EPCN

European Pond Conservation Network

Value Ponds in the 21st Century

Eyes of the Landscape

PROGRAMME and ABSTRACTS

4th Conference of the European Pond Conservation Network (EPCN)

Berlin (Erkner), Germany, 1 - 4 June 2010

Conference contact
Leibniz Centre for Agricultural Landscape Research (ZALF)
Institute of Landscape Hydrology
Organising committee 4th EPCN conf. 2010 (Chair: Dr. Thomas Kalettka)
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For information about EPCN see also www.europeanponds.org

Impressum

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Eyes of the Landscape - Value Ponds in the 21st Century

4th Conference of the European Pond Conservation Network (EPCN) Berlin (Erkner), Germany, 1st – 4th June 2010

"Bildungszentrum Erkner" (Education Centre Erkner)

Seestraße 39, D-15537 Erkner

www.4epcn2010.de

OBJECTIVE

Berlin (Erkner), Germany is the host of the 4th Conference of the European Pond Conservation Network (EPCN) continuing a series of three highly successful conferences since 2004. These events take place every two years, attracting more and more pond experts with widely diversified backgrounds from basic sciences to the practical aspects of conservation and management. 130 delegates from 25 countries attended the last conference in Valencia, Spain 2008.

Millions of ponds are an exceptional freshwater resource around the world that represents 30 percent of the global surface area of standing water. They have a high potential for ecosystem functions and services. On the other hand, ponds face many threats from human activities but receive little protection under European and national legislation. There is an urgent need to protect, consolidate and increase the pond resource in Europe. Therefore, the European Pond Conservation Network (EPCN) was launched 2004 in Geneva, as an issue of the 1st EPCN Conference to promote awareness, understanding and conservation of ponds in European landscapes. As a result of EPCN work, at the Valencia conference an important milestone was delivered with the publication of the "Pond Manifesto" (2008). This document presents the case for conserving European ponds. It provides an outline strategy for much needed conservation action across and beyond the continent.

We warmly invite you to continue this process and are happy to see you at the 4th EPCN Conference 2010 in Berlin (Erkner), Germany. In 2010, the year of biodiversity, the objective is to intensify exchange of experiences of pond experts from both, basic sciences and applied work on conservation and management to address the issue of the Pond Manifesto. The conference is addressed to scientists and students of universities and research centres, experts from consulting firms, decision makers from ministries and governmental authorities, representatives from organisations for nature conservation, water management and farming.

ORGANISATION

Organisers

Leibniz Centre for Agricultural Landscape Research (ZALF), Müncheberg, Germany (www.zalf.de)

In cooperation with

European Pond Conservation Network (EPCN), (www.europeanponds.org)

German Limnological Society (GLS), working groups "small water bodies" (www.kleingewaesser.de) and "shallow lakes" (www-f.igb-berlin.de)

Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin, Germany (www.igb-berlin.de)

University of Applied Sciences Neubrandenburg, Germany (www.hs-nb.de)

BUND "Friends of the earth - Germany"

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Jeremy Biggs (Pond Conservation, GB)
Andrew Hull (Liverpool John Moores University, GB)
Régis Cereghino (University of Toulouse III, F)
Patrick Grillas (Tour du Valat, F)
Olivier Scher (Pôle Relais Mares et Mouillères de France, F)
Nicola Bressi (Trieste Natural History Museum, I)
Thomas Kalettka (Leibniz Centre for Agricultural Landscape Research, D)

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Jeremy Biggs (Pond Conservation, EPCN, GB)
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Michael Hupfer (Leibniz Institute of Freshwater Ecology and Inland Fisheries, GLS, D)
Ursula Karlowski (BUND, GLS, D)
Thomas Pitsch (GLS, D)

Local Organising Committee

Scientific staff

Thomas Kalettka (chair), Ralf Dannowski, Gert Berger (Leibniz Centre for Agricultural Landscape Research, D)

Technical office

S. Fritsche, D. Henning, H. Schäfer, R. Schulz, T. Schönbrodt, R. Tauschke, L. Wascher, I. Wolf, W. Zabel (Leibniz Centre for Agricultural Landscape Research, D)

GENERAL INFORMATION

Conference Venue

The conference venue is at "Education Centre Erkner", situated at the southern borderline of Eastern Berlin, featuring state-of-the-art conference facilities within a park-like setting. The conference site is easily accessible by public transport from Berlin City (see travel). Furthermore, it is not far away from the pond rich agricultural landscape of the young moraine region.

Address:
"Bildungszentrum Erkner" (Education Centre Erkner)
Seestr. 39, D-15537 Erkner
Phone: +49(0)3362-769-0, email: empfang@bz-erkner.de, website: www.bz-erkner.com

Registration and Accommodation

Registration fee includes costs for rent of rooms & equipment, coffee breaks, lunches, programme & abstract book and conference bag (June 1-3). The personal badge you will receive is your entrance to all conference sessions, coffee breaks and lunches – remember to wear it.

Costs for evening reception include buffet and dance music by a DJ, drinks are on your own. Lunches and buffet will be served at the restaurant of the Education Centre.

Costs for excursion include bus transfer and lunch package. Number of participants is limited, but a minimum number is necessary. We will make reservation for excursions on first come - first save basis. If an excursion will be overbooked we will make reservation for your second choise. We regret that no refunds will be available for cancellation of conference fees after 15th March 2010 (early registration) due to commitments by contracts, but substitute delegates will be welcome.

Accommodation at Conference venue "Education Centre Erkner"

We highly recommend you to use accommodation at the same venue "Bildungszentrum Erkner" (Education Centre Erkner) as the sessions, catering and evening reception take place. Reservation of accommodation at conference venue is only possible by registration form (62.50 €/day bed + breakfast for conference participants, optional dinner, special conditions for accompanying persons). The price for accommodation includes use of swimming bath, sauna, tennis court and volley ball.

Cancellation of booking is free until 9 May 2010. There are 80 % of booking costs by cancellation starting from 10 May.

Internet access is available at reserved rooms (special price, ask staff of Education Centre) and at conference office.

Hints for alternative accommodation and restaurants

Erkner is a suburb between forests and lakes at the borderline to Berlin with limited capacities for restaurants (see www.erkner.de, see table). Other alternatives are accessible only by car in a distance < 10 km at the surroundings of Erkner (Grünheide, Gosen-Neuzittau, Fangschleuse) and in direction to Berlin City (by urban railway S3, regional train RE1 or car). Beautiful urban districts of Berlin in the shortest distance to Erkner along the line of the urban railway S3 are Rahnsdorf (6 min.), Friedrichshagen (11 min.) and Köpenick (15 min.). To station Alexanderplatz in Berlin City it takes you 37 min.

Accommodation and restaurants in Erkner	**Offers**
Pension "Schützenhaus", Am Schützenwäldchen 14, D-15537 Erkner, Phone: +49(0)3362-700121	Restaurant
El Gaucho, Fangschleusenstr. 6, D-15537 Erkner, phone: +49(0)3362-883778, info@el-gaucho.net	Restaurant (Argentinic Steakhouse)
Kellings Schifferstube, Uferstr. 20, D-15537 Erkner, Phone: +49(0)3362-47 91, KellingsSchifferstube(@)t-online.de	Restaurant (German style)
Maulbeerbaum, Friedrichstr. 9, phone +49(0)3362-75880	Restaurant (Balkan style)
Löcknitzidyll, Fangschleusenstr. 1, D-15537 Erkner, Phone: +49(0)3362-50 11 04, joachimlangerbistro(@)t-online.de	Restaurant (German style)

Travelling to Erkner

From airport Berlin-Tegel to Erkner

Bus TXL to "Berlin Hauptbahnhof" station. From there travel by train Regionalexpress RE in direction "Frankfurt/Oder". Get out at station Erkner (time of travel: ~ 60 minutes).

From airport Berlin-Schönefeld to Erkner

Train RE7 in direction "Dessau" to station "Karlshorst". From there, travel by urban railway S3 towards station "Erkner" (last station).

By train from Berlin-Hauptbahnhof to Erkner

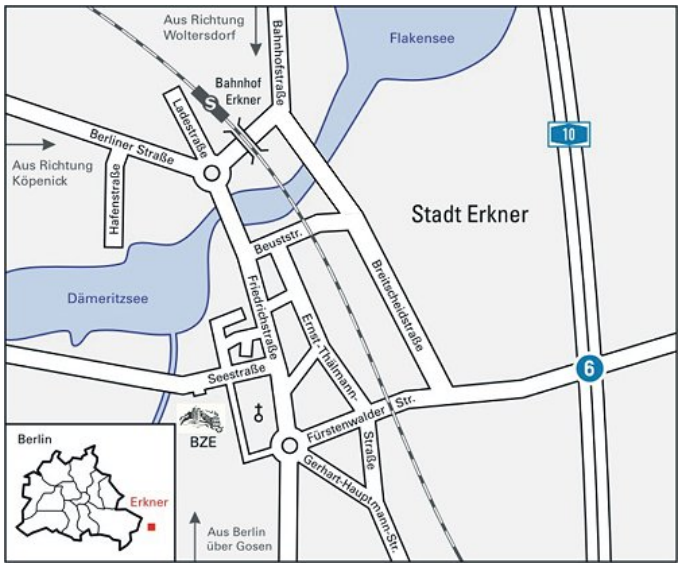
From main station "Berlin Hauptbahnhof " travel by train RE in direction "Frankfurt/Oder". Get out at station Erkner (time of travel: 30 minutes).

From station Erkner to conference place "BZE"

Walk to conference place needs 15 minutes or take a taxi(see map below).

By car from highway A10

Exit Erkner/Berlin-Köpenick (6) to conference place (BZE) (see map below).



INFORMATION FOR PRESENTATIONS

The conference language is **English**.

Oral presentations will extend for 20 min. including 5 min. discussion (Power-Point, MS Office 2003). All sessions will be moderated by chairman/-woman.

Poster presentations are on Tuesday June 1 and Wednesday June 2 at conference hall and seminar room 2. The maximum poster format is 841 x 1189 mm (= A0 portrait format).

INFORMATION FOR PUBLICATION

Publication of presentations in "Hydrobiologia"

- As realised at the last conferences a special issue of the international peer-reviewed journal "Hydrobiologia" (ISI Impact Factor = 1.5) is planed (will be published in 2011). Both papers presented orally and posters can be submitted for publication. The papers (max 10 pages, in English) should be submitted before 30th September 2010.
- The submission has to be done electronically; the instructions (with the web link) will be given in Berlin (June 2010).
- The manuscripts will later be submitted to peer review.
- Manuscript preparation has to follow the rules fixed by Hydrobiologia (web site: http://www.springer.com/life+sci/ecology/journal/10750)

PROGRAMME

Topics

1 Pond typology, functions, services in landscapes
2 Methods of ecological monitoring and assessment
3 Pedogenesis and paleolimnology of ponds
4 Hydrology, biogeochemistry, pollution of ponds
5 Habitat functions, biodiversity, bioindication
6 Practical use, conservation, management of ponds
7 Decision aids for policy, legislation, pond users
8 Education on pond functioning, values, wise use

Sessions

1 Typology, functions and services of ponds in landscapes (Topics 1, 5, 6)
2 Ecology and conservation of macroinvertebrates (topics 2, 4, 5, 6)
3 Ponds under the threat of climate change (Topics 4, 5, 6)
4 Ecology and conservation of vegetation (topics 4, 5, 6)
5 Land use impacts on biodiversity in farmland ponds (Topics 1, 4, 5, 6)
6 Water quality aspects of ponds (Topics 2, 4, 5, 6)
7 Conservation and management aspects of fish ponds (topics 4, 6, 7)
8 Ecology and conservation of amphibians in agricultural landscapes (Topics 1, 2, 4, 5, 6)
9 Ecology of zooplankton (topic 5)
10 Hydrology of ponds (Topics 1, 3, 4)

Short Programme

Monday 31 May

16:00 – 19:00	CONFERENCE OFFICE (REGISTRATION, POSTERS)

Tuesday 1 June

07:30 – 18:00	CONFERENCE OFFICE (REGISTRATION, POSTERS)	
09:00 – 09:20	Welcome	
09:20 – 10:40	Keynotes Jeffries + Vanschoenwinkel	
10:40 – 11:10	COFFEE BREAK	
11:10 – 12:30	Session 1	Session 2
12:30 – 14:00	LUNCH	
14:00 – 15:40	Sessions 3 + 4	Session 2
15:40 – 16:10	COFFEE BREAK	
16:10 – 17:30	Poster session	
17:30 – 18:30	EPCN General Assembly	

Wednesday 2 June

07:30 – 17:00	CONFERENCE OFFICE (REGISTRATION, POSTERS)	
09:00 – 09:40	Keynote Declerck et al.	
09:40 – 10:40	Session 5	Session 6
10:40 – 11:10	COFFEE BREAK	
11:10 – 12:10	Session 7	Session 6
12:10– 13:50	LUNCH	
13:50 – 14:30	Session 7	Session 6
14:30 – 15:30	Poster session	
15:30 – 16:00	COFFEE BREAK	
16:00 – 18:00	Special Workshops	
19:00 – 24:00	EVENING RECEPTION	

Thursday 3 June

07:30 – 17:00	CONFERENCE OFFICE (REGISTRATION, POSTERS)	
09:00 – 09:40	Keynote Drews	
09:40 – 10:40	Session 8	Session 9
10:40 – 11:10	COFFEE BREAK	
11:10 – 12:30	Session 8	Sessions 6 + 9
12:30 – 14:00	LUNCH	
14:00 – 14:40	Keynote Suhling	
14:40 – 15:40	Session 2	Session 10
15:40 – 16:10	COFFEE BREAK	
16:10 – 16:40	Conclusions	

Friday 4 June

08:30 – 18:00	Excursions

Extended Programme

MONDAY, 31 MAY

16:00 – 19:00 CONFERENCE OFFICE (REGISTRATION, POSTERS)

TUESDAY, 1 JUNE

06:30 – 09:00 BREAKFAST

07:30 – 19:00 CONFERENCE OFFICE (REGISTRATION, POSTERS)

Conference hall

09:00 – 09:20 WORDS OF WELCOME

Session 1: Typology, functions and services of ponds in landscapes (Topics 1, 5, 6)
Chair: M. Grünwald

09:20 – 10:00 **1st Keynote: M. J. Jeffries**
The nature of ponds: history, natural history and why we need to understand both

10:00 – 10:40 **2nd Keynote: B. Vanschoenwinkel* and L. Brendonck**
Space, time travel and metacommunity dynamics: temporary pools as models for ecology and evolution in metacommunities

10:40 – 11:10 COFFEE BREAK

Session 1: Typology, functions and services of ponds in landscapes (Topics 1, 5, 6)
Chair: V. Della Bella

11:10 – 11:30 **Ch. Hassall, A. Hull and J. Hollinshead**
Pond diversity in four dimensions: resurveying ponds of north west England

11:30 – 11:50 **R. Zollinger, R. Struijk and W. Bosman**
Important Pond Areas in the Netherlands related to biodiversity and metapopulation structures of species

11:50 – 12:10 **L. Denys**
Ecological typology of permanent standing water bodies in lower Belgium

12:10 – 12:30 **P. Williams, J. Biggs, A. Crowe, J. Murphy, P. Nicolet, A. Weatherby, M. Dunbar**
Pond quality decline in the UK and what to do about it

12:30 - 14:00 LUNCH

Session 3: Ponds under the threat of climate change (Topics 4, 5, 6) and
Session 4: Ecology and conservation of vegetation (Topics 4, 5, 6)
Chair: L. Denys

14:00 – 14:20 **B. Oertli and V. Rosset**
Freshwater biodiversity under climate warming pressure: identifying the winners and losers in ponds

14:20 – 14:40 **V. Rosset, S. Angélibert, F. Arthaud, D. Vallod, B. Oertli**
How climate change could affect the biodiversity of stagnant waterbodies: a case-study with eutrophic to hypertrophic ponds (Dombes, France)

14:40 – 15:00 **S. Lanfranco, P. Grillas**
Prediction of the impact of projected climate change on hydrology and vegetation of temporary freshwater rockpools of the Maltese Islands

15:00 – 15:20 **A. Schlutow, H.-D. Nagel, T. Scheuschner**
Risk Assessment and Recovery Potential of Ponds Applying the Model $BERN_{aqua}$

15:20 – 15:40 **H. John**
A management scheme for the mining pond system "Revierwasserlaufanstalt Freiberg" (Erzgebirge) under consideration of versatile practical use and nature conservation purposes

15:40 – 16:10	COFFEE BREAK
16:10 – 17:30	POSTER SESSION (CONFERENCE HALL AND SEMINAR ROOM 2)
17:30 – 18:30	EPCN GENERAL ASSEMBLY (CONFERENCE HALL)
18:30 – 20:30	DINNER

TUESDAY, 1 JUNE

Seminar room 1

Session 2: Ecology and conservation of macroinvertebrates (Topics 2, 4, 5, 6)
Chair: T. Pitsch

11:10 – 11:30	**J. Klečka and D. Boukal** Lazy ecologist's guide to water beetle diversity: comparison of four major sampling methods in an alder carr
11:30 – 11:50	**G. Porst and K. Irvine** Importance of spatial and temporal variability for monitoring of turlough macroinvertebrate communities
11:50 – 12:10	**T. Čejka, Z. Čiamporová-Zaťovičová, A. Darolová, D. Illéšová, M. Illyová, Z. Pastuchová, L. Pekárik & F. Čiampor, jr.** Small water reservoirs on submontane streams: impact of impoundment on biota (meet the project and present results)
12:10 – 12:30	**Z. Pastuchová, Z. Čiamporová-Zaťovičová, T. Čejka, D. Illéšová, E. Bulánková, P. Beracko, F. Čiampor Jr.** Small water reservoirs: new source of macroinvertebrate diversity
12:30 - 14:00	LUNCH

Session 2: Ecology and conservation of macroinvertebrates (Topics 2, 4, 5, 6)
Chair: S. Angelibert

14:00 – 14:20	**A. Bransden and F. Slater** The physical and biological characteristics of upland ponds in mid-Wales, UK
14:20 – 14:40	**A. Ruhí, J. Herrmann, St. Gascón, Joja Geijer, J. Sala, D. Boix** Macrofaunal succession in a 13-year-old wetland in South-eastern Sweden
14:40 – 15:00	**J. Herrmann, M. Iversjö** Can artificial wetlands favour invertebrate biodiversity?
15:00 – 15:20	**L. Nagorskaya** Biodiversity of ponds, floodplain water bodies and temporary pools
15:20 – 15:40	**B. Gołdyn** Diversity of large branchiopods (*Crustacea*) in ponds of western Poland: status
and	perspectives
15:40 – 16:10	COFFEE BREAK
16:10 – 17:30	POSTER SESSION (CONFERENCE HALL AND SEMINAR ROOM 2)
17:30 – 18:30	EPCN GENERAL ASSEMBLEY (CONFERENCE HALL)
18:30 – 20:30	DINNER

WEDNESDAY, 2 JUNE

06:30 – 09:00 BREAKFAST

07:30 – 17:00 CONFERENCE OFFICE (REGISTRATION, POSTERS)

Conference hall

Session 5: Land use impacts on biodiversity in farmland ponds (PONDSCAPE) (Topics 1, 4, 5, 6)
Chair: A. Hull

09:00 – 09:40 **3rd Keynote: St. Declerck, T. De Bie, D. Ercken, H. Hampel, J. Van Wichelen, L. Van Hecke, L. Denys, W. Vyverman, B. Goddeeris, K. Van der Gucht, L. Brendonck, L. De Meester, M. Koen**
Biodiversity in small farmland ponds: multigroup congruency and associations with land use practices at multiple spatial scales

09:40 – 10:00 **T. De Bie, St. Declerck, E. De Roeck, L. Denys, L. Van Hecke, K. Van der Gucht, M. Villena Alvares, W. Vyverman, M. Koen, L. De Meester**
Biodiversity in farmland ponds at multiple spatial scales

10:00 – 10:20 **H.M. Cauchie, A. Boscher, E. Praca, N. Bonjean, E. De Roeck, L. Colson, B. Goddeeris, D. Ercken, L. De Meester, T. De Bie, St. Declerck, W. Vyverman, K. Van der Gucht, P. Vanormelingen, M.V. Alvarez, L. Denys, L. Van Hecke and K. Martens**
Drivers for the diversity of microbial functions in the pond complex of Tommelen (Belgium)

10:20 – 10:40 **E.R. De Roeck, T. De Bie, St. Declerck, D. Ercken, B. Goddeeris, L. De Meester, K. Martens**
Sludge removal: the ally of pond ecosystems?

