We have surveyed 45 sites, 38 are new sites respect of Rete Natura 2000 census.

Keywords: temporary pools, spatial scale, suitability map, GIS, habitat conservation, Apulian region

Title: Morphometric analysis about the genus *Isoetes* in Puglia and observations on its distribution

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Abstract: The kind *Isoetes* is included in the family of Isoetaceae class Lycopsidea, division Pteridofitae Eterosporee. Species of *Isoetes* are notorious for the difficulties they present in identification. This is a genus not widespread in the Italian territory; in the Apulian region were noted only two sites. The studies was conducted in the Apulian region and aims to identify the differences between types and to improve the knowledges of distribution. By a first research, we've found three different morphological types on the basis of certain characteristics observed: size of the leaves, spores, phyllopodia, velum, bearing ligula.

The purpose of this research is to investigate whether the three morphological types correspond to three different species. Were carried out detailed bibliographic research and analyzed microspore and macrospore derived from herbarium vouchers of three types from 5 different stations: spores were observing the SEM and analyzed through image analysis software. There were also carried out studies for the chromosome counts.

We have to tests also the germination of macrospore and microspore on soil sample taken in situ. The results showed significant differences between the types morphological also confirmed by first karyotype analysis. However, the matter needs further investigation.

Keywords: *Isoetes*, temporary pools, spore morphology, Apulian region

Title: How to identify Mediterranean temporary wet habitats according to the Habitats Directive?

Authors: Caria M.C. and Bagella S.

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Abstract: Mediterranean temporary wet habitats are considered to be habitats of Community Interest and are included in the “standing water group”. Due to an overlap in the plant species and syntaxa indicated as characteristic, the assignment of the plant communities to the habitats 3120, 3130 and 3170* is far from straightforward. The aim of this paper was to identify suitable criteria to facilitate univocal identification of these habitats. Macrophyte assemblages specific cover and water depth were monthly monitored along permanent transects in temporary ponds, waterlogged soils and rock pools at 10 different landscape units in Sardinia.

A two-dimensional ordination of the assemblages was obtained by nMDS analysis. Formal significance tests for differences between assemblages were performed using the one-way ANOSIM permutation/randomization test. When no significant differences between assemblages were observed, characterizing species were identified using the SIMPER analysis. The results showed significant differences between habitats (global $R=0.91$; $p=0.1\%$) and sampling data (global $R=0.86$, $p=0.1\%$). Indicator species and alliances according to the phytosociological classification were proposed for a univocal identification of the habitats, taking in account that they establish a complex mosaic which can be interpreted throughout spatial and temporal small scale analysis.

Keywords: ANOSIM, nMDS, SIMPER, macrophyte assemblages, small scale analysis

Title: The zooplankton community in new, temporary ponds in Doñana National Park (SW Spain)

Authors: Anna Badosa, Dagmar Frisch, Arantza Arechederra and Andy J.Green

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Abstract: The zooplankton community (rotifers, cladocerans and copepods) has been studied in an experimental set of 96 new shallow temporary ponds. They were created between summer 2004 and spring 2005 in the framework of a restoration project of a Mediterranean marsh located in the Doñana National Park (SW Spain). Zooplankton samples were obtained from two sampling campaigns, the first one in April 2006, during the first complete flooding event, and the other one a year later, in April 2007. We analysed changes in the species abundance and composition as well

as in several parameters of community structure (species richness, diversity, evenness and dominance) between the first and second hydroperiod. We also identify pioneer species present in most ponds in the first hydroperiod, as well as those that tended to arrive in ponds during the second hydroperiod. Preliminary results showed that species richness is limited by high conductivity in these ponds.

Keywords: zooplankton, colonization, new temporary ponds, Mediterranean marsh

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