10:40 – 11:10 COFFEE BREAK

Session 6: Water quality aspects of ponds (Topics 2, 4, 5, 6)
Chair: B. Nixdorf

11:10 – 11:30 **M. Reina, M. J. Fernández-Rodríguez, A. Jiménez-Rodríguez, N. Elkhiati, L. Serrano**
The assessment of "trophic state" in shallow aquatic systems

11:30 – 11:50 **J. Robin, D. Vallod, G. Bornette, F. Arthaud, A. Wezel**
Phytoplankton as a trophic index for small waterbodies and its relation with selected taxonomic groups

11:50 – 12:10 **S. Teissier, A. Peretyatko, S. De Backer, L. Triest**
Strength of phytoplankton - nutrient relationship in ponds and lakes

12:10 – 13:50 LUNCH

Session 6: Water quality aspects of ponds (Topics 2, 4, 5, 6)
Chair: S. Hilt

13:50 – 14:10 **S. De Backer, A. Peretyatko, S. Teissier, L. Triest**
Biomanipulation of eutrophic ponds: the importance of submerged vegetation recovery

14:10 – 14:30 **G. Lischeid, T. Kalettka**
Analysis of kettle holes water quality monitoring data in Northeast Germany, using nonlinear statistics: Processes and trends

14:30 – 14:50 **R. Köhler**
Ecological and ecotoxicological "fireworks" effects of lindane (gamma-HCH) on the biocoenosis of a semi-natural pond

14:50 – 15:45 POSTER SESSION (CONFERENCE HALL AND SEMINAR ROOM 2)

15:45 – 16:15 COFFEE BREAK

16:15 – 18:00 **Special Workshop 1**:
Ponds as sentinel systems for environmental impacts

WEDNESDAY, 2 JUNE

06:30 – 09:00 BREAKFAST

07:30 – 17:00 CONFERENCE OFFICE (REGISTRATION, POSTERS)

Seminar room 1

Session 6: Water quality aspects of ponds (Topics 2, 4, 5, 6)
Chair: U. Karlowski

09:40 – 10:00 **B. Nixdorf, G. Lippert, I. Henschke, R. Deneke, R. Ender, M. Veste, M. Böhme, D. Lessmann**
Primary succession in a pond (Huehnerwasserteich): physico-chemical conditions and primary production

10:00 – 10:20 **R. Igamberdiev, B. Lennartz**
Water quality monitoring of kettle holes by means of hyperspectral remote sensing in Northeastern Germany

10:20 – 10:40 **A. Peretyatko, S. Teissier, S. De Backer, L. Triest**
Assessment of the risk of cyanobacterial bloom occurrence in urban ponds: probabilistic approach

10:40 – 11:10 COFFEE BREAK

Session 7: Conservation and management aspects of fish ponds (Topics 4, 6, 7)
Chair: A. Wezel

11:10 – 11:30 **C. Bauer, K. Schlott, G. Schlott, G. Gratzl**
Carp Ponds in Austria

11:30 – 11:50 **M. Oberle, H. Wedekind**
Situation of Carp-farming in nature protected areas in Bavaria

11:50 – 12:10 **N. Bressi**
Aliens in the pond: a review of problems and solutions to manage and eradicate invasive fish in pond conservation

12:10 – 13:50 LUNCH

Session 7: Conservation and management aspects of fish ponds (Topics 4, 6, 7)

Chair: C. Bauer

13:50 – 14:10 **A. Wezel, F. Arthaud, B. Sarrazin**
Influence of land use and lake management on water and sediment parameters of shallow lakes with fish production in the Dombes region, France

14:10 – 14:30 **Lazartigues, A., Feidt, C., Brun-Bellut, J., Banas, D., Thomas, M.**
Linkages between pond aquaculture and watershed management in north-eastern France (Lorraine region)

14:30 – 14:50 **K. Šumberová, M. Ducháček, S. Kubešová**
Flora and vegetation diversity of special types of ponds in the Czech Republic

14:50 – 15:45 POSTER SESSION (CONFERENCE HALL AND SEMINAR ROOM 2)

15:45 – 16:15 COFFEE BREAK

16:15 – 18:00 **Special Workshop 2**:
State and perspectives of pond research and conservation in Germany

19:00 – 01:00 EVENING RECEPTION

THURDSDAY, 3 JUNE

06:30 – 09:00 BREAKFAST

07:30 – 17:00 CONFERENCE OFFICE (REGISTRATION, POSTERS)

Conference hall

Session 8: Ecology and conservation of amphibians in agricultural landscape (LIFE, DBU)
(Topics 1, 2, 4, 5, 6)
Chair: R. Zollinger

09:00 – 09:40 **4th Keynote: H. Drews**
Conservation of *Bombina bombina* in the Baltic Sea Region (*Bombina*)

09:40 – 10:00 **Ch. Schröder, I. Pokorny, S. Lippold, St. Bernhöft, J. S. Hauswaldt, H. Stuckas, R. Tiedemann**
Genetic survey of relict and man-made populations of the highly endangered fire-bellied toad *Bombina bombina* to guide further habitat and population management

10:00 – 10:20 **G. Berger, H. Pfeffer, C. Schütz, T. Schönbrodt, H. Schobert, T. Kalettka**
Field cultivation in pond rich arable landscapes and implications for amphibians

10:20 – 10:40 **T. Kalettka, G. Berger, R. Dannowski, H. Pfeffer, C. Schütz**
Impacts of management and conservation measures on hydroperiod and water quality of kettle holes with respect to habitat suitability for amphibians

10:40 – 11:10 COFFEE BREAK

Session 8: Ecology and conservation of amphibians in agricultural landscape (LIFE, DBU)
Chair: H. Drews

11:10 – 11:30 **C. Schütz, G. Berger, B. Schröder**
Improving landscape connectivity in agricultural landscapes for *Triturus cristatus*

11:30 – 11:50 **W. Bosman, R. Zollinger**
Reproductive ecology of the Crested newt (*Triturus cristatus*) in a real estate in the Netherlands

11:50 – 12:10 **C. Gómez-Rodríguez, A. Guisan, C. Díaz-Paniagua, J. Bustamante**
When should we survey amphibian communities? Application of detection probabilities to the design of monitoring programs in temporary ponds

12:10 – 12:30 **N. Bressi**
Do frogs tell the truth? Herps community may not be a good indicator of pond quality

12:30 – 14:00 LUNCH

Session 2: Ecology and conservation of macroinvertebrates (topics 2, 4, 5, 6)
Chair: N. Bressi

14:00 – 14:40 **5th Keynote: F. Suhling**
Dragonflies in pond ecosystems: a review

14:40 – 15:00 **M. Florencio, C. Díaz-Paniagua, C. Gómez-Rodríguez, L. Serrano**
Explanatory environmental variables in the macroinvertebrate community of a heterogeneous pond network

15:00 – 15:20 **A. Waterkeyn, P. Grillas, L. Brendonck**
Community structuring processes in Mediterranean temporary wetlands

15:20 – 15:40 **Thornhill, I., Ledger, M., Batty, L., Friberg, N.**
The macroinvertebrate communities and environment of urban ponds

15:40 – 16:10 COFFEE BREAK

16:10 – 16:40 CONCLUSIONS

18:00 – 20:30 DINNER

THURSDAY, 3 JUNE

06:30 – 09:00	BREAK FAST
07:30 – 17:00	CONFERENCE OFFICE (REGISTRATION, POSTERS)

Seminar room 1

Session 9: Ecology of zooplankton (Topic 5)
Chair: X. Armengol

09:40 – 10:00	**M. Sahuquillo, M. R. Miracle, E. Vicente** Crustacean communities in Mediterranean ponds in relation to environmental factors
10:00 – 10:20	**A. M. Basińska, N. Kuczyńska-Kippen, K. Świdnicki** The role of habitat characteristics on the body size distribution of Chydorus sphaericus (O.F. Müller) in small water bodies (the Wielkopolska region, Poland)
10:20 – 10:40	**R. Ortells, C. Olmo-Rodríguez, S. Rodríguez, A. Gómez, X. Armengol** Genetic characterization of Daphnia magna populations in new and recently restored ponds
10:40 – 11:10	COFFEE BREAK
11:10 – 11:30	**K. Świdnicki, N. Kuczyńska-Kippen, A. Basińska** Seasonal dynamics of rotifer (*Rotifera*) and crustacean (*Cladocera* and *Copepoda*) zooplankton of meteorite crater ponds in the nature reserve "Meteoryt Morasko" in Poznań, Poland
11:30 – 11:50	**M. Illyová** The zooplankton community of reservoirs with the different trophy

Session 6: Water quality aspects of ponds (Topics 2, 4, 5, 6)
Chair: S. Teissier

11:50 – 12:10	**J. Steidl, T. Kalettka, V. Ehlert, J. Augustin** Nutrient retention from agricultural drainage effluents by retention ponds
12:10 – 12:30	**M. Omar, D. Balla** Potential of Duckweeds for desalination and treatment of agricultural drainage water in detention ponds
12:30 – 14:00	LUNCH

Session 6: Hydrology of Ponds (Topics 1, 3, 4)
Chair: G. Lischeid

14:40 – 15:00	**H. H. Gerke, S. Koszinski, T. Kalettka, M. Sommer** Hydrological functions and pedo- and geomorphologic structures in hummocky soil landscapes with kettle holes
15:00 – 15:20	**W. Golus** Selected differences between small water bodies on moraine plateaus and on outwash plains of Northern Poland
15:20 – 15:40	**S. Lanfranco, P. Grillas** Hydrological characteristics of temporary freshwater pools of the Maltese Islands
15:40 – 16:10	COFFEE BREAK
16:10 – 16:40	CONCLUSIONS
18:00 – 20:30	DINNER

FRIDAY, 4 JUNE

06:30 – 10:00	BREAKFAST
08:30 – 18:00	EXCURSIONS
18:00 – 20:30	DINNER

Excursion 1

Pond rich agricultural landscape

This excursion deals with investigations of the Centre for Agricultural Landscape Research (ZALF) Müncheberg on problems of water pollution and nature conservation in pond rich agricultural landscapes of East Brandenburg. These ponds are glacially created depressional wetlands (Eng: kettle holes, Am: potholes, Ger: Sölle) which mostly undergo a wet-dry-circle. They have a high potential for structural and biological species diversity. Although they are protected by law, they are still subject to pollution, drainage and structural reduction from intensive land use practices.

During the first stop at a pond rich field site 5 km south of Müncheberg we will present methods and results of investigations on hydroperiod, land use impacts, habitat function (amphibians, vegetation) as well as conservation and management measures. But not only ponds are considered. Based on three years of investigations we will discuss the temporal and spatial behaviour of amphibians, explain conflicts with agriculture and introduce solutions which partly impact agriculture. Measures of landscape structuring (mainly set aside and field edges) and adaptation of agricultural management will be discussed.

After lunch at Müncheberg we will shortly visit a retention pond for drainage water and discuss effectiveness for water and nutrient retention as well as potentials for habitat function. Then our trip will go around the beautiful landscape between the hilly Nature Park "Märkische Schweiz" and river "Oder" valley with stops at impressive historical and nature sites including coffee break. At "Neuhardenberg" we will see an impressive manor house ("castle") and an extensive park.

Organisation:

- **Dr. Gert Berger** (Leibniz Centre for Agricultural Landscape Research, Inst. of Land Use Systems, Müncheberg, bergerg@zalf.de)
- **Dr. Thomas Kalettka** (Leibniz Centre for Agricultural Landscape Research, Inst. of Landscape Hydrology, tkalettka@zalf.de)

Schedule:

- 8:30-18:00 (start / end at education centre Erkner)

Hint:

- Boots for field conditions as well as rain gear are recommended.
- There is option to finish the excursion at lunchtime if you have the need for earlier departure (train to Berlin, station "Lichtenberg", takes 42 min., departure every hour at 12:46, 13:46…..)

Kettle hole Landscape

Kettle hole restoration

FRIDAY, 4 JUNE

06:30 – 10:00	BREAKFAST
08:30 – 18:00	EXCURSIONS
18:00 – 20:30	DINNER

Excursion 2

Nature conservation station "Rhinluch"

The excursion deals with aspects of nature conservation at ponds of the fen landscape "Rhinluch" and of the agricultural landscape with high percentage of fields. The first stop is at nature conservation station "Rhinluch", which belongs to the Environment Agency Brandenburg. The station is situated in the nice village "Linum", which is famous for many nesting storks. An overview about different pond conservation projects will be given with special context on amphibians and swamp turtles. The next stop in a short distance is the pond landscape "Teichland Linum". Aspects of biotope and pond management and habitat value for waterfowl at these former fish ponds will be discussed. The fish ponds are important resting place for Cranes. Afterwards the excursion leads to the fen landscape "Rhinluch" ("Rhinbogen", "Potsdamer Platz"). There you will get an overview about newly created ponds at fen sites (EU-LIFE-Project). After a short stop at a historical monument (battle at "Fehrbellin") there will be time for lunch at "Wustrau/Altfriesack". After lunch the excursion leads to some midfield ponds at site "Keglitz". There some preliminary results of a conservation project will be presented.

Organisation:

- **Dr. Norbert Schneeweiß** (Environment Agency Brandenburg, Nature conservation station „Rhinluch", norbert.schneeweiss@lua.brandenburg.de)
- **Thorsten Seeger** (Landschaftsförderverein Upper „Rhinluch")
- **Holger Pfeffer, Dr. Ulrich Stachow** (Leibniz Centre for Agricultural Landscape Research Müncheberg, Institute of Land Use Systems, hpfeffer@zalf.de, ustachow@zalf.de)

Schedule:

- 8:30-18:00 (start / end at education centre Erkner)

Hint:

- Boots for field conditions as well as rain gear are recommended

ponds of the fen landscape "Rhinluch"

village "Linum", which is famous for many nesting storks

historical monument "Fehrbellin"

WORKSHOPS

Workshop 1: Ponds as sentinel systems for environmental impacts

Facilitator: Beat Oertli (contact: beat.oertli@hesge.ch)

Ponds are numerous and widely distributed geographically. Even if they do not constitute perfect replicates in the landscape, they can be used as such with some care. Indeed, they already have proved their relevance as sentinel systems in various monitoring programs (e.g. in relation with global changes, atmospheric pollution, biodiversity assessment, or landscape assessment).

This workshop aims at assessing the relevance of ponds as sentinel systems and at promoting their use in this way.

Some key issues to discuss and to develop:

- Introduction: list of existing cases where pond are used as sentinel systems (and of teams working directly or indirectly on this topic).
- Sentinel systems: for what kind of environmental impact. List of impacts (also new to implement).
- Pros and cons for using ponds as sentinel systems.
- What is the future for this topic? Can we promote the use of ponds as sentinel systems (regionally or internationally)? How?

Workshop 2: State and perspectives of pond research and conservation in Germany

Facilitator: Thomas Kalettka (contact: tkalettka@zalf.de)

The workshop is addressed to both, registered German participants of the EPCN conference and other nonregistered interested persons from Germany. The aim of the German speaking workshop is to exchange experiences about state and perspective of pond research and conservation in Germany.

Some key issues are:

- EPCN and German Limnological Society (working groups “Small water bodies” and “Shallow lakes”)
- Finished and ongoing pond related research and conservation activities (who, where, objectives, results, problems)
- Important areas for ponds (IAP) in Germany
- Development of a pond community in Germany

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

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Keywords: invertebrates, interactive keys, multi entry, assessment tool, management

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

Changes in zooplankton diversity along three consecutive years in a restored pond in L'Albufera Natural Park (Valencia, Spain)

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Keywords: diversity, restoration, species richness, succession, zooplankton

The succession of the zooplankton community and its diversity were studied in a permanent peridunal pond located in L'Albufera Natural Park (Valencia, Spain) which was restored in 2003 increasing 15 times its surface, but maintaining its maximum depth. The aim of this study was to assess the changes in the zooplankton community in the last years (2006-2009) and to compare it with the community before restoration. Zooplankton samples were taken monthly along three consecutive years, and at the same time, common limnological variables were measured. Rotifer community presented the highest diversity, compared with the crustaceans, whereas the juvenile copepods presented the highest density. The restoration had a positive impact in the community, since the enlarged surface and the creation of new habitats caused an increase in specific richness and diversity. Nevertheless, diversity diminished during the last period (2008-2009), probably due to the increase in the trophic level of the pond which led to the dominance of a few species (nauplii, *A. fissa* or *T. pusilla*). Causes and consequences of the observed richness and diversity patterns and their relation with restoration process were analyzed through this communication.

Dispersal and colonization patterns of zooplankton in shallow water bodies at a local scale: project guidelines and preliminary results

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Keywords: dispersal, restoration, colonization, peridunal ponds, zooplankton

Dispersal and colonization are fundamental processes to explain the composition and dynamic of the zooplankton community. These processes are particularly important in aquatic organisms, because for a successful dispersal they must go through a hostile (terrestrial) environment and arrive to another water body. Temporary ponds are ephemeral environments which demand characteristic adaptations to their inhabitants, which should allow them to colonize new habitats or survive to the dry season. Our study is focussed on zooplankton, organisms which have passive dispersal mechanisms based on transport of resting stages (eggs, ephippia, diapausing stages...). We intend to study the patterns of both processes (dispersal and colonization) and to explain them in an ecological context. We will study also the clonal dispersal in *Daphnia magna*, trying to confirm several topics as the monopolization hypothesis, considering the interactions with biotic and abiotic factors.

This project, starting in 2009, has been financed by the Spanish Ministry of Science and Innovation (CGL2008-03760/BOS) in the framework of a restoration project going on in "malladas". This is the local name for small and shallow peridunal ponds in the area of L'Albufera Natural Park (Valencia, Spain). In the sixties most of them were dried out and some were silted with ground, but in recent years, a process of restoration has been carried out in some of these ponds.This restoration has provided a mosaic of new and old shallow lakes which allow us to test the hypothesis related to this matter. We also want to monitorize the limnological variables, particularly those focussed on zooplankton. We will choose several ponds to make a temporary monitoring. Finally, we will investigate the role of wind, birds and humans as vectors to plankton dispersal.

Richness of established vegetation and propagule bank in shallow lakes: impact of phytoplankton productivity

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Keywords: shallow lakes, submerged aquatic vegetation, propagule bank, phytoplankton productivity

A high proportion of continental aquatic ecosystems are managed shallow lakes. The understanding of the impact of management practices on biodiversity is essential for conciliating maintenance of services and biodiversity conservation. This work aimed to investigate the impact of phytoplankton productivity on the diversity of aquatic plants in networks of temporary shallow lakes used for producing fish (Dombes, France).

For this aim, the propagule bank and established vegetation of thirteen shallow lakes were sampled in 2008. Phytoplankton productivity, estimated through chlorophyll a concentration, was measured during all the vegetation period.

Chlorophyll a concentration was negatively correlated to the richness and abundance of established vegetation, while it did not affect the propagule bank. Similarity between propagule bank and established vegetation was lower for higher concentrations in chlorophyll a.

Management practices may favour temporal and spatial plant dispersal and maintenance of a persistent propagule bank in such lakes. Species are recruited and reproduce themselves using windows of opportunity, which availability is ruled by management practices.

Grazing and temporary wetland conservation in the dehesa landscape

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Key words: Habitat Directive, Isoeto-Nanojuncetea, land use, Sardinia, small-scale zonation

In Sardinia the presence of temporary wetlands (TWs) is relevant especially on the tablelands, on impermeable ignimbritic rocks where plant landscape is characterized by the neutro-acidophilic cork-oak series, *Violo dehnhardtii-Querco suberis*. Land use until 20 years ago was mainly based on traditional livestock activities, wich favored the formation of wooded pastures know in the Mediterranean basin as dehesa landscape. Even if TWs are not part of the successional trajectories of the main vegetation series, the surrounding woody vegetation, if not controlled by grazing, is able to encroach them.

Despite their small size, TWs present a large variability which is mainly attributed to their typical trait: a fine-scale zonation of the vegetation, depending on the water depth and the flooding period. The arrangement is based on concentric belts which should be considered homogeneous areas and the targets for conservation actions. The external belt is dominated by species of *Isoeto-Nanojuncetea* class, which is the benchmark class for the priority habitat 3170*. The external belt is also to be considered the more vulnerable in respect to the colonization by terrestrial woody species in undergrazed systems and by ruderal species, belonging to the *Stellarietea mediae* class in overgrazed systems. Therefore the external belt should represent the main conservation target within TWs.

The role of habitat characteristics on the body size distribution of *Chydorus sphaericus* (O. F. Müller) in small water bodies (the Wielkopolska region, Poland)

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Keywords: cladoceran, body length, habitat type, ponds

Small water bodies are characterised by dynamic conditions, which may be crucial for zooplanktonic species distribution. The multiplicity of environmental factors such as the catchment area type, as well as pond morphology and accessible habitats, contribute to the determination of community structure and the body length of crustaceans. The specificity of the spatial and morphological structure of the aquatic plant habitat may strongly modify the distribution of crustacean communities. Therefore, it might be supposed that the kind of hydromacrophytes dominating at a particular sampling station would also influence the body size of individuals of *Chydorus sphaericus*.

The objective of this work was to compare the body size of the cladoceran *C. sphaericus* in different habitats – hydromacrophyte stands representing various ecological types of aquatic vegetation (nymphaeids, elodeids and helophytes) and comparatively in the open water zone among different types of small water bodies (mid-forest and mid-field). The examined ponds differed also in respect to surface size (small, medium and large), the physicochemical characteristics and fish presence/absence. Moreover, the relationship between *C. sphaericus* size as well as its densities and both physical-chemical and biological parameters was analysed.

As a result of this examination it was found that the type of water body, its surface size and also the specificity of a habitat and the presence of fish were the best predictors of the body size of *C. sphaericus* inhabiting small water bodies. These facts indicate a necessity for undertaking investigations of small water reservoirs in the aspect of their microhabitual variation relating to habitats of different spatial and morphological complexity. It also indicates that not only the number of individuals will vary between habitats within a microscale, but also other population parameters such as e. g. body size will depend on a number of environmental factors, including biological interactions and physical-chemical characteristics along with the level of habitat heterogeneity.

Carp ponds in Austria

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Keywords: carp pond, fertilizer, water quality

Ponds are an essential man made part of the landscape and provide valuable water and wetland ecosystems. Many ponds are therefore designated as NATURA 2000 areas or other forms of protected areas. However, the main purpose of ponds was and still is the farming of fish, mainly common carp (*Cyprinus carpio* L.). Although carp farming has changed quite a lot over the centuries, this form of land use is still the best guarantee for the further existence of pond ecosystems. However, it was a long way from the extensive beginnings with very low yields to the first scientific approach to pond aquaculture at the beginning of the 20th century, followed by the doctrine of pond fertilizing and intensifying in the middle 20th century, to a more sustainable approach today.

Still at the beginning of the 1980s it was recommended to use up to 400 kg ha^{-1} of P-fertilizer and another 400 kg ha^{-1} of N-fertilizer to boost production of carp in the pond. However, today fertilizers are not used any more and data show a reduction of P_{TOT} and NH_4-N in the ponds over the last 20 years. The mean amount of P_{TOT} decreased from more than 250 µg l^{-1} between 1985 and 1990 to 150 µg l^{-1} in the period from 2001 to 2006. A similar reduction was observed for NH_4-N. An impressive enhancement of water quality, which is not only positive for the environment but also for the carp farmer: $P_{TOT} > 250$ µg l^{-1} dramatically increases problems with low oxygen in ponds. Furthermore, against all apprehensions production of carp did not decrease and in the same time. In the north of Austria up to 800 kg ha^{-1} (mean production: 300 kg ha^{-1}) can be produced per annum.

Carp ponds and the EU Water Framework Directive

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Keywords: legislation, water framework directive, carp ponds

Ponds in Austria are essentially man made water bodies mostly constructed for carp farming. Their value as landscape elements and wetland ecosystem is widely recognised and especially the large ponds with their extended reed belts are designated NATURA 2000 areas. However, this environmental importance is a secondary function. Moreover, many large ponds have been constructed more than hundred years ago by impounding small rivers and creeks or by using large quantities of water abstracted from running waters. This often resulted in an interrupted continuum and a migration barrier for water organisms and a severe lack of water flow in the river downstream of the pond. This way of pond construction is not up to the environmental standard of today and the existing ponds clearly do not achieve the EU Water Framework Directive objective of "good ecological status". But on the other hand, these ponds are often protected areas which provide habitats for endangered species like otter (*Lutra lutra*), marsh harrier (*Circus aeruginosus*) and osprey (*Pandion haliaetus*) as well as the special fauna and flora of a wetland ecosystem. It is likely that the restoration of the river continuum will lead to the degradation of these ponds. So there are several environmental as well as economical and social interests which may collide with each other. The presented poster intends to show the conflicting interests concerning the protection of fish ponds on the one hand and restoration requirements of rivers on the other hand on the basis of a chain of ponds connected to a small river system in the North of Austria.

Field cultivation in pond rich arable landscapes and implications for amphibians

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Keywords: amphibians, agriculture, field cultivation, temporal and spatial coincidence

Pond rich arable landscapes are often used by intensive agriculture. On the other hand, these regions are habitat of many species of amphibians. Due to their biphasic behaviour, individuals use aquatic as well as terrestrial habitats. Very often extensive migrations between both types of habitat occur. Under conditions of low structured and intensively used arable landscapes temporal and spatial coincidences of management procedures and amphibians are unavoidable. Depending on damaging rates population declining effects can be caused.

From 2006 to 2008 we conducted a research project on these coincidences. Based on extensive field investigations, we identified major conflicts between agriculture and amphibian species, and we concluded basic rules for a sound land management. Mineral fertilizers in form of granules widely spread on the soil surface are considered serious. Within 5 days, up to 50 % of the population of single amphibian species had contacts with the granules at the soil. Depending on soil moisture and rate of dissolution of fertilizers, individuals are affected more or less heavily. Soil cultivation by plough is a second major threat for amphibians. Some wet spots within crop fields as well as the short and dense vegetation cover of winter rape (during stubble period after harvesting) attract amphibians due to microclimate and food supply. If these areas of arable fields are ploughed the animals are buried deeply into the soil without any chance to escape. Thus these spots act as traps for animals, and a massive loss of amphibians can be estimated.

Injection technology of mineral fertilizer into the soil is one protection measure to avoid contact of amphibians with harmful fertilizers. Substitute ploughing for reduced soil cultivation without plough is a second recommendation for farming. The well known buffer strips along water bodies are of highest importance for amphibians and thus strictly recommended to agriculture.

Does the isolation matter? Habitat loss and hydrophytes distribution among ponds in agricultural landscape of the Szczecin Hills (NW Poland)

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Keywords: ponds disappearing, macrophytes, nearest-neighbor statistic, spatial autocorrelation

Small water bodies are completely surrounded by upland at the local scale. It is beneficial to study such wetlands as habitat islands, emphasizing isolation. The effective conservation of isolated wetlands calls i. a. for knowledge on their inhabitants' dispersal potential. The direct empirical data are available for very few plant species, but we tried to identify this potential indirectly, based on macrophytes distribution among mid-field ponds in one of the highly cultivated regions in NW Poland (the Szczecin Hills, 64 % covered by field with ponds being the main form of surface water). Changes in mid-field ponds number and their isolation occurred during the last one hundred years were also estimated.

The analysis of spatial distribution of the mid-field ponds at the end of the 19th and 20th century was carried out using the CrimeStat software. Spatial autocorrelation in distribution of hydrophytes was explored with the joincount.test routine of R CRAN software.

At the end of the 19th century there were 170 mid-field ponds. Mean nearest neighbor distance (MNND) was 423 m. 109 mid-field ponds (64 %) disappeared by the end of 20th century. In addition to 61 preserved ponds 49 new water bodies were created. At the end of the 20th century, MNND reached 638 m for the total of 110 mid-field ponds.

The spatial analyses were performed for 28 aquatic macrophytes, selected from 146 plant species noted in 50 mid-field ponds. It was found that ponds with less than average number of hydrophytes were more isolated (MNND = 1,042 m) than those with a larger number (MNND = 595 m). Explorative spatial data analysis revealed the presence of significant positive spatial autocorrelation in the distribution of 36 % hydrophytes (search radii to 4,881 m). In their cases it is possible to reject the random distribution hypothesis, which enables a spatial regimes exploration.

Reproductive ecology of the crested newt (*Triturus cristatus*) in a real estate in the Netherlands

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Keywords: reproductive ecology, Triturus cristatus, ponds, terrestrial habitat, metapopulation structure

The "Landgoederen Oldenzaal" is a real estate in the northeast of the Netherlands where *Triturus cristatus* is present. It is one of the biggest meta-populations of this species in the Netherlands.

Between May and September 2009 220 ponds in this area were investigated on the presence of the crested newt. In this area several surveys on *Triturus cristatus* have been carried out since 1980 so changes in (meta)populations structure can be presented and discussed.

The presence of the crested newt was related with several measured biotic and abiotic factors of the reproduction site and the direct terrestrial environment. The results show that the *Triturus cristatus* does avoid ponds where fish is present. Furthermore there is no direct relationship with the presence of submerse vegetation. Terrestrial there is a strong relationship with the presence of forests in the direct vicinity of the pond. Agricultural fields and pastures had a negative influence on the presence of the species.

The physical and biological characteristics of upland ponds in mid-Wales, UK

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Keywords: upland ponds, Wales, UK BAP, pillwort, fairy shrimp

The upland ponds of central Wales, UK, 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 Great Britain. Some of their defining features include their shallow depth, hydrology and geology and, in biological terms, they share a number of characteristics with temporary ponds in the New Forest such as the presence of UK Red Data Book and UK BAP priority species such as Pillwort (*Pilularia globulifera*) and the Fairy shrimp (*Chirocephalus diaphanus*). The proposal to include 'Ponds of High Ecological Quality' as a priority habitat within the UK could see the upland pools of central Wales recognized as a UK BAP priority habitat in their own right. In order to investigate further into this, we sought to examine the unique physical and biological nature of these ponds and discover how this is maintained. Preliminary work identified upland ponds to be locally concentrated within the area. Monthly water chemistry and biological data were collected from 20 of these ponds, over an 18 month period (March 08-Nov 09) in order to identify the physical and biological characteristics of these ponds spatially within the landscape, as well as investigating the effects that temporal fluctuations in physical factors might have on the biodiversity within such a habitat. The current findings of the study are discussed in this paper.

Aliens in the pond: a review of problems and solutions to manage and eradicate invasive fish in pond conservation

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Keywords: ponds, fish, alien, invasive, eradication

Alien fish, either local or exotic taxa, if not native pond dwellers are one of the main reasons of biodiversity loss in ponds, mainly in the little or rocky pools with simple-structured habitats. Even if fish should generally be unable to colonise ponds they are too commonly introduced by citizens and local communities, representing not only an ecological problem but a delicate and important topic in pond communication with stakeholders and in pond popularisation projects.

Nevertheless, ponds are little and, generally, isolated freshwater habitats, so alien fish management is definitely easier than in lakes or rivers. When possible and if accepted by local community, eradication is the best solution. Different methods are possible to eradicate fish from ponds: from drying-up of the basin to gill-netting and electro-fishing, but different experiences suggest that using "rotenone" is largely the best.

Skills are suggested to avoid social contrasts with animalists, to minimise impact of fish-removal on non target species and to prevent the coming-back of the fish in the ponds. Cases (few) when fish removal is inappropriate for ecological, historical, or opportunistic reasons have also to be taken into consideration.

Do frogs tell the truth? Herps community may not be a good indicator of pond quality

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Keywords: Amphibians, Odonata, Heteroptera, pond, biodiversity

Amphibians and reptiles are generally considered as top predator in ponds and, therefore, good bio-indicators of pond quality and biodiversity. Moreover, these vertebrates are more well-known and accepted than invertebrates or plants, so they are generally considered as "umbrella species" or as "flag species" in pond conservation. In the area of Trieste (NE Italy) ponds are not frequent due to the karstic and very permeable soil. Nevertheless 10 species of amphibians (*Salamandra salamandra salamandra, Lissotriton vulgaris meridionalis, Triturus carnifex carnifex, Bombina variegata variegata, Hyla arborea arborea, Bufo bufo spinosus, Pseudepidalea viridis, Rana dalmatina, Pelophylax ridibundus, Pelophylax lessonae*) and 2 of freshwater reptiles (*Natrix natrix, Emys orbicularis*) used to be common and widespread in the area. At the end of last century, ponds became extremely rare due to lack of management and direct impoundment. Therefore, related herps species strongly declined. To avoid local extinction of amphibians and freshwater reptiles, since 1994, 30 ponds have been restored or constructed. All ponds were surveyed in 2009 for amphibians, reptiles, odonata and heteroptera. All herp species colonised new ponds and augmented their population number around Trieste; except *Pelophylax lessonae* and *Emys orbicularis* (that resulted more strongly connected to old -the frog-, or big -the turtle- ponds). Being able to fly, the insects should be better coloniser than herps. On the contrary, only few common species of odonata and heteroptera have been found in the new pond, even in the ponds with the richest herpetological biodiversity. Some species, mainly *Ranatra linearis*, resulted possibly locally extinct. Only the ponds with the relict population of *Pelophylax lessonae* showed also the highest insect biodiversity. At least in the studied area, *Pelophylax lessonae*, inhabiting only well structured and aged ponds, seems to be the only umbrella species, and a good bio-indicator, in pond conservation.

Is there any relationship between soil and vegetation patterns in Mediterranean temporary wetlands? A case study in Sardinia (Italy)

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Key words: CCA, homogeneous spatial units, hydrological gradient, site effect, vegetation belts

This research was undertaken in six temporary wetlands (TWs) in North-western Sardinia with the aim to define soil and vegetation patterns and to point out the relationships between them. TWs were located in different environmental conditions (e. g. substratum, elevation). Homogeneous spatial units (HSUs) within each TW were recognized; it was generally possible to distinguish a central belt (CB), an intermediate belt (IB), and an outer belt (OB). Three soil samples were taken from the A horizon (0-20 cm) in each belt. Vegetation was sampled along transects. The hydrological gradient (e. g. water depth and flooding period) was monitored monthly. The nMDS ordination and the ANOSIM analysis based on soil physical-chemical parameters, pointed out that there were not significant differences between HSUs (Global $R = 0.02$; $p = 0.23$). Differences between sites were significant overall (Global $R = 0.69$; $p = 0.001$) as well as between each pairs of sites. Overall 96 plant taxa were found. The nMDS ordination and the ANOSIM analysis based on the contribution of each plant to vegetation cover pointed out that there were significant differences in all the comparisons. Differences between HSUs were significant (Global $R = 0.406$; $p = 0.001$) as well as differences between each pairs of groups. Differences between sites were significant overall (Global $R = 0.472$; $p = 0.001$) and between each pairs of sites. The CCA triplot showed that the soil characteristics which most affected the vegetation were some macro-nutrients (e. g. total P, extractable P and available P, and N), pH, silt and sand content.

The results showed that the soil pattern in Mediterranean TWs is mainly due to a "site effect" while vegetation pattern was driven by a "site effect" as well as by a "within TW effect".

Drivers for the diversity of microbial functions in the pond complex of Tommelen (Belgium)

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Keywords: functional diversity, microbial activity, production, respiration, nitrification

Ecosystem functioning does not only rely on the species diversity but also on the diversity of functions that organisms can play within the system. Unicellular organisms generally exhibit a large variety of functions within aquatic ecosystems. They are tightly linked to the geochemical cycles of matter and are therefore likely to react readily to changes in the abiotic environment. On the other hand, they are at the basis of the food web and can interact with higher trophic levels. The present study aims to explore the relationships existing between the taxonomic diversity, the abiotic characteristics of ponds and the microbial activities in 40 closely related ponds. Ponds were sampled in June and July 2007. The target activities are primary production, bacterial secondary production, microbial respiration, nitrification and patterns of enzymatic activities. These variables were measured concurrently with taxonomical data on bacterio-, phyto- and zooplankton, phyto- and zoobenthos, macro-invertebrates, amphibians, fish and aquatic macrophytes. On the other hand, a large set of physico-chemical data was also collected. Relationships between the studied variables were first explored using Redundancy Analysis. The microbial activities were highly inter-correlated and discriminated very well the sites. They appeared to be significantly associated to a very limited number of other biotic variables. Only the primary production appeared to be significantly correlated with the algal species ordination, confirming that the composition of the algal community is changing along the primary production gradient. Nitrification rate and bacterial production appeared to be significantly correlated with the absolute as well as relative abundance of detritivores. Such correlation suggests that the bacterial production and nitrification rates could be increased in the presence of detritic organic material that favours detritivores. The exact nature of the interaction has to be ascertained with experiments that are beyond the scope of the present study.

Small water reservoirs on submontane streams: impact of impoundment on biota (meet the project and present results)

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Keywords: reservoirs, streams, human impact, biota

Small artificial ponds with their diverse functions create important component of lowland landscape, despite they were in minor concern of limnological research in Slovakia so far. Therefore this project is oriented to all aspects of water biota (bottom fauna, fishes, amphibians, birds, aquatic and riparian vegetation, plankton) of six small water reservoirs belonging to two different catchments.

The first step was to obtain sufficient environmental and biological data, and improve the knowledge on the biodiversity of aquatic ecosystems influenced by small water reservoirs (inlets, littoral and outlets). Preliminary results suggest the importance of ponds as source of biodiversity. From 50 to 70 littoral benthic taxa have been identified in individual ponds, altogether nearly 200 taxa; inlets and outlets were inhabited with 40 to 100 taxa, 330 taxa altogether. Water biota (benthos and zooplankton) reflected the trophic state of individual ponds rather than natural differences between catchments.

Molecular analysis of genetic diversity is also part of the project. Haplotype diversity was studied in model species within individual reservoirs, and the results are used to estimate changes in population genetic structure induced by constructing reservoirs and differences among reservoirs. Implementation of the innovative methods of the multidisciplinary ecological research (artificial neural networks – ANN) will enable modelling the virtual reservoir within the frame of existing environmental conditions. Suggested model will serve for the application of outputs in the ecological management oriented to the sustainable development of the artificial aquatic ecosystems in combination with their primary use and implementation of the results gained at the international scale.

The study was supported by the project SAV-FM-EHP-2008-03-04.

Structure and dynamics of phytoplankton communities of astatic ponds of the Wielkopolska Lakeland (W Poland)

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Keywords: biodiversity, algae, inundation, farmland, temporary waters

Phycological and physico-chemical analyses were conducted on samples from 9 field ponds of the Wielkopolska Lakeland (W Poland). Water samples (180 in total) were collected every two weeks from 11 February 2008 till 11 May 2009. The aim of this study was to examine the qualitative and quantitative structure and temporal changes of phytoplankton communities in astatic water bodies, with reference to physical-chemical properties of water. The major factors influencing the phytoplankton structure in the ponds studied were changes in the water level and length of hydroperiod. Euglenophyta (52 taxa) was the richest group of algal species in the investigated ponds and often the dominant group in phytoplankton abundance. The major genus was *Trachelomonas*. Quantitative analysis showed that phytoplankton was dominated usually by Bacillariophyceae and also by small species of Chlorophyta (mainly by Chlorococcales) and Cryptophyceae, which indicates unstable conditions for the inhabiting organisms. Temporal changes in phytoplankton abundance were characterised by high fluctuations which were connected with frequent variations of environmental factors. The most rapid changes occur in time following inundation of desiccated or frozen water body. During first few weeks after such flooding event a fast increase in algal biodiversity occurs. After one/two months the community becomes more stable, the diversity decreases and relatively steady structure of dominance forms. The community becomes dominated by forms adapted to conditions occurring during given hydroperiod. Such conditions are not constant for a given pond across a series of hydroperiods. As a result, during subsequent inundation periods of the same pond, different patterns of community structure emerge from the initial peak of diversity.

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A Preliminary biotypology of European ponds

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Keywords: biological traits, bioassessment, classification, databases, macroinvertebrates

A typology of European ponds is still needed to develop bioassessment techniques along broad environmental gradients. We analysed the distinctness of the pond biota across a latitudinal gradient ranging from Northwestern to Southwestern Europe. Biological traits were used to compare communities over broad geographic ranges, because they are independent of taxonomy, and reflect adaptations to environmental characteristics. Data on the occurrence of 204 pond invertebrates in 96 ponds were collected from the literature, and traits were described for each taxon. Ponds were divided into three subsets according to their biogeographic origin (Mediterranean, Atlantic and Alpine, and Continental), and to a gradient of hydroperiod. Invertebrates in the Mediterranean Region allocated much energy to reproduction and resistance forms. These characteristics, and others such as small body size, suggest that populations are selected by unstable habitats. Most species had narrow thermal ranges, making Mediterranean invertebrates more susceptible to climate change. In Continental areas, invertebrates allocated less energy to reproduction and dispersal, whereas resource use was favoured by short-lived organisms, and a high diversity of feeding groups. These characteristics suggest higher resilience capabilities. Those populations are selected by more stable and structured habitats, allowing spatial and temporal segregations of species. The main difference between ponds in the Alpine and Atlantic regions was their elevation. Alpine conditions necessitate specific adaptations related to hydroperiod length, rapid temperature fluctuations, and low nutrient concentrations. Although we could gather information on about 100 ponds, we are still unable to obtain information on a much larger set of ponds that would be evenly distributed across Europe. These data certainly exist, but their heterogeneity and low accessibility remain problematic. There is still, therefore, a pressing need for the incorporation of high quality data sets into a standardized database so that they can be further analyzed in an integrated European-wide manner.

The influence of small water reservoirs on haplotype diversity of aquatic insect populations

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Keywords: reservoirs, DNA, genetic variability, Coleoptera, Trichoptera

The artificial water reservoirs built on streams fragment these lotic ecosystems, and thus influence reasonably their natural conditions. Beside other impacts, the stream fragmentation can cause changes in genetic structure of population and even loss of genetic polymorphism in aquatic organisms. We tested possible influence of such a fragmentation in submontane Vývrat stream on the west side of the Small Carpathians and lowland Podhájsky potok stream (western Slovakia). Both streams are equally cut into two parts by reservoir retaining water for agriculture and fishery. Two model species were selected for molecular analysis of the genetic variability, i. e. *Elmis maugetii* (Coleoptera: Elmidae), representing slowly moving benthic organisms with both larval and adult stages aquatic, and *Hydropsyche angustipennis* (Trichoptera: Hydropsychidae), more agile species with aquatic larvae and terrestrial, well flying adults. Samples of each species were collected from inlet and outlet of respective reservoir. Firstly, 339bp (*E. maugetii*) and 360bp (*H. angustipennis*) fragments of cytochrome b mtDNA were used for haplotype analysis. Within *Elmis* samples, 8 haplotypes were identified, 5 of which were common for both sites, three haplotypes were unique for inlet and three for outlet. Within *H. angustipennis*, only two haplotypes were identified, occurring equally in inlet and outlet. The preliminary results suggest very low impact of artificial reservoirs on the haplotype polymorphism, especially in case of *H. angustipennis*, however, more samples and more fragments should be analysed to describe the influence in detail.

The genetic survey represents a part of the multidisciplinary project investigating the impact of artificial reservoirs on biota and results gained from the DNA analyses will be included in the final suggestions for the reservoir ecological management.

The study was supported by the projects SAV-FM-EHP-2008-03-04 and VEGA 2/0028/09.

Population genetics of alpine lake invertebrates (the High Tatra Mts.) – an introduction

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Keywords: alpine lakes/ponds, DNA, haplotype, Agabus, Coleoptera, the High Tatra Mts.

High mountain lakes and ponds of glacial origin belong to the most remote and undisturbed aquatic environments over the world. Recovery from anthropogenic pollution, classification of lakes, and potential impact of climate change on these ecosystems are scientific hot topics at present. However, little attention is still paid to the study of population genetics and phylogeography of their inhabitants, especially macroinvertebrates, not only in large scale (between mountain ranges), but also within smaller areas. Results of analysis based on proper and sensitive molecular methods can considerably contribute to the knowledge on their distributional trends and identifying their possible refugia.

The High Tatra Mountains (western part of Carpathian arch) were overstruck about 10,000 years ago and as a consequence of the last Ice Age, more than 110 permanent lakes of glacial origin and many other small ponds rested there. In 2009, the study of genetic variability of model alpine macroinvertebrate species started there. In the preliminary stage aquatic beetle *Agabus bipustulatus solieri* (Coleoptera: Dytiscidae), representing aquatic insects with the whole life cycle spent in the water and with restricted possibility of long-range motion, was chosen. At first, DNA of up to 50 specimens from 22 standing waters (17 on Slovak and 5 on Polish side of the High Tatras), belonging to 12 different valleys was isolated. Partial cytochrome b – 345bp mitochondrial DNA fragment was used for haplotype analysis. Within the *Agabus* samples, 4 haplotypes were identified until now. One of them was dominant, scattered over the whole area. Remaining haplotypes were almost exclusively restricted to one of the sampled valleys (each haplotype to another valley). However, many more samples and additional fragments of DNA will be analyzed in the next future to describe population genetics of *Agabus* more precisely.

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Searching for a quality index for the Italian retting pools: the first attempts

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Keywords: Retting pools, quality index, invertebrate, aquatic plant

Until 1950, Eastern Po River plain showed many thousands of retting pools that were used in the textile industry of the hemp (*Cannabis sativa*). In the province of Ferrara (Emilia-Romagna, Italy) part of the still surviving ponds (about 1,400) are retained as stepping stones in the ecological networks but they undergo many threats, such as alien invasive species, very high trophic levels and, above all, intensive agricultural practices and urban sprawl. Very often, local Authorities are asked for the permission to close some retting pools and sometimes ponds are closed without permissions. If we are able to relate the ecological value of each retting pools to an index of quality, we could assess the functioning of the ecological networks, help the Authorities in choosing ponds that should absolutely be preserved and evaluate the environmental damage of the unauthorized closures.

Aquatic invertebrates were collected in a sample of about 60 ponds with a hand-net in one or two dates using a standardized approach. Other information such as the pond area, pH, the aquatic plant species and the surface colonized by them, the percentage of the pond area colonized by the bank plants, surrounding trees and bushes, etc. were recorded. We tried an assessment of the retting pools following the criteria proposed for PSYM (Predictive System for Multimetrics): some results are consistent with the forecasting of the method but, in general, Italy lacks long series of data about ponds to support predictive methods. Moreover, the ecological role of Italian plant and animal species need to be carefully assessed.

The protection of the retting pools: communicate ponds to citizen and municipality officials

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Keywords: ponds, protection, communication

In the Municipality of Ferrara, the 436 retting pools that still survive after the end of the hemp cultivation are now classed as freshwater stepping stones in the municipal ecological network that was definitively approved one year ago as a part of the new city plan. By now, the plan only states that ponds can be managed for their conservation and they cannot be closed, but penalties for unauthorized closures are not yet fixed. Thus, the protection of the retting pools must invoke the Habitat Directive and a regional list of particularly protected animal species (invertebrate, Fishes, Amphibians, Reptiles, small Mammals and Bats) approved in 2009.

The scientific study of retting pools started in 2004 with a census project, but the communication on the importance of the typical Ferrara ponds dates back to 2000, when the Natural History Museum began to offer regular educational activities to the primary school students. In 2006 a few high school students were involved in activities both in the classroom and on field and a cooperative company published a paper written by the first author of this abstract on its journal, which is sent for free to about 400.000 associated people. In 2007-2008, the first data of the census project were used as the general background for an exhibition held at the Natural History Museum. In 2009, text and photographs of the exhibition were published in a photographic book.

Now, we are planning a communication campaign targeting adult citizen and even the officials of the Municipality engaged in planning, projecting and controlling, who are not completely aware of the existence of the network, of the pond ecological role and of the duties that their protection involves.

Biomanipulation of eutrophic ponds: the importance of submerged vegetation recovery

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Keywords: pond restoration, eutrophic, peri-urban, fish recolonization, zooplankton

Thirteen phytoplankton-dominated eutrophic ponds in Brussels (Belgium) were biomanipulated (complete emptying and fish removal) in order to restore the ecological quality and reduce the risk of cyanobacterial blooms. Data on nutrients, phytoplankton, macrophytes and zooplankton were obtained before and after biomanipulation. Fish removal initially resulted in a drastic reduction of phytoplankton biomass and a shift to the clear-water state in twelve ponds. Lower phytoplankton biomass was associated with a marked increase in density and size of large cladocerans and/or a recovery of submerged vegetation.

During the period after biomanipulation, the ponds have shown very different dynamics, mainly defined by planktivorous fish recolonization and presence of submerged vegetation. In ponds where fish remained absent, large cladocerans were perfectly capable of controlling phytoplankton biomass, regardless of the presence of vegetation. All ponds that were not recolonized by fish as such remained in the clear-water phase.

As a result of fish recolonization in some of the ponds, a strong decrease of density and size of large cladocerans was observed, even in vegetated ponds, suggesting that submerged macrophytes did not provide any shelter for large zooplankton against fish predation. Despite a strong impact of fish predation on large cladocerans, only non-vegetated ponds returned to a turbid, phytoplankton-dominated state. In ponds with a submerged vegetation cover of > 30 %, submerged macrophytes inhibited an increase of phytoplankton growth, most likely through nutrient limitation, as suggested by the lowered nutrient concentrations in vegetated ponds.

Biodiversity in farmland ponds at multiple spatial scales

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Keywords: hierarchical partitioning of diversity, alpha, beta & gamma diversity, multiple organism groups, pond cluster, pond landscape

Among-pond variability in species composition can strongly determine the total amount of aquatic pond species that occur at the landscape scale. To optimize this gamma diversity, ponds should therefore be managed at the scale of pond clusters, whole landscapes or even entire bio-geographic regions, rather than at the scale of individual ponds. The development of efficient conservation and pond management strategies for multiple organism groups requires a good knowledge on the spatial architecture of pond biodiversity at the landscape scale. This implies that the contribution of each spatial scale to total national biodiversity should be identified for a wide variety of organism groups (plants and animals, poor and good dispersers, organisms with small and large body sizes).

In the framework of the PONDSCAPE project (www.pondscape.be), we conducted a large scale survey on 11 organism groups during the summer of 2008 and sampled in total 125 ponds according to an *a priori* defined spatially hierarchical design. For this, we selected five eco-regions in Belgium/Luxembourg (Gutland, chalk region, sand region, polder region and loam region). In each of these eco-regions we defined five 30 km² circular areas, and in each of these areas we selected clusters of five ponds randomly. We decomposed the observed gamma diversity of each organism group into an alpha component and three beta components, i. e. beta diversity among individual ponds within clusters (beta 1), among pond clusters (beta 2) and among eco-regions (beta 3). The results allow us to indentify the spatial scales that represent the largest fraction of pond biodiversity for a large variety of organism groups. This information is crucial to develop guidelines for pond conservation at the national level.

Biodiversity in small farmland ponds: multigroup congruency and associations with land use practices at multiple spatial scales

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Keywords: pond biodiversity, agricultural land use, community concordance, spatial scale

The potential effects of agricultural land use on the ecological integrity and biodiversity of small standing freshwater bodies is generally acknowledged. However, the majority of studies has so far mainly focused on rivers or lakes and has mainly considered responses of one or only a few organism groups to land use effects. In order to evaluate the effect of agricultural land use on overall pond biodiversity, we need to assess the extent to which responses of biodiversity in different pond organisms are concordant. Furthermore, there is a need for a better understanding of the specific mechanisms through which land use affects pond biodiversity and at which spatial scales these effects are most manifest. Indeed, intensive agricultural land use can simultaneously lead to reduced biodiversity directly through mechanical disturbance or the influx of pesticides, as well as indirectly through nutrient enrichment or landscape wide effects on metacommunity dynamics.

In this talk, we will present results that were obtained in the framework of two large scale pond biodiversity surveys (the BELSPO-projects MANSCAPE and PONDSCAPE). We will evaluate the degree of community concordance among a wide variety of pond organism groups. We will also assess the relative importance of direct and indirect effects of agricultural land use on the biodiversity and community structure of pond organisms and evaluate the scale dependency of these effects.

Important Areas for Ponds (IAPs) Project in the Alpine Arc and the Mediterranean region

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Keywords: Priority ponds, pond conservation, pond awareness raising, Water Framework Directive, Habitats Directive, Keys of biodiversity area

As part of a larger program aiming at raising the awareness of the importance of ponds (the Pro-pond Project), the European Pond Conservation Network (EPCN, www.europeanponds.org) is currently identifying Important Areas for Ponds (IAPs) in the Alpine Arc and the Mediterranean region, including North Africa. IAPs can either be (i) proposed by pond workers (site managers, researchers, or other stakeholders) or (ii) identified using GIS techniques and existing plant and animal biological records. In order to qualify as an IAP, a pond site needs to fulfil one of five criteria based on 1) the presence of important EU habitats, 2) the presence of species of high conservation value (e. g. listed on Habitats Directive), 3) high pond density (pond network), 4) cultural, historical, economic or scientific interest or 5) exceptional importance for other reasons (e. g high species diversity at national level). The information gathered from this work will be used to encourage better protection measures for ponds at the regional, national and international level, and their inclusion in biodiversity and water protection strategies (e. g. Water Framework Directive River Basin Management Plans). We will present the Project's methodology and results achieved so far for the Alpine Arc and the Mediterranean Region. The proposed IAPs identified as part of the Pro-Pond Project will be published on the EPCN website later this year.

Ecological typology of permanent standing water bodies in lower Belgium

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Keywords: diatoms, rotifers, macro-invertebrates, macrophytes, ponds

The European Water Framework Directive renewed interest in water-body typologies for ecological monitoring and implementing management policy. Although it addresses all standing waters, socio-economic values and practical considerations (braced by pointers such as 'lakes', 'significant' and '> 0.5 km^2) have mainly directed attention to those of considerable size to embody the variation in lentic conditions. For obvious reasons, this may not always be appropriate and such is judged to be the case in lower Belgium (Flanders).

A region-wide survey of permanent stratified and mixed standing waters was undertaken to provide more comprehensive data that could underpin their typology. Soil conditions, morphology, surrounding land use and vegetation, physicochemistry and proxies for production/decomposition processes were recorded for 186 selected waters (211-740,000 m^2, median 13,300 m^2) from GIS maps, field observations and repeated sampling. Data were collected on macrophytes, littoral macro-invertebrates, periphytic rotifers as well as epiphytic and surface-sediment diatom assemblages. The survey encompassed dilute to marginally brackish conditions (EC 24-3,520 µS cm^{-1}) and the entire alkalinity range represented in the region (up to > 5 mmol l^{-1}). Although special attention was given to sites that appeared to be less strongly impaired, most were rich in nutrients (median TP 210 µg l^{-1}, median TN 1.8 mg l^{-1}), whilst submerged vegetation was often scarce. A simple *a posteriori* typology was derived from the principal structuring variables for the majority of the four taxonomic groups.

Although the result is possibly challenged by the effects of human impacts (near-pristine 'reference sites' being virtually absent in the region), it can be made to suite water-management purposes if cautiously considered. Within the observed range, size as such does not matter much from the adopted perspective. It is therefore further examined whether any distinction of 'ponds' and 'lakes' might be required at all within this typological framework.

Diatoms in a dense array of bomb-crater ponds

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Keywords: PONDSCAPE, hydrology, variation partitioning, spatial configuration, diversity

In the framework of the PONDSCAPE project, sediment diatom assemblages were examined from water-filled bomb craters in a small nature reserve (12 ha) near Hasselt in northern Belgium. Water chemistry varied considerably between ponds (pH 5.4-8.4, TP 23-7,000 µg l^{-1}) but species turnover remained fairly limited. About ¼ of the compositional variation could be explained by measured variables, with alkalinity and vegetation cover appearing to be most influential. Whereas infiltration and winter flooding by enriched water from an adjacent brook was responsible for a gradient in major ion concentrations, differences in vegetation cover mainly appeared to reflect relative permanency. Combined with surface topography, this resulted in a distinct spatial pattern of diatom assemblages, with tolerant taxa such as *Planothidium frequentissimum* and *Navicula veneta* characterizing the area with strongest influence of brook water and *Gomphonema exillissimum, Pinnularia* spp. and *Nitzschia acidoclinata* featuring at the most isolated sites.

At the scale of the entire set of ponds, the 'pure' spatial component accounted for ca. 1/5th of the variation in assemblage composition that could be explained. This dropped to an insignificant fraction if only the deeper, isolated ponds were considered. However, more variation could be explained and the spatial effect markedly increased for this subset of ponds if the spatial configuration relative to other ponds was also taken into account. This might indicate spatial dynamics or the presence of an important but yet unmeasured environmental characteristic with a spatial structure.

Furthermore, nestedness, differences between pool types in the partitioning of diversity components and the partitioning of β diversity between turnover and nestedness were examined.

Conservation value of vegetation and dragonflies of coastal dune ponds in Belgium

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Keywords: Odonata, charophytes, survey, biodiversity, management

About 50 % of the taxa commonly inventoried in Belgium occur in the remaining 30 km^2 of undeveloped coastal dunes. This remarkable contribution results from considerable variation in landscape and vegetation structure, soil properties such as pH and management. During the last decade, a considerable number of ponds in this area were restored or newly created to enable livestock grazing and improve habitat conditions. Much of this work was supported by the LIFE programme. At present the number of dune ponds and pools exceeds 200. Although biodiversity goals are set high for all of them, their conservation status and the key factors involved are insufficiently known.

Between 2007 and 2010 the general features and vegetation were surveyed of most sites that remained inundated at least until early summer. Visiting and ovipositing dragonflies were recorded repeatedly within a single season at ca. 140 sites. In addition, more detailed environmental and biological data were collected for a subset of 45 ponds and pools.

We analyze the assemblage composition of macrophytes and the distribution of Odonata in relation to environmental conditions and management regime. Also, an overview of the conservation status of individual sites is presented, based on the coastal affinity and Red List status of the observed taxa. The importance of the dune region as a hotspot for charophytes and migration corridor for northwards expanding dragonfly species is highlighted. At a later stage, data on amphibia, macro-invertebrate fauna, cladocera and diatoms will provide a more complete picture of pond biodiversity in the study area.

Sludge removal: the ally of pond ecosystems?

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Keywords: ponds, PONDSCAPE, management, dredging, Belgium

The amount and quality of pond ecosystems are deteriorating throughout Europe at an alarming pace. Nevertheless, ponds are worth preserving as they have a relatively high regional biodiversity value and contain many unique and rare species. To protect and increase biodiversity levels, not only information concerning the pond system itself, but also regarding the effect of management practices must be studied thoroughly.

The PONDSCAPE-project aims at providing scientifically underpinned recommendations for a sustainable management approach in Belgium and Luxembourg, studying bacteria, phyto- and zoobenthos, phyto- and zooplankton, macro-invertebrates, amphibians and macrophytes. In this presentation, we will give an overview of the most commonly used management techniques and study the effect of a popular technique (i. e. sludge removal) on macroinvertebrate communities of the Tommelen pond complex (Belgium). Sludge was removed from 14 ponds in October 2008, while also the environmental and biological conditions of nine control ponds were followed up.

A change in environmental conditions was apparent in the spring after sludge removal. This is probably due to the disappearance of plants and the removal and disturbance of sediment immediately after dredging. A year after management of the ponds, we detected no large difference between the non-benthic macroinvertebrate richness of managed and control ponds, although there was a decreasing trend in richness. To study this in more detail, the recovery of these ecosystems will be followed up in the near future. An explorative study on ponds managed during the mid 1990's indicates that at present no clear difference can be seen between these systems and the ones without sludge removal (for macroinvertebrates and environmental conditions). If ponds are not managed, they will over time change into terrestrial habitats due to filling up, indicating that this seemingly drastic management practice of sludge removal is necessary.

Geographical distribution and local adaptation of the fire-bellied toad (*Bombina bombina*) in ponds of Brandenburg – a genetic approach

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Keywords: Bombina bombina, genetical variation, geographic scale, local adaptation, migration

The fire-bellied toad *Bombina bombina* is a critically endangered species. One of the most important factors for the decline of Bombina populations among the Baltic region is the destruction of their habitats. Especially agriculture poses a threat to the spawning ponds.

Comparison of genetical variation of different populations across Europe as part of the European Union (EU) LIFE project 'Management of fire-bellied toads (*Bombina bombina*) in the Baltic region' revealed that every single population is highly genetically divergent at different geographic scales and especially island population showed local adaptations.

Schneeweiß (2009) described different types of ponds in which Bombina was found across Brandenburg. In southern parts populations occur e. g. in fish-breeding-ponds while in the northern they are found in e. g. flood plains. How large are the genetic differences among the Brandenburg population? Do the populations also show genetical adaptations to their living ponds? How do the different habitats of Bombina look in Brandenburg, and what can the genetical analyses tell us about migration routes regarding the historical dispersal of *Bombina bombina*?

Conservation of *Bombina bombina* in the Baltic Sea Region (*Bombina*)

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Keywords: bombina, conservation status, population, habitat, management, LIFE04NAT/D000028

The fire-bellied toad (*Bombina bombina*) was once a common inhabitant of the cultural landscape around the Baltic Sea, but recent intensification and land consolidation in the arable fields affected it severely. The sunny breeding pools it vitally needed were filled in to make way for productive land, or else meadows with watering ponds were abandoned. Breeding water quality decreased severely by overgrowing and shading or eutrophication. In arable fields annual loss rates of individuals are increasing due to heavy machinery use and fertiliser application. The combination of suboptimal habitats with low annual reproduction rate and increased loss rates in modern agricultural landscapes are driving forces towards extinction of fire-bellied toad populations.

While numbers of fire-bellied toads underwent a severe decline during the last few decades overall, a previous LIFE project, focussing on *Bombina bombina*, made some progress towards the prevention of extinction of insolated fire-bellied toad populations in Denmark. The project strategy was to establish mirror populations as genetic back-up for endangered populations on small Danish islands.

The LIFE Project *Bombina* aimed to safeguard the north-western population of the fire-bellied toad *Bombina bombina* in the Baltic Sea region. A set of tools was introduced based on the experience of the former Danish project to provide a long term sustainable management of fire-bellied toad populations around the Baltic and including genetic analysis, habitat management and population management.

Of these three actions genetic analysis was employed to detect genetic diversity and to evaluate populations in respect of population management activities (management demanding or self-sustainable populations). Habitat management is seen as essential and habitat quality was improved by converting arable fields into grassland; creating new ponds and the restoration of eutrophicated ponds (150 in total); building hibernation sites (about 50) and the establishment of a whole grazing regime by the introduction of hardy cattle and horses in areas surrounding the ponds. Winter grazing or grazing including early spring and late autumn has positive impacts on vegetation and structure of ponds and the surrounding grasslands. Finally a population management is carried out to secure the survival of small populations (less then 50 adult toads), to build up new mixed populations based on recommendations of the genetic survey at sites where fire-bellied toads went extinct and to build up mirror/reserve populations as a genetic reservoir of unique, isolated populations. Population management will be carried out by the rearing of eggs to metamorphosing tadpoles and releasing young toads at home sites as well as at newly created and restored sites.

Finally the project was successful in the combination of these actions and it was possible to prevent extinction of small fire-bellied toad populations. The negative population trends in many sites were turned into positive.

The project comprises 7 partners from 4 EU countries surrounding the Baltic Sea including Germany, Denmark, Sweden and Latvia. The project ran from 2004 to 2009 and had a total budget of 2,266,293 €. Of this, 1,064,233 € (≈ 47 %) were co-financed by LIFE-Nature programme.

Two Ramsar sites of striking resemblance: Sidi-Boughaba (NW Morocco) and the Doñana National Park (SW Spain)

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Keywords: merja, water quality, macrophytes, Chara canescens

The Merja Sidi-Boughaba was designated a site of international importance by the Ramsar convention in 1980, while the wetlands of the Doñana National Park were entered on to the Ramsar list in 1982. A limnological study carried out in Sidi Boughaba during 2009 has allowed the comparison of several physico-chemical and biological variables with previous data of the Doñana wetlands, and has showed strong similarities in some past and present common features. Recent land use changes in Doñana have produced a different landscape with thousands of smaller ponds scattered within the marginal aeolian sand dune system while the mud flats are seasonally flooded. In the Moroccan coastal sand dune system in the vicinity of the Sebou River, the 6 km-long shallow lake of Sidi Boughaba is now the only permanent merja in the area. At both sites, total P concentrations in the water are mainly locked up in the particulate fraction while the concentration of dissolved inorganic N is usually below 0.1 mM (rarely reaching 0.5 mM). In the water, Mg^{2+} generally dominates over Ca^{2+} even after the rainy season when the conductivity drops sharply, particularly in the Doñana ponds (< 2 mS/cm) compared to Sidi-Boughaba (< 12 mS/cm). The wide spectrum of environmental conditions encountered among the Doñana ponds is partly found at Sidi-Boughaba where water and sediment gradually change from the northern side with humic-coloured waters and sandy substrate to a calcium rich substrate with turbid and silted waters. As a consequence, the community of submersed macrophytes is very rich (*Chara canescens*, *C. aspera*, *C. galioides*, *C. connivens*, *Tolypella sp*., *Ruppia cirrhosa*, *Zannichellia palustris*, *Naias marina*) and populations of Chara spp. grow in dense beds. The macrophyte composition of the Doñana ponds lacks those species typical of highly mineralized water though they occur in the Doñana marshland.

Managing phytoplankton blooms in fish-ponds of the Doñana Natural Area (SW Spain)

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Keywords: Guadalquivir estuary, aquaculture, crysophytes, nanoplankton

Forty-five artificial ponds are currently used for fish production in a private state (Veta La Palma) located on the east side of the Doñana Natural Area. On average, each fish-pond has a surface of 70 ha and a depth of 45 cm, and is encircled by a deeper canal connected to the distribution network that transports tidal water to and from the Guadalquivir estuary. Cultivation of shrimp and some fish is done extensively in the fish-ponds while other native fish species are retained in the canals for semi-extensive production. The commercial quality of fish seems partly related to the phytoplankton composition during blooms, in particular to carotene-rich species, such as crysophytes. Our aim is to provide the guidelines for the management of primary production that favours blooms of certain species while avoids a general dominance of cyanobacteria. Phytoplankton and phytobenthos biomass, turbidity, and nutrient concentrations in water and sediment were measured biweekly at four sites in two fish-ponds since February 2009. Conductivity, dissolved oxygen, pH and redox potential were measured continuously in the water of each fish-pond. Phytoplankton blooms have occurred every 1.5-2.5 months with maximum values of chorophyll a in the surface water ranging from 90 to 330 $\mu g\ l^{-1}$. Species composition is dominated by a few species during blooms: either *Nannochloropsis gaditana* (Chlorophyta), *Ochromonas* aff. *minuta* (Chrysophyta) or an unknown haptophyte. Phytobenthos biomass, however, changed differently along time in each fish-pond as well as redox potential which turned to negative more often during summer at the site where phytoplankton exceeded phytobenthos biomass. Nutrient concentrations and turbidity were highly dependent on the water quality of the incoming tidal water suggesting that this kind of semi-extensive aquaculture production could be threatened unless a bigger effort is done to improve the water quality of the Gualdalquivir River estuary.

Explanatory environmental variables in the macroinvertebrate community of a heterogeneous pond network

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Keywords: macroinvertebrate community, Doñana National Park, nestedness, idiosyncratic taxa, temporary ponds

Doñana pond network is a heterogeneous system composed of more than 3,000 water bodies, mainly including temporary ponds with a recurrent dry period in summer. Dispersal to more permanent ponds is the main strategy for macroinvertebrates to survive this period, then colonizing again temporary ponds after their flooding in the following year. The pond macroinvertebrate assemblages constitute a highly nested system where only particular taxa and assemblages departed from the nested pattern. We focused in the role of environmental variables to explain: 1) the structure of the macroinvertebrate community, 2) the particular distribution of idiosyncratic taxa and assemblages, and 3) the nested pattern. We measured physicochemical variables and variables related to the physical location in 91 ponds widespread in the Doñana National Park. We detected that environmental variables did not have a high contribution to explain the macroinvertebrate community structure and the Coleoptera, Heteroptera and Odonata structures, obtaining for Odonata the highest explained variance (28 %). Plant richness, conductivity and marsh distance were some of the most explanatory variables. We also detected that the matrix of presence-absence of plant taxa per pond was correlated to the matrix of presence-absence of macroinvertebrate taxa found in every pond.

Exploring macroinvertebrate assemblages of particular ponds, we detected a relationship with particular environmental variables. These ponds contributed to the global dissimilarity at different levels, contributing idiosyncratic ponds and taxa with higher levels (i. e. *Anacaena lutescens* and *Helochares lividus* were detected in ponds which exhibited high turbidity and temperature). All environmental variables contributed to the nested pattern of the macroinvertebrate assemblages, but plant richness was the variable with highest contribution in generating this pattern.

The wide number of environmental variables explaining this structure reveals the high heterogeneity of ponds in this habitat network, which must be preserved to warrant the nested structure in this macroinvertebrate community.

Two complementary methods to sample macroinvertebrates in Mediterranean temporary ponds: the suitability for detecting spatial differences and diel activities

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Keywords: sampling devices, submerged nets, dip-netting, macroinvertebrate assemblages, Doñana

The preservation of temporary ponds is an essential element in the conservation of biodiversity. Standardized sampling techniques for characterizing their biological communities are necessary in order to obtain comparable data across wetlands in different geographical areas. We compared the suitability of dip-netting and the use of submerged nets for detecting spatial and diel activity differences in sampling macroinvertebrate assemblages of a temporary pond in Doñana National Park (SW Spain). We sampled every six hours in two zones of the pond which clearly differed in depth and plant cover during March and April 2007. Dip-netting captured a higher number of taxa and ontogenetic stages, detected greater abundances than submerged nets, thus resulting more appropriate to sample macroinvertebrates in temporary ponds. Conversely, submerged nets distinguished better between nocturnal and diurnal macroinvertebrates, hence being more appropriate to monitor variation in diel activitiy. Because diel activities varied between sampling periods for the same taxa and stages, the sampling period is an important aspect of macroinvertebrate sampling. Diel activities of macroinvertebrate assemblages depended on the diel activities of their integrating taxa and stages. Through the use of submerged nets, we detected two diurnal (*Sympetrum fonscolombei* and *Notonecta* spp. larvae) and a nocturnal taxa (Fam. Colymbetinae). We did not detect movements of the macroinvertebrate taxa and stages between the two pond zones at different day hours. Submerged nets also captured good swimming macroinvertebrates better than dip-netting did. Consequently, the combination of the dip-net and submerged nets would yield a better picture of the representative macroinvertebrates of temporary ponds and their activity patterns.

Evaluating subsampling methods for macroinvertebrate diversity studies in farm ponds in a Mediterranean region (SE Spain)

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Keywords: macroinvertebrates diversity, taxa richness, ponds, fixed-count subsampling, large-rare search

Subsampling is crucial to the reduction of both costs and time associated with processing benthic macroinvertebrate samples, due to the large amount of material and number of organisms to be sorted and identified. There are many studies on subsampling procedures to develop rapid bioassessment protocols (RBPs) in rivers, but subsampling approaches for macroinvertebrate diversity studies in lentic waters are scarcer.

An extensive biodiversity survey, carried-out during spring 2007 on 120 farm ponds all over Andalusia, revealed that each benthic sample was frequently composed of several thousands of individuals. Therefore, we proceeded to elaborate a subsampling protocol to reduce the effort but minimizing the loss of information. In order to determinate the number of organisms needed to reach 70 % of taxa richness, we selected four samples from respective highly-diverse ponds, which were processed in its entirety to construct rarefaction curves with taxonomic resolution to species. Several convex and sigmoid models were adjusted to these data, concluding that Chapman-Richards function produced the best fit. This model allows us to determine that 500-1,700 individuals were needed to reach 70 % of taxa richness. In a second step, we selected six pond samples, of different typology, to assay six fixed-counts (500, 700, 1,000, 1,200, 1,500 and 1,700 individuals), coupled with an additional large-rare (LR) search. The cost of increasing subsampling size was assessed as the amount of time each fixed-count required for picking to perform Power-Cost Efficiency analysis. Furthermore, we tested for significant differences in relative abundances of macroinvertebrate taxa among subsamples. Our results suggest that fixed-counts of 500 individuals, followed by LR searches, can be considered as an optimal subsample size for farm ponds macroinvertebrate diversity studies, as it provides the same taxa richness than larger fixed-counts with lower cost.

Effect of fish farmer cultural practices on ecological pond quality

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Keywords: ecological quality, pond, cultural practices

The Lorraine region (France) is well known for its traditional pond polyculture activity (7,000 ha) based on an extensive management (mean annual productivity around 100-150 kg of fish per ha). In the two main micro-regions concerned (Saulnois, Woëvre), ponds are also considered as ecosystems with a high ecological interest (abundance of reed surfaces, richness of a specific biodiversity in relation to migratory birds for example). Its specific environmental quality has been recognized by local governance, fish farmers receive some grants from the Region if the reed surface is superior to 1 ha in a pond. Such financial support concerns 1,300 ha of pond. However, the ecological quality of ponds is not clearly defined and the effects of the aquaculture practices on this ecological quality are not known.

In this way, a study supported by the Lorraine Region is conducted in order to determine the effect of fish farmer cultural practices on ecological pond quality. A first step will intend to determine the ecological quality of ponds (environmental diagnostic based on habitat evaluation), a second step (survey) will be focused on the characterization of the fish farmer cultural practices and production (water management, pond inputs, fish capture…), and finally a third one will try to correlate them (data analysis using PCA or CFA methods).

The study concerns 45 ponds managed by 25 fish farmers in the framework of a convention with the Lorraine Region for preservation or creation of reed beds.

Do large branchiopods co-occur randomly?

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Keywords: temporary ponds, co-occurrence patterns, null models, large branchiopods

The distribution of large branchiopods is complex to assess due to the ephemeral nature of its habitat and the erratic occurrence of the species. Nevertheless, these assemblages may be subjected to environmental driving forces that at the end may cause nonrandom spatio-temporal distributions. It is still not clear if the co-occurrence patterns observed are due to chance or are expressions of, for example, interspecific interactions. Null models are used to examine if the co-occurrence patterns observed are due to chance or to some environmental driving force. To do so, we used presence-absence data recorded through several surveys in the Ibero-balearic region. In order to analyse the large branchiopod co-occurrence patterns, the Checkerboard score (C-score), Variance ratio (V-ratio), and the number of species combinations (Combo) were measured. In a competitively structured assemblage, the C-score should be significantly larger than expected by chance; in contrast a fewer number of species combination may be found when compared to the possible number obtained by chance. On the other hand, if niche limitation constrains the number of coexisting species, the variance in species richness (V-ratio) among sites will be small relative to the null model. Our results showed that large branchiopod co-occurrences were not randomly distributed and therefore could be interpreted as an evidence of the existence of niche limitation (observed V-ratio < expected V-ratio; $p < 0.001$) and/or interspecific competition (observed C-score > expected C-score and observed Combo < expected Combo; $p > 0.001$). Additionally, we also checked if some environmental characteristics were determinant to explain the observed patterns weighting by different factors. Preliminary results showed that pond size could not be considered as a driving force explaining the nonrandom pattern observed in large branchiopod assemblages. The most usual combinations of species were identified and the habitat characteristics in which these associations are more frequently found are described.

Hydrological functions and pedo- and geomorphologic structures in hummocky soil landscapes with kettle holes

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Keywords: surface runoff, preferential flow, soil hydraulic, sediment structures, geophysics

Post-glacial landscapes with kettle holes as internal catchment systems are widely distributed in Northeast Germany and many other regions. These hummocky soil landscapes are characterized by ponds that trap lateral fluxes in topographic depressions. It is hypothesized that lateral field scale preferential flow processes (i. e., surface runoff and lateral subsurface flow) are dominating the hydrological regime. The objective of this presentation is to identify structure-related field-scale flow and transport processes. The study combines field hydrologic observations and minimal-invasive geophysical explorations within a pedo-hydrologic concept.

Identification of structures is based on geophysical methods (i. e., electrical resistivity and electromagnetic induction) and soil hydraulic measurements (i. e., tensiometer and TDR). Colluvial areas with textural differences between upper and deeper soil layers are identified as potentially relevant flow structures. The colluvial fringe around the pond seems to be a sensitive area with important lateral exchange fluxes. Hydraulic gradients perpendicular to this pond boundary indicate lateral fluxes directed from the pond outwards into the partially saturated soil.

Results suggest that surface flow is dominating the hydrological regime during the winter when the soil is frozen and in the summer during storm events. The relations between pedo-geomorphologic structures and hydrologic function are highly complex and not fully understood. The localized infiltration of trapped water in kettle holes controls large fractions of ground water recharge and may have implications for fate of agricultural chemicals in post-glacial landscapes. These ponds can only be understood within the context of the surrounding soil landscape.

Diversity of large branchiopods (Crustacea) in ponds of western Poland: status and perspectives

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Keywords: Anostraca, Notostraca, Laevicaudata, Spinicaudata, conservation

I will present some preliminary results and conclusions from a survey on temporary ponds conducted in search for large branchiopod crustaceans (Anostraca, Notostraca, Spinicaudata and Laevicaudata) in Wielkopolska province (W. Poland). For now (February 2010) about 500 pools have been studied in the region and large branchiopods have been found in 216 of them. Seven species have been found, including anostracans: *Branchipus schaefferi*, *Chirocephalus shadini* and *Eubranchipus grubii*; notostracans: *Lepidurus apus* and *Triops cancriformis*; spinicaudatan: *Cyzicus tetracerus* and laevicaudatan *Lynceus brachyurus*. Both the number of species and the abundance of localities show that the diversity of globally endangered large branchiopods is still relatively high in the region. On the other hand, the results give some reasons for anxiety. Distribution of all the species is highly clustered – of seventy 10 x 10 km² studied areas large branchiopods were found in ponds of 27 areas. Two species have been found in only two such squares: *Ch. shadini* (6 ponds) and *B. schaefferi* (63 pools, exclusively on military grounds). Ponds inhabited by large branchiopods almost always occur in groups forming patches of suitable habitats slightly differing in detailed characters (especially length of hydroperiod). Sustaining the existence of abundant metapopulations seems therefore essential for conservation of large branchiopod diversity. Decline in the number of suitable habitats is especially visible in river valleys, where once abundant populations are nowadays limited to protected and restricted areas. In-depth researches conducted on two study areas show that other key-factors limiting the occurrence of particular species are the hydroperiod length, water conductivity and turbidity, type of bottom sediments and contents of heavy metals in the sediments. Field observations bring also some examples of human activities unintentionally supporting the large branchiopod conservation.

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Selected differences between small water bodies on moraine plateaus and on outwash plains of Northern Poland

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Keywords: small water body, moraine plateau, outwash plain, river network, water level

Small water bodies (SWB) are a characteristic feature of the postglacial landscape in Northern Poland and are found in great numbers not only on moraine plateaus but also on outwash plains. Little is known, however, about their function in the water cycle in these areas.

Although SWB are traditionally considered a form of lentic water bodies, my study indicates that a large proportion of them are actually involved in superficial outflow. In order to investigate this issue in a greater depth I selected two catchments: an agricultural catchment situated on a moraine plateau (about 4 km^2 in area) and a forest catchment situated on an outwash plain (about 16 km^2 in area). I measured, at monthly intervals, water levels in the selected SWB and discharges in the streams that connected them, and created maps of the hydrographical network.

I found that the hydrographical network of moraine plateaus differs in some important respects from that of outwash plains.

The moraine plateaus were dominated by SWB of small surface areas (< 1 ha) and the outwash plains by those of larger surface areas (up to 5 ha). The moraine plateau SWB were interconnected by a dense network of intermittent streams, while those on outwash plains by a more dispersed network of perennial streams. As a result, the total surface area of endorrhoeic basins was variable on the moraine plateaus (ranging from 0 % of the total catchment area in the summertime to 50 % in the wintertime) and constant on outwash plains (76 % throughout the year).

Another difference I discovered between the moraine plateau SWB and the outwash plain SWB was the difference in water level amplitudes, which depended on the duration of surface outflow. On the moraine plateaus, I observed sporadically lotic SWB (SWB with the duration of surface outflow below 1 month in a year), sporadically lentic SWB (SWB that remain lentic for less than 2 months in a year) and SWB of intermediate durations of surface outflow. The sporadically lotic SWB were characterised by large water level amplitudes (up to 60 cm), the sporadically lentic SWB by low water level amplitudes (10-15 cm) and the SWB of intermediate durations of surface outflow by moderate water level amplitudes (20-35 cm). On the outwash plains, on the other hand, I observed completely lentic SWB and permanently lotic SWB whose water level amplitudes did not exceed 20 cm and 30 cm, respectively.

My study has shown that the hydrographical network of the moraine plateaus is characterised by much higher dynamics than that of the outwash plains. On moraine plateaus, depending on the season of the year, the same area may either be endorrhoeic and devoid of any river networks or exorrhoeic and containing a dense river network. The outwash plains, on the other hand, are characterised by a highly stable river network.

Evidence of hydroperiod shortening in a preserved system of temporary ponds

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Keywords: remote sensing, Mediterranean temporary pond, spatio-temporal variation, fluctuations, Landsat

Conservation programs of temporary ponds should incorporate the monitoring of temporal changes in their distribution, extent and habitat characteristics relevant for associated species (i. e. pond annual hydroperiod). We used remote-sensing data (Landsat TM and ETM+ imagery) to evaluate the spatio-temporal variability in the flooding regime of a system of small temporary ponds for a 23-years period. In particular, we tried to separate trends in pond deterioration (i. e. shortening of pond inundation) from natural random fluctuations. Although medium-resolution remote sensing data have rarely been applied to the reconstruction of the hydrological dynamics of small-sized wetlands, this study evidences its utility for the understanding of the hydrology of Mediterranean temporary ponds at a local scale. We show that the temporary ponds in Doñana National Park constitute a large and heterogeneous system with high intra and inter-annual variability, both critical attributes for the preservation of a rich associated fauna. We also evidence that the conservation value of this ecosystem is threatened by the observed tendency to shorter annual hydroperiods in recent years, probably associated to aquifer over-exploitation. The system of temporary ponds in Doñana National Park deserves special attention for the high density and heterogeneity of natural ponds, not common in Europe. For this reason, management decisions to avoid its destruction or degradation, such as the shortening of pond annual hydroperiods, are critical.

When should we survey amphibian communities? Application of detection probabilities to the design of monitoring programs in temporary ponds

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Keywords: amphibian, Mediterranean temporary ponds, monitoring program, probability of detection, sampling efficacy

Failure to detect a species in an area where it is present is a major source of error in biological surveys. We assessed whether it is possible to optimize single-visit biological monitoring surveys in highly dynamic freshwater ecosystems by framing them *a priori* within a particular period of time, when the species' probability of detection is expected to be highest. We developed single-species occupancy models to estimate the monthly probability of detection of amphibian species of conservation interest during a four-year monitoring program in a system of Mediterranean temporary ponds. Following an information-theoretic approach to model selection and multimodel inference of parameters, we evaluated alternative hypotheses, i. e. the probability of detecting a species was constant, changed among sampling visits, or in accordance to habitat characteristics. Our results revealed that there was not a "best month" to survey, common to all species and years, since occupancy and detection probability were species-specific and changed among sampling visits within a breeding season and also among breeding seasons. We conclude that the optimization of biological surveys with minimal survey effort (a single visit) is not feasible for amphibian species in this type of ecosystems, as it proves impossible to select *a priori* an adequate sampling period that remains robust across years. Our study provides evidence of the variability and uncertainty that likely affects the efficacy of monitoring surveys, highlighting the need of repeated sampling in both ecological studies and conservation management.

Pond diversity in four dimensions: resurveying ponds of north west England

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Keywords: resurvey, turnover, macroinvertebrates, plants, amphibians

A pond inventory was carried out in Cheshire, north west England, which found 20,546 ponds at a density of 9.75 ponds·km^{-2}. When the terrestrial regions in the immediate vicinity of ponds are included in the definition of the pondscape, 98.2 % of the county was covered. In total 484 Cheshire ponds were surveyed between 1995 and 1998 and most invertebrate groups, all plants and amphibians were identified to species. While alpha-diversities of individual ponds are lower than those in lakes and rivers, we find that the alpha-diversity of river sites can be surpassed by the combined alpha-diversity of two ponds for invertebrates and that mean pond plant alpha-diversity was greater than that for river sites. Beta-diversity values suggested high degrees of variation between ponds and were similar for plants and invertebrates. In 2006, 51 ponds were subsequently resurveyed. Variation in pond communities between surveys was of a similar magnitude to spatial variation within surveys, adding a further dimension to the biodiversity of the pondscape. Measures of macroinvertebrate and plant community conservation value did not vary between periods. Invertebrate beta-diversity was lower in the second survey relative to the first, suggesting that the pondscape is becoming more homogeneous, although this was not found for plants. In terms of amphibian presence over the study period, the decline in the number of ponds supporting the protected species *Triturus cristatus* represented a worrying trend. This study serves to highlight (i) the importance of the true spatial scale of the pondscape relative to the area of open water, (ii) the conservation value of species inhabiting ponds and (iii) the dynamic nature of those pond communities. These factors, along with ecosystem services that ponds can provide, render the conservation of this habitat a necessity.

Chemical and biological gains in a small stormwater wetland in Kalmar, SE Sweden

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Keywords: stormwater, pollutants, invertebrates, plants, colonisation

Constructing wetlands/ponds is increasingly common all over the world, primarily for treating polluted water. Especially in industrialized countries storm water is treated for reduction of P, N, metals, and solids, but at the same time also biodiversity is favoured. Generally, few follow-up studies are performed, but in Kalmar, SE Sweden, several such waters have been monitored. Here is reported the chemistry and biology for the initial years in the storm water Skälby Dämme [dämme – small dam/pond], a series of 2-3 ponds, in total ca 1 ha, water depth 0.5-1.5 m, surrounded by mainly deciduous forest, grazing land and paths, and draining ca. 120 ha of residential areas. Monthly water samples over a year indicate nutrient reductions of 30-40 %, metals (Cd, Cu, Cr, Pb, Zn) 30-70 %, whereas solids show lower figures. Invertebrate sampling over two years exhibited > 70 taxa, most common were oligochaetes, isopods (*Asellus aquaticus*), snails (*Physa fontinalis*), mayflies (*Cloeon dipterum*), water bugs (Hemiptera and Dystiscidae), plankton midges (Chaoboridae), and midges (Chironomidae). Colonising macrophytes were mainly sea club-rush (*Scirpus maritimus*), bulrush (*Typha latifolia*), and common reed (*Phragmites australis*).

Can artificial wetlands favour invertebrate biodiversity?

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Keywords: artificial wetland, pond, invertebrates, biodiversity, colonisation

Constructed wetlands/ponds are increasingly popular, mostly for reduction of nutrients, especially nitrogen, and other pollutants. Besides, even if less raising the needed money, is frequently argued the benefit for biodiversity in urban and agricultural landscapes, today often deprived of most natural water bodies. Of many hundreds of artificial wetlands/ponds, only few have been monitored in a way that allows us to ascertain if the biodiversity has been favoured. This presentation evaluates studies about benthic plants and invertebrates in artificial/man-made/constructed wetlands/ponds in many countries, telling what taxa are colonizing the new water bodies and when. Quite often the number of species in man-made waters attains high numbers, also yielding "rare" species. Most rapid colonizers are non-biting midges (Chironomidae), but in many cases remaining at high abundances also after several years. Also prominent in the initial phase are gastropods (mainly Lymnaeidae), mayfly nymphs (mainly *Cloeon dipterum*), and hemipterans (mainly *Corixa* spp.). Less often are mentioned isopods (*Asellus aquaticus*), oligochaetes, coleopterans, trichopterans, odonates, and some other groups. The found species numbers are in the various reports, in different ways, related to time, plant diversity, fish, and cattle. Several observations occur that collectors (bottom sediment feeders) are more abundant in the early phase. Much eutrophication seems to suppress species numbers. Comments will be given on these findings, incl. what importance these biotic components might have for the nutrient retention function.

Species composition, dominance and diversity of the summer zooplankton (Cladocera, Copepoda) in the astatic soda pans of Hungary

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Keywords: microcrustaceans, Calanoida, Cyclopoida, Eurytemora velox, saline ponds

The microcrustacean zooplankton of the Hungarian astatic soda pans was studied in May and June 2009. Abiotic data (temperature, pH, conductivity, dissolved O_2-content) and semiquantitative samples of summer zooplankton were collected from 29 natural and 4 reconstructed pans. For zooplankton samples, 20 liters of water were collected and sieved through a plankton net (mesh size 30 μm). 25 microcrustacean (7 Cyclopoida, 3 Calanoida, 15 Cladocera) species were identified altogether. The Shannon-Wiener diversity index and the number of species correlated negatively with conductivity. The sensitivity test of the diversity index resulted that each pan had only one or two dominant species. According to that, all the habitats could be classified into eight groups dominated by *Arctodiaptomus spinosus*, *Arctodiaptomus spinosus* and *Moina brachiata*, *Moina brachiata*, *Arctodiaptomus bacillifer*, *Eurytemora velox*, *Megacyclops viridis*, *Daphnia magna* or *Daphnia magna* and *Acanthocyclops robostus*. *Arctodiaptomus spinosus* was dominant in 12 pans (but it could be found in 20) and correlated positively with conductivity, pH and temperature, while *Arctodiaptomus bacillifer* was only dominant in two (and occurred in six). They could be found together barely in one case (Dinnyési Fertő). Although *Eurytemora velox*, found as a new invader in the soda pans, occurred only in one reconstructed pan (Legény-tó), it was its dominant microcrustacean. While *Daphnia magna* is not a sodic water specialist, it dominated 10 of the 33 pans but it avoided ponds with conductivity higher than 12 mS cm^{-1}. The halophilic *Moina brachiata* was present in 14 pans and dominant in six. Our data suggests that conductivity seems to be one of the most determining factors influencing the species composition and distribution in these soda pans.

Spectral response from various types of kettle holes: analysis and application of remote sensing techniques for chlorophyll estimation

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Keywords: chlorophyll concentration, spectral response, derivative analysis

Kettle holes, small inland water bodies usually less than 1 ha, are subject to pollution, drainage, and structural alteration by intensive land use practices. This study presents the seasonal and cross-seasonal analysis of spectral signatures from various types of kettle holes based on *in situ* water sampling and reflectance measurements. Water samples and surface reflectance from kettle holes were collected from 6 ponds in 15 field campaigns (5 in 2007 and 10 in 2008) resulting in a total of 80 spectral datasets (in 2008 one kettle hole dried up).

Assessment of existing semi-empirical algorithms to determine chlorophyll content for different types of kettle holes using seasonal, cross-seasonal normalized reflectance and derivative spectra was conducted. The study results show that in spite of the high variety of hydro-morphological, physical and bio-ecological factors influencing upwelling radiance from the water body, the application of the derivative analysis approach produces stable correlations with chlorophyll concentrations. Derivative spectra at 675-710 nm wavelength range have high potential for chlorophyll estimation in small shallow water bodies. However, no single relationship exists for the various types of kettle holes that relate spectral information to chlorophyll concentration.

Water quality monitoring of kettle holes by means of hyperspectral remote sensing in Northeastern Germany

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Keywords: water quality, hyperspectral remote sensing, derivative analysis

The acquisition of inland water quality (WQ) data is an important but tedious task due to the pronounced spatial and temporal variability of most in-water constitutes, especially for small shallow water bodies. Small inland waters such as kettle holes are subject to pollution, drainage, and structural alteration by intensive land use practices. Hyperspectral Remote Sensing (HRS) provides data in the contiguous narrow bands which may assist in WQ monitoring campaigns.

This study presents an approach to estimate spatial and temporal variation of kettle holes' water quality parameters, such as chlorophyll content, depth (transparency) and total suspended sediments (TSS), from hyperspectral airborne ROSIS and HyMap datasets (acquired on 15 May and 29 July 2008, respectively). Analysis of airborne spectra revealed that chlorophyll absorption near 677 nm is the same for both datasets. In order to enhance absorption properties, both airborne hyperspectral datasets were normalized by the continuum removal approach. Linear regression algorithms for ROSIS and HyMap datasets were derived using normalized average chlorophyll absorption spectra. Overall accuracy of biomass mapping for ROSIS data is 71 % and 64 % for HyMap.

For estimation of depth and TSS, derivative analysis approach has been applied to the airborne image datasets. Derivative airborne spectra show best correlation for TSS at 596 nm and at 630 nm with overall classification accuracy of 83 % and 76 % for ROSIS and HyMap datasets accordingly. Correlation between depth and derivative reflectance at 530 nm of ROSIS and HyMap hyperspectral imageries reveals high linear regressions coefficients with classification accuracy of 87 % and 80 %, respectively.

The results of this study show that HRS can provide useful information for WQ monitoring in agricultural young moraine landscape in Northeastern Germany. However, biomass mapping results showed that, depending on the type of kettle hole, the 'packaging effect' and bottom reflection lead to miscalculation of chlorophyll content.

The zooplankton community of reservoirs with the different trophy

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Keywords: water reservoir, eutrophication, phytoplankton, zooplankton

Studies carried out on two groups of reservoirs in lowlands of western Slovakia indicated that the qualitative and quantitative structure of zooplankton was correlated with the reservoir trophic state. The first group of three reservoirs is strongly affected by human activities, by gradual eutrophication and is regularly stocked by carp fish. The reservoirs are placed near the agricultural fields, the inflows flow through the villages and water is polluted by domestic sewage. The values of total phosphorus (TP) in reservoirs ranged from 0.09 mg l^{-1} to 0.38 mg l^{-1}; total nitrogen (TN) ranged from 1.32 mg l^{-1} to 11 mg l^{-1}. Concentration of chlorophyll-a ranged from 5.8 μg l^{-1} to 180.3 μg l^{-1}, and average value was 62.57 μg l^{-1}. The phytoplankton of a water basin was mostly strongly dominated by representatives of Chlorophyta. In the zooplankton of reservoirs strongly affected by human activities, rotifera and *Bosmina longirostris* dominated. In all three reservoirs only small Daphnia species were recorded.

The second group of three reservoirs is localized near the Malé Karpaty Mts. (Slovakia). The reservoirs are not under the atrophic pressure, the inflows flow from the protected area CHKO Malé Karpaty Mts. The eutrophication of these reservoirs was low. The values of total phosphorus (TP) in reservoirs ranged from 0.03 mg l^{-1} to 0.06 mg l^{-1}; total nitrogen (TN) ranged from 0.78 mg l^{-1} to 4,31 mg l^{-1} . Concentration of chlorophyll-a ranged from 0.05 μg l^{-1} to 28 μg l^{-1}, and average value was 9.03 μg l^{-1}. The phytoplankton of a water basin was mostly strongly dominated by representatives of Chromophyta. The high species diversity of planktonic crustaceans, but low abundance and biomass of zooplankton was found.

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Seasonal dynamics of plankton in a small eutrophic water reservoir in Modra (W Slovakia)

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Keywords: eutrophication, water reservoir, anoxic conditions, algae, protozoa, zooplankton

The aim of our study was to prevent the eutrophication process (excessive nutrients in a lake or other body of water) of water reservoirs by using composite sorbent. Before the sorbent application in the season of 2008-2009, the seasonal dynamics of phytoplankton, zooplankton and microbenthos were investigated in a small shallow eutrophic water reservoir in Modra (W Slovakia). As early as spring, a plankton boom in all its components was observed. At that time, also a high concentration of total phosphorus (TP), 1,000 μg l^{-1} was recorded which later on, in the second half of April, dropped rapidly. The concentration of chlorophyll-a appeared to be high and during the study period it increased from 162.7 μg l^{-1} in March to 2,322 μg l^{-1} in September. The phytoplankton of the water reservoir was strongly dominated by green colonial alga *Golenkiniopsis longispina* that caused an intensive green coloring of water, especially in summer time. However, in other periods also some more microorganisms were observed, e. g. diatoms in March and April or/and colonies of *Aphanocapsa delicatissima* from October through December with typical cell dimensions of picoplankton. The high production of green algae and cyanophytes created anoxic conditions (waters where oxygen is absent) near the bottom of the reservoir. Massive (multiple) occurrence of benthic protozoa in plankton as a consequence of anoxia has been observed as well as the dominance of detritivore and omnivore Cilliata species in microbentos, omnivore *Coleps hirtus*, in particular. Extreme values of zooplankton density (54,016 ind l^{-1}) were recorded in spring followed by a sudden fall in summer and autumn. The contribution of rotifers (*Brachionus* gen. spec., *Filinia longiseta*) in the total zooplankton density and biomass was 98 %. Low species richness of crustaceans (4 Cladocera and 3 Copepoda) and no differences between littoral and limnetic zooplankton communities were observed.

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The nature of ponds: history, natural history and why we need to understand both

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Keywords: ponds, numbers, communities, management, history

The recent surge of research devoted to ponds has revealed the significance of these neglected habitats for biodiversity, has established new paradigms for pond conservation and discovered fascinating details of the lives lived by pond wildlife. Most of us focus our research at one scale, e. g the behaviour of a species of water beetle or remote sensing of landscape throughout a country. The conservation of ponds, both the political and legislative strategies and the practical advice, requires us to integrate these diverse scales. Using an example from northern England I will explore the insights gained from combining large scale map records covering 150 years, with recent community typological surveys through to the current distribution of individual species. In 1865 222 ponds were shown on regional maps in the study area and in 2005 257 ponds were recorded, an overall gain. However of the original 222 mostly farm ponds, only 24 survived whilst 40 of the final 257 were brand new ponds on a golf course; individual ponds come and go. Botanical surveys showed ponds with different origins and histories supported distinct plant communities; current typologies reflect past histories. At the species level distributions show distinct habitat preferences and an association between invasive species and management by nature conservationists. The conservation of ponds needs us to integrate our growing experience across wildlife, people, time and space to be effective.

A management scheme for the mining pond system "Revierwasserlaufanstalt Freiberg" (Erzgebirge) under consideration of versatile practical use and nature conservation purposes

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Keywords: ephemeral waters, Littorelletalia, Isoeto-Nanojuncetea, Coleanthus subtilis, Habitats Directive

The "Revierwasserlaufanstalt Freiberg" is located in the centre of the Erzgebirge mountains (Saxony/Germany). It consists of mining ponds connected by ditches and subterraneous trenches. Initiated in the early 16th century to store water for the operation of mining machines, this water system is still used today even for drinking and industrial water supply, fishery as well as human recreation and is protected as a historic monument.

Due to the continuous specific use, the ponds became drained periodically and thus have ephemeral character. Those intensive water level fluctuations were the basis for the colonisation by rare plant species belonging to the vegetation of Littorelletalia and Isoeto-Nanojuncetea. The ponds also inhabit the endangered and protected *Coleanthus subtilis*, which develops only on moist mud. Thus the ponds have pan-European relevance for nature conservation and are protected by the European Habitats Directive.

Within the DBU funded project "GehVege", foundations for the sustainable conservation of the unique vegetation here and a methodological example for the derivation of nature conservation measures for similar ecosystems elsewhere were elaborated. Vegetation ecological and historical approaches were the keys for a management scheme coordinating the different kinds of practical use with each other and with the requirements of nature conservation.

Major focuses of the vegetation ecological approaches were the species' dispersal mechanisms and ecological requirements to pre-estimate the consequences of major changes in the use and management of the system to be expected in future. The history, especially the continuous specific use of the ponds as the basis for the colonization by those species and the persistence of the populations over such a long time, has been considered here for the first time.

The management scheme includes specific measures for each pond and general guidelines for the whole system that are flexible against future changes.

Effect of submerged macrophytes on the viability of the zoosporic fungi *Pythium ultimum*

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Keywords: submerged macrophytes, phytopathogenic fungi, ponds, irrigation water, zoospore

Aquatic oomicetes, particularly those in the genus *Pythium*, are well known for its damage in crops all over the world. *Pythium* infection leads to damping off in seedlings and root rot in older plants. This kind of fungus uses water for dispersion by producing zoospores, asexual mobile spores by flagellums. Therefore, irrigation systems in general, and ponds in particular, might play an important role in dissemination of these phytopathogenic fungi. Submerged aquatic vegetation (SAV) thrives well in many artificial ponds used for drip irrigation in greenhouse areas of southern Spain. It is well known that several species of SAV excrete to the aquatic environment certain allelopathic organic compounds to out-compete with phytoplankton and other macrophyte species. In this study we carried out laboratory experiments to determinate the influence of two of the most frequent SAV species in ponds located in greenhouse areas of Almería (Southeastern Spain), *Chara fragilis* and *Chara vulgaris* var. *longibracteata*, on the viability of *Pythium ultimum*. We used microcosms of 8 l volume where *P. ultimum* was inoculated on 3 different treatments, *Chara fragilis*, *Chara vulgaris* and no SAV. Microcosms without SAV and not inoculated were used as control. Three replicate microcosms were used for each treatment and control. A temporal survey was carried out during a month, weekly intervals, by placing carnation petals as baits for fungal zoospore capture (24 hours exposed in water). Thereafter, baits were cultured in specific agar mediums for selective fungal growth. Our results showed that *P. ultimum* was not isolated from microcosms where both *C. fragilis* and *C. vulgaris* were grown, as well as in control microcosms. On the contrary, this fungus was detected in 64.3 % of baits exposed in microcosms treated without SAV. These results suggest that an environmentally friendly management, allowing or favoring *Chara* development in irrigation ponds, might play a role to prevent crop infections from this phytopathogenic fungus.

Successional changes in water quality, phytoplankton and submerged vegetation in irrigation ponds after desiccation and cleaning: a comparison of two management regimes

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Keywords: irrigation ponds, biocide, water quality, aquatic vegetation

A high concentration of small artificial water bodies for drip irrigation purposes is located on Mediterranean coastal areas of South-East Spain, a semi-arid region with one of the largest concentrations of greenhouses in the world. Several studies carried out in agricultural landscapes all over the world, have demonstrated that irrigation ponds can play a relevant environmental function for biodiversity conservation, especially when submerged aquatic vegetation (SAV) grows. However, according to the opinion of many greenhouse growers, the development of SAV and phytoplankton in the pond is undesirable due to emitters' clogging in the drip irrigation systems. To control algae and SAV development, growers clean periodically the ponds and frequently apply biocides. In order to analyse the effects of these practices on water quality for irrigation and phytoplankton and SAV development, we selected eight ponds of similar size located in one of the main greenhouse areas in Almería (SE Spain). All ponds were dried and dredged after the cropping season. Chemical treatment using copper sulphate, the most common biocide used in this region, was applied to five of the experimental ponds, just after filling, and the other three were not treated. Post-cleaning pond succession was surveyed during an annual cycle, from July 2008 to June 2009, measuring major cationic and anionic water content, nutrients, phytoplankton biomass of the major functional groups of algae, and SAV cover and species richness. A Pincipal Component Analysis of the results revealed that the main variation trend in chemical data was dilution of salts as succession progress, a pattern that was related with rainfall timing. In not-treated ponds, this pattern was parallel to SAV development, reaching covers over 40 % by the end of the experiment, and low phytoplankton biomass particularly on the final successional stages studied. On the contrary, treated ponds did not develop SAV and were characterised by significantly higher phytoplankton biomass and suspended solids, compared to not-treated ponds, all over the succession. These results suggest that the current pond management practice of copper sulphate addition does not meet the grower goal of increasing water transparency.

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

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Keywords: kettle hole, pond, amphibians, hydroperiod, water quality, conservation, management

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 to characterise potential impacts of both, site factors of kettle holes (water, sediment, morphology, land use) and management and conservation measures (mud clearance, buffer strips, cutting of woods) on hydroperiod and water quality of kettle holes with respect to habitat suitability for amphibians. That's one basis for the development of a decision support system to protect amphibians in agricultural landscapes.

In the agricultural region close to Müncheberg (Brandenburg, Germany) 69 kettle holes were selected to analyse the mentioned impacts on amphibians by different variants of infield kettle holes (with and without measure) compared with reference kettle holes (long-term fallow and forest).

Depending on the annual climatic water balance and the hydrogeomorphic kettle hole type, 13-40 % of the kettle holes did not achieve the minimum flooding duration (July 15) necessary for reproduction of amphibian species. Deep mud clearance of 10 kettle holes has a significant effect on extension of flooding duration (increase of open water body volume, decrease of transpiration by reed vegetation, easement of water exchange between water body and water bearing sediment layers). Shallow mud clearance has no significant effect.

Values of O_2, pH, NH_3, NO_2 and heavy metals partly exceed quality limits, especially at infield kettle holes without measure, indicating potential toxic effects on amphibians. Many of the infield kettle holes without measure undergo long term strong oxygen deficit from July to September. In tendency, water quality and heavy metal availability of sediments is improved by each measure alone. Combination of buffer strips and mud clearance as well as long-term fallow have the best effects. Heavy metal availability of sediments is higher at forest kettle holes (sandy soil) compared to kettle holes with measures in the agricultural landscape (loamy soil).

Lazy ecologist's guide to water beetle diversity: comparison of four major sampling methods in an alder carr

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Keywords: aquatic insects, sampling methods, rarefaction, sampling effort, size selectivity

Biodiversity surveys of aquatic macroinvertebrates in standing water bodies rely on various methods but a thorough quantitative comparison of the different techniques is lacking. This hampers analyses across surveys and impedes the development of efficient sampling schemes. We compare the selectivity and efficiency of four methods most commonly used to sample aquatic insects: activity traps (ATs), box trap (BT), handnetting (HN), and light trap (LT), using a large dataset from a long-term survey of water beetles in a site with ≈ 100 species. We use time investment as a natural basis for the comparisons of efficiency, since it can be used for all methods.

As means of capturing as many species as possible, ATs performed well for both adults and larvae. In adults, LT samples were most depauperate and provided the lowest number of species for the same amount of effort. In the larvae, the number of species was highest for HN. A thorough mapping of a rich community requires great sampling effort. We estimate that the effort necessary to collect 90 % of all species or species detectable by each method was high, between 40 and 400 hours depending on the method. Differences in species composition obtained by the four methods could be attributed to different size selectivity. In both adults and larvae, ATs selected for larger species, probably due to their higher activity, than the other methods.

Combinations of ATs and BT lead to highest numbers of species in a 40-hour survey simulated from our dataset. Rapid bioassessment surveys should therefore use a combination of these methods with fast extraction of specimens. However, even the best simulated rapid surveys missed between one third and one half of all species present at the site, emphasizing the need for long-term studies in species-rich habitats.

Ecological and ecotoxicological "fireworks" effects of lindane (gamma-HCH) on the biocoenosis of a semi-natural pond

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Keywords: biocides, lindane, biocoenosis response, light climate, direct/indirect effects, degradation rate

1982 Eickermann fit up a semi-natural concrete pond of an area of about 150 m^2 and 90 cm depth with a continuous reed zone in order to prepare this pond for outdoor experiments with biocides. This semi-natural pond showed properties very similar to natural ponds.

In spring 1986, 10 cm soil made of sand was added and four walls with doors. These walls made it possible to divide the pond in four compartments in 1988. Two of them served as controls and in the two others the insecticide lindane was applied from April to September 1988, in order to assess the effects of lindane on the biocoenosis. A continuing lindane concentration of about 20 $\mu g\ l^{-1}$ was tested.

The biocoenosis responded on the lindane dosages much more sensible than it could have been expected from lots of effect data from the laboratory respectively from literature. In comparison to other investigations in the laboratory and in outdoor ponds, the biocoenosis revealed ecological and ecotoxicological fireworks effects of lindane. Hitherto published data underestimate sensitivity of numerous species, especially species of the taxa Trichoptera, Odonata, Ephemeroptera and Chaoboridae.

Vehemency and diversity of lindane effects expressed themselves among others in the annihilation of all this year's larvae of *Notonecta glauca* and Gerridae, all *Notodromas monacha* (Ostracods) individuals and other Ostracods, all larvae of Zygoptera-, Baetidae- and Trichoptera and of all the Collembola living on the water surface, as well as in strong impairment of existing Haliplidae population and the Chaoborus larvae.

Lindane induced direct effects on the top predators and in consequence indirect effects on water temperature, chlorophyll a concentrations, plankton production, biological oxygen demand, as well as on the structure and dynamic of the Cladocera-, Rotatoria-, Copepoda- and Phytoplankton populations. Exceeding high degradation rates of lindane are caused by anaerobic soil zones between Characeae and reed plants.

On the water surface a hide of Cyanobacteriales caused considerable effects on Haliplidae adults. This hide increased the lindane uptake rate of the beetles whenever they touched the hide needing to take oxygen at the water surface.

At the end of May it became obvious that in the lindane contaminated compartments *Lemna trisulca* developed tremendous swimming covers. This and other effects changed the light climate in the pond of that kind that differences in water temperature could be measured.

From July 1988 all Mollusca showed a strong proliferation in the lindane compartments.

The presentation intends to support understanding of countless imaginable effects of biocides in natural ponds and wetlands.

Rehabilitation of the Baltic Coastal Lagoon Habitat Complexes (BaltCoast)

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Keywords: coastal habitats, lagoon, Apium repens, Bufo viridis, Bufo calamita, LIFE05NAT/D00015

The LIFE Project BaltCoast aimes at restoration and improvement of several characteristic habitat types within the Lagoon-Dune Habitat Complex. It assembles around 21 partners from 5 countries (D, DK, S, EE, LI) around the Baltic Sea running from 2005 to 2011.

Actions foreseen are, among others, the restoration of natural hydrology of lagoons and salt meadows by blocking drainages and reducing unnatural lagoon discharge. Water bodies will be improved by dredging accumulated mud and removal of dense reed. Often habitats are invaded by unnatural overgrowth of bushes, trees including alien invasive species (e. g. *Rosa rugosa*), which displaces natural plants and animals; this tendency will be stopped and reversed by mowing and grazing. Finally, a recreation of natural morphology of depressions and dells in dunes and meadows is foreseen.

Several activities rising public awareness will accompany these measures.

Main 'tool' for sustainable long term management are hardy cattle and horse grazers. Winter grazing or grazing including early spring and late autumn has positive impacts on site vegetation and structure.

All this will not only be done for the benefit of the different habitat types of Annex I of the EU-Habitat Directive but also for plants (*Apium repens*) and animals (*Bufo viridis*, *Bufo calamita*). At the same time Dunlin, Ruff and Avocet, listed on the EU-Birds Directive, will be targeted by a special project-expert group.

The total project budget of 5,685,005 € will be cofinanced by LIFE Nature by 3,403,203 € (≈ 60%).

Species diversity feature of molluscs assemblages in the floodplain oaken forest pools of the Pripyat River, Belarus

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Keywords: Polesye, molluscs, floodplain, species diversity

The research was conducted in the Pripyatskij National Park area (the middle part of the Pripyat River). It is an area famous for its unique reserve of the flood oak woods and plate-like lakes. Four (of the eight) existing Wetlands of International Importance (Ramsar Sites) in Belarus are situated at Polesye region. Based on the data set on pools' morphology, the main groups of water bodies which represent the key types of the habitats in the system of floodplain oaken forest (lakes, brooks, bogs, ponds, pit, vernal pools and oxbows) are selected and investigated.

The total number of molluscs was reported 38 species (28 Gastropoda and 10 Bivalvia). Species richness per site ranged from 3 to 21 as a consequence of maintaining high levels of habitats diversity across the floodplain. There are reasons to believe that a taxonomic group's number estimated for molluscs at the family's level are correlated with a water vegetation structural diversity in the investigated reservoirs. The factor is important enough to be taken into consideration as actively participating in development of molluscs assemblages feature and well suited for the explanation patterns in ecosystems. Assemblage composition was dominated by *Viviparus contectus, Valvata cristata, Acroloxus lacustris, Stagnicola palustris, Bathyomphalus contortus, Anisus spirorbis, Planorbis planorbis, Segmentina nitida, Planorbarius corneus, Planorbis planorbis, Pisidium casertanum, Pisidium nitidum, Pisidium obtusale, Sphaerium corneum, Musculium lacustre* respectively, and was occurring at more than 50 % of the sites.

The result obtained for the molluscs fauna of the habitats in the system of floodplain oaken forest revealed as well as rare and protected both in Belarus and in Europe species: *Valvata pulchella, Bithynia leachii, Bithynia leachii troschelii, Stagnicola corvus, Aplexa hypnorum, Anisus spirorbis, Anisus vorticulus, Gyraulus rossmaessleri, Hippeutis complanatus, Pisidium pseudosphaerium, Pisidium obtusale, Musculium lacustre*.

Hydrological characteristics of temporary freshwater pools of the Maltese Islands

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Keywords: temporary freshwater rockpools, hydrology, Maltese Islands

The hydrological relationships of temporary freshwater rockpools of the Maltese Islands were investigated over a period of seven years, from 2001 to 2008. Hydrological, morphometric and meteorological data collected during the first six years of the study (wet seasons of 2001/2002 to 2006/2007) were used to construct simple models predicting the values of three hydroperiod indicators (number of hydroperiods each year, duration of longest hydroperiod and hydroperiod index).

The study did not use summarised annual weather data in isolation, as the hydrological cycle of these pools does not solely depend on the amount of rain but also on its distribution. The punctuated pattern of rainfall of the Maltese Islands implies that water supply to the basins is very variable within years and a summary statistic such as total annual rainfall would be informative but not very useful. The present study subdivided the wet season into four segments and incorporated individual rainfall events (deluges, heavy showers, moderate showers and light rain) into predictions of hydroperiod. Although necessitating the analysis of a large dataset, this approach nonetheless facilitated the identification of the most relevant meteorological factors for hydrodynamics and the time of year at which their effect was most pronounced.

The models were validated using data from the 2007/2008 wet season, predicting hydroperiod indicators that were not significantly different from the ones actually recorded during that wet-season. The explanatory power of the three models ranged from 70.5 % (number of hydroperiods) to 85.9 % (Hydroperiod Index) suggesting that a proportion of the variability in hydroperiod indicators is attributable to factors that had not been included in the models. The models also provided an indication of the relative importance of the factors considered, with total rainfall during November-December and amount of solar radiation in winter representing two significant predictors of hydroperiod indicators.

Prediction of the impact of projected climate change on hydrology and vegetation of temporary freshwater rockpools of the Maltese Islands

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Keywords: temporary freshwater rockpools, climate change, aquatic plant communities, Maltese Islands

The effect of projected climatic change on the hydrology and vegetation dynamics of the temporary freshwater rockpools of the Maltese Islands was investigated through the construction of three future outlooks ('Most optimistic', 'Optimistic' and 'Pessimistic') based on IPCC data for Southern Europe and the Mediterranean. The projected data were subsequently utilised as inputs into hydrodynamic equations that predicted the values of three hydroperiod indicators (number of hydroperiods each year, duration of longest hydroperiod and hydroperiod index).

The number of hydroperiods in all three projected outlooks was significantly higher than that recorded during 2007/2008 ($P < 0.05$) whilst the duration of the longest hydroperiod was projected to be significantly shorter in a warmer and drier climate ($P < 0.05$).

Predictions of hydroperiod duration from all three outlooks implied that pools with relatively shallow margins are likely to be subject to increased infiltration by 'opportunistic' species from the surrounding habitat. Communities dominated by submerged species would be expected to decline in abundance under warmer and drier climatic conditions as a decreasing hydroperiod index would be expected to favour a compositional shift away from such species and towards amphibious species. Application of this data to the known population dynamics of *Elatine gussonei*, an amphibious species, suggested that, in general, *Elatine gussonei* and species with similar ecological strategies will be expected to persist in the rockpools of the Maltese Islands under each of the three future outlooks of climate. In the case of the 'Most optimistic' outlook, a population that was reduced to 16 % of the carrying capacity by a possible intra-annual drought or other disturbance would potentially recover fully within three years. Conversely, the risk of population extinction under the 'Pessimistic' outlook was much higher, with a sustained climatically-unfavourable period of 11 years leading to extirpation.

Linkages between pond aquaculture and watershed management in north-eastern France (Lorraine region)

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Keywords: ponds, watershed, contaminants, edible fish, water, sediment

Extensive fish ponds are relatively large water bodies strongly connected with their surrounding watersheds. In consequence, management of the watershed upstream from the fish ponds can significantly affect the functioning of the water bodies, enhance or reduce their productivity as well as impact on the safety of the fish produced, through the bioconcentration and/or bioaccumulation of numerous harmful substances as pesticides, trace elements or other micropollutants. Moreover, fishfarmers cannot control the chemical inputs in their fish ponds, being derived from several phenomenons (atmospheric deposition, runoff, effluent, food web).

Our objective was to study the impact of watershed agricultural practices on ponds in France where the rearing system in ponds takes over the second rank after the intensive rearing systems of Salmonids. The aim was to have a best understanding of the transfer processes between environmental and biological matrices and finally to promote sustainable use of water resources. Extensive fish pond offers the opportunity to combine these different objectives. Fish farming, depending on the management practices to improve and control their productivity, can either generate waste water which is discharged into the downstream river network, or act as water bodies in which several beneficial ecological processes can take place (development of water life, or natural purification processes).

For this, five sites were selected in north-eastern France with five levels of agriculture intensification on their watersheds. The identification of substances susceptible to be discharged into fish ponds has been conducted on the basis of survey and interviews of the land users with a historical view on the last five years and numerous analyses. The contaminations of the environmental and biological matrices were variables in quality and in quantity. Only the surveys with a multi-contaminants approach and also some spatio-temporal considerations were relevant to endeavour a best understanding of the transfer processes in fish ponds.

Colonization patterns and photosynthetic activity of pelagic and benthic autotrophs in a pond in an initial state (Huehnerwasserteich)

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Keywords: plant colonization, seasonality, pond, phytoplankton, macrophytes, bacteria

Shallow lakes and ponds are under high trophic pressure with high variability of nutrient inputs. Depending on the temporal and spatial intensity and load of nutrients, the response of primary producers can be very different. Huehnerwasserteich pond has formed at the lowest part of a new artificial catchment (Chicken Creek catchment, Lusatia) area since 2005. During the filling phase and early state of initial development, the phytoplankton colonization was at mesotrophic level and irregular (*Pseudopedinella erkensis* (Chrysophyceae), *Fragilaria* sp. (Diatomeen) and *Euglena* sp. (Euglenophyceae)). Since 2007 macrophytes and filamentous algae have been become more and more dominant (*Potamogeton pectinatus, Potamogeton lucens, Myriophyllum spicatum, Potamogeton natans* and *Chara globularis*). Seasonal succession of colonization patterns and productivity in 2008 and 2009 are analysed.

Analysis of kettle holes water quality monitoring data in Northeast Germany, using nonlinear statistics: processes and trends

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Keywords: kettle hole, pond, monitoring, water quality, Northeast Germany, nonlinear statistics

In the Pleistocene landscape in Northeast Germany, small glacially created ponds, so called kettle holes, are very abundant. They exhibit large spatial heterogeneity with respect to water quality, hydrodynamics, and flora and fauna, seemingly rendering each kettle hole unique. However, this is at odds with any scientific approach. Thus, a classification scheme has been developed for kettle holes in Northeast Germany based on morphology, structure of the shores, land use of the respective catchment, connection to stream networks, and hydrodynamics. These indices are assumed to be related both to water quality as well as to biological issues of the kettle holes.

Starting in the mid-1990s, an extensive monitoring program has been established in the federal state of Brandenburg, Germany. Here, a subset comprising 975 samples from 60 kettle holes was analysed, where 29 parameters had been determined. A nonlinear principal component analysis was performed. The first four components explained more than 90 % of the variance. These components seem to provide quantitative measures of groundwater contribution to the ponds, the redox conditions, nitrogen contamination from the adjacent agricultural fields, and effects of the internal nutrient and carbon cycling. That allowed differentiating between the natural and anthropogenic impact factors on water quality. Moreover, time series of component scores were investigated. The results contribute to a better understanding of biological and biogeochemical processes and can be used to check the effects of conservation and management strategies for kettle holes.

Aphanius iberus predation effects on aquatic community and the efficiency of physical and visual refuge

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Keywords: saline ponds, refuge, predation, plankton, benthos

The predation effects of a small fish (*Aphanius iberus*) on the invertebrate community have been investigated. The study was performed in March and July (2009) in the salterns of San Pedro del Pinatar (Murcia, Spain). The sampling was designed to assess the physical (between vegetated and non-vegetated zones) and visual (day and night) refuge efficiency against predation on both benthic macroinvertebrate and zooplanktonic fractions.

Density of *A. iberus* per sample was estimated as a value of predation pressure. Two factors: (1) vegetation (comparing samples collected within macrophyte mats and in open water) and (2) day/night (comparing midday and midnight samples) were used to test physical and visual refuge importance for both fractions. Several aquatic community parameters were analyzed for each fraction to assess the fish predation effects: size diversity, size geometric mean and total biomass.

Predation pressure affected in different ways the community parameters analyzed. Total biomass of benthic macroinvertebrate and zooplankton fractions was always higher in vegetated zones. Size diversity and individual size (geometric mean) varied differently among factors and community fraction. As a result, physical refuge appeared as a key factor affecting macro-invertebrates because vegetated zones showed lower size diversities and geometric means than non-vegetated, whereas no significant differences appeared between day and night samples. Regarding planktonic organisms, individual sizes were higher at night and a higher total biomass was recorded at vegetated sites. Thus, our results showed that both kind of refuge (physical but also visual) are used.

Eutrophication caused by increased P content in a water basin

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Keywords: surface water, eutrophication, composite sorbent, plankton, phosphorus

Eutrophication of water defined as the enrichment of nutrients of waters beyond the natural levels, principally by the nutrient phosphorus, is a serious cause of concern in many countries all over the world. Anthtropogenic-increased eutrophication has been defined as the greatest threat of the quality of rivers and lakes. The nutrient status of many lakes and rivers has increased dramatically over the past 50 years. Diffuse sources, associated with agriculture and point sources from industrial and municipal waste treatment facilities represent the major contributors to eutrophication. The excellent illustration of this situation is the highly eutrophic water in Water basin in a Slovak town of Modra, West Slovakia.

Due to its important ecological role in the aquatic environment, the concentration of total reactive phosphorus (TRP) is the most frequently used parameter in assessing water quality. A eutrophic condition is indicated by a biological quality rating of less than Q4 (and an annual median concentration of > 30 μg l^{-1} of TRP. The leaching of P from soils into water occurs in a diffuse manner. The nutrient's mobility is strongly dependent not only on soil formation and structure, but also on soil hydrology. Water basin in Modra (48°19'45''N, 17°18'54''E) is now used as a productive pond. Its altitude is 144 above s.l. and area is of 0.55 ha, depth is ranging between 1 and 2 m, the basin has neither direct inflow nor outflow except for over the winter and spring snow thawing.

The P levels in water basin were studied over the previous year 2009, in the frame of the project – the limitation of eutrophication process in surface water using composite sorbent. The lowest TRP concentrations were recorded in February, and were continually lifted in line with high P concentrations in an inflow. The highest TRP levels were found in the middle of April (above 100 μg l^{-1}), gradually decreased with the massive boom of all the components of plankton. On the other side, total P concentrations were increased with the plankton growth. The highly hypertrophic conditions in the water basin were reflected in very high concentrations of chlorophyll (September 2009 – 2,322 μg l^{-1}).

Extensive and semi-extensive aquaculture production in The Doñana Natural Area (SW Spain): a sustainable future for estuaries?

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Keywords: Guadalquivir River, sustainability, restoration

Extensive and semi-extensive aquaculture provides a sustainable future for the Guadalquivir River estuary and marshes as it contributes to both the conservation of the environment and the development of a local economy. This kind of integrated management has become an integral part of the Doñana Natural Area since the company was established in 1982 and restored the pre-existing grazing land into aquaculture ponds in 1990. A total of 3,200 ha are currently devoted to aquaculture in a private state of 11,300 ha called "Veta la Palma" owned by "Pesquerías Isla Mayor, S.A". This is a floodable terrain distributed in 45 rectangular artificial ponds with a mean surface of 70 ha each one. These aquaculture ponds are connected to each other and to the Guadalquivir River by means of a complex 300-kilometer channel network. To maintain oxygenation and water quality in these aquaculture ponds, 10^6 m^3 of tidal water is pumped daily from the river estuary through the whole system, which is designed to work both in open and closed circuits depending on environmental and operational circumstances. These extensive aquaculture ponds maintain rather stable flooded conditions regarding water depth (40-50 cm on average), water flow rate (up to 1 hm^3 day^{-1} in summer) and water salinity that ensures a large buffering capacity for changes in salinity, water flow and nutrient concentration which can be very drastic in the Guadalquivir estuary. At the same time, they support dense populations of a large number of microalgae and invertebrate species which are the ecological basis for the extensive range of aquaculture products provided by this company. Cultivated species are those typical of the Guadalquivir estuary, including sea-bass (*Dicentrarchus labrax*), sea-bream (*Sparus aurata*), meagre (*Argyrosomus regius*), sole fish (*S. senegalensis*), shrimp (*Palaemonetes varians*), eel (*Anguilla anguilla*) and mullet (*Mugil cephalus, Liza ramada*).

Stakeholders' perception on rural ponds: towards a sustainable management of ponds at the landscape level

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Keywords: farmland pond, farmers, perception, survey

During the last decades, ponds have lost a lot of their value in rural areas. In the past, ponds were often used for various agricultural purposes. The main reasons for this gradual decline are that ponds have suffered different "crises". Firstly the perception on these small water bodies has been affected seriously after hygienist campaigns starting in the mid 19th century. Secondly, the distribution of running water in villages during the 1900-1960 period accelerated the depreciation of ponds. This progressive disinterest of men for ponds led to a reduction in their maintenance and a slow loss of ponds in rural areas.

Considering the ecological value of ponds, it is necessary to take into account the viewpoint of farmers to better preserve them. The objective of the PONDSCAPE project is to provide scientifically underpinned recommendations for a sustainable management approach by obtaining insights into the way farmers perceive ponds, value risks and benefits of ponds, and to examine how the creation and maintenance of ponds can be promoted in a sustainable way.

Survey by questionnaire was sent to a sample of 400 farmers throughout Belgium. 111 questionnaires were sent back and analysed. Results showed many different perceptions among farmers. The variations observed can be explained by different factors: age of the farmers, education, sex gender and involvement in environmental schemes. Moreover, it seems that ponds didn't loose all of their past uses. In many cases, farmers are still aware of the role played by the pond mainly as water flood circulation regulator. Financial compensations to preserve them allocated by regional institution seems to have little role in conservation attitudes of farmers. These results will be used to build up management recommendations for ponds adapted to the different profiles of farmers.

Biodiversity of ponds, floodplain water bodies and temporary pools

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Keywords: macrofauna, rare and threatened species, habitat variability, bioindication, conservation

An assessment of macrofauna diversity of different small and shallow water bodies was done. Data available in Belarus for temporary pools, ponds, and floodplain water bodies was analysed. The community composition of pools was compared to assign some species groups. The first group consisted of common widely distributed species. The second group was composed of characteristic species which inhabited only a certain water bodies' type. The third group supported a number of occasional species which irregularly occurred in various pools. The similarity of above-mentioned water bodies' fauna was estimated.

The habitat variability governed both the species richness and their abundance in all type of pools. Biota of water bodies of the same type but with different protective state (agriculture lands, National parks, nature reserves) was examined. The WFD EC approaches and methods to assess the ecological state of water bodies were used. Multifactor analyses were applied to split pools in accordance with their community structure, abundance and some environmental parameters. The assessment of the water quality of pools with the bioindicative characteristics was done.

No doubt that some pools are under real threats from human activities (landscape degradation, catchment contamination, etc.). It is particularly dangerous for pools which support rare and threatened species. Because of their small sizes, most of referred pools have no any required protection. The improvement of legislation for sustainable conservation of small water bodies is essential to protect their biodiversity and to safe important units of the landscape diversity.

Primary succession in a pond (Huehnerwasserteich): physico-chemical conditions and primary production

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Keywords: post-mining landscape, pond, phytoplankton, macrophytes

There are only few studies about limnological primary succession of freshwaters. The fast changes in the general living conditions lead to distinct adaptation reactions of the pond biocoenosis. Our study deals with the primary succession of a pond ecosystem in the post-mining landscape of Lusatia. Huehnerwasserteich pond has formed at the lowest part of a new artificial catchment area since 2005. Hydrological conditions and erosion in the catchment area have continuously changed its morphology and the physical and chemical conditions, resulting in the absence of a seasonal pattern of plankton succession during the initial phase. Planktonic primary production was on a mesotrophic level and limited by phosphorus and silica. Aquatic macrophytes played a growing role in the ecosystem. In 2008, their primary production rate exceeded phytoplankton primary production ten times. In total, a change from a net heterotrophic system to an autotrophically dominated system was observed. The development of the pond ecosystem will be analysed in detail.

Situation of carp-farming in nature protected areas in Bavaria

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Keywords: carp, pond, economics, cormorant, protection areas

In the federal state of Bavaria, southern Germany, exist 20,000 hectares of carp-ponds. Almost all of them are more than 400 years old. In that area, common carp farming is practiced since 1,200 years. Traditional carp production – as practised still today – is an enterprise in harmony with nature: The natural food (zooplankton, benthos) is the protein source and cereals are given as supplementary feeding, when necessary. Nowadays, the economic situation of this aquaculture is problematic due to the low price for table-size carps. Moreover, fish losses due to predation and injuries caused by cormorants are partly immense. Approximately 1,800 hectares of the Bavarian carp ponds are located in nature protection areas. Farming in those areas is economically difficult, which is caused by significant restrictions. The higher presence of cormorants in nature protection areas increases the economic loss in carp production.

The normal fish loss in table carp production at times with fewer cormorants, 15 years ago, were about 5 %, the loss in the production of two year old carp about 20 %. Nowadays about 20 % loss in table carp production and 40 % in the production of two year old carp are estimated. In protected areas loss of 50 % (table carp) and 85 % (two year old carp) were documented. This leads to significant negative economic balance ratios. The calculations of the economic situation of 21 farmers in three different protected areas result in margins of –475 € ha^{-1}. At earlier times without significant presence of cormorants the amount of 1,441 € ha^{-1} has been gained.

As a consequence out of this, an increasing number of farmers resign from aquaculture activities in nature reserves and drain their ponds. Presently a large carp farm (100 ha total pond surface) in the centre of the nature protection area “Waldnaabaue” resigns production. He is considering an agricultural use of the drained ponds instead. As a consequence, valuable aquatic biotopes – and a century-old farming tradition – are lost.

Freshwater biodiversity under climate warming pressure: identifying the winners and losers in ponds

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Keywords: small waterbodies, climate change, extinction, colonisation, species traits

Climate warming is affecting the distribution of species and the composition of communities around the world, leading regionally to geographical expansion or contraction of species ranges, and locally to colonization events (potential winners) or extinction events (losers). The balance between colonisation and extinction events is often positive leading to an increase in species richness, locally (community) or regionally (regional species pool). It is therefore crucial for conservation of biodiversity to identify the potential winners and losers involved in such drastic changes. We focus here on ponds from Switzerland and five representative groups of its aquatic or amphibiotic biodiversity: vascular plants, snails, beetles, dragonflies, and amphibians. We first investigated sensitivity of each species to warming through their thermal preferences. In a second step, additional traits linked to the species' resilience to perturbation were investigated in the chosen area, as were dispersal ability, affinity to different types of ponds, present population size.

When considering only species' thermal preferences, the potential losers in the Alps are between 0 to 13 % of the regional species pool, depending on the taxonomic group. Potential winners include most of the other species and are therefore much more abundant. In lowlands, losers are not only related to their thermal preference, but also to their resilience to perturbation. Winners include Mediterranean species.

When considering all species traits linked to resilience to global warming, the species could be classified along a gradient of sensitivity. Such information puts in evidence the species most at risk and will allow the managers to prioritize their conservation efforts. Action plans are expected for such species.

Colonization of zooplankton in restored temporary ponds after the autumn flooding

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Keywords: zooplankton, temporary pond, colonization, restoration, rotifers

Emergence of zooplankton and colonization of the water column in temporary ponds after seasonal flooding depends mostly on the egg bank characteristics (abundance and diversity of resting forms). In a newly created temporary pond, the sediment lacks of diapausing stages, but along different drying seasons egg bank increases accumulating more resting forms. To study the effect of "restoration age" (time since the pond was restored) on zooplankton community, nine temporary ponds restored at different times were selected: three were restored in 1998, three in 2003 and the last three in 2007. The restoration process consisted in an extensive dredging of the ground which was used to silt (in the sixties) the antique water basin. Along four consecutive weeks, following a quick autumn inundation (after heavy rains between 21st and 22nd September 2009), we took weekly samples of zooplankton and measured common limnological variables. Our aim was to follow the colonization process after this flooding and their effect on zooplankton community structure. For this purpose we compared changes in specific richness and abundance between these groups of ponds along this period. In the new ponds (2007) rotifers were more abundant at the first week, but at the end of the period cladocerans dominated. The ponds from 2003 showed a similar pattern for the rotifers but with more relevance of young cyclopoids. The three older ponds (1998) showed a different community structure with less relevance of rotifers. These results suggest that associated to the egg bank maturity more diverse communities could be found colonizing the water column.

Potential of duckweeds for desalination and treatment of agricultural drainage water in detention ponds

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Keywords: duckweeds, detention ponds, Lemna test

Detention ponds offer a cost-effective measure for drainage water treatment. Excessive salinity and water scarcity are the biggest challenges facing arid regions. Duckweeds are aquatic free-floating macrophytes ranging in the world from tropic to the arctic zone and used recently for removal of nutrients, especially nitrogen and phosphorus. Therefore, the main purpose of these investigations was to gain results of desalination efficiency, salt-removal kinetics reaction, and growth of duckweeds under different salinities and temperatures. The salt-removal efficiency of an actual pond in Germany is determined by integrating salt-removal kinetics reaction with mean residence time resulted from a 2D hydro-numerical flow and transport simulation.

Lemna tests under laboratory conditions and experiments under natural conditions were undertaken. For the laboratory tests, *Lemna minor* was cultured in (SIS) medium and tested in solutions with NaCl concentrations from 0 to 10 g l^{-1} and temperatures 5, 25, and 35 ºC. In outdoor experiments, duckweeds were grown in tanks with actual drainage water with salinity (S) of 0.6, 1.6, and 2.1 g l^{-1}. Lemna test showed growth inhibition significantly by NaCl increase but with optimal growth up to S = 1.3 g l^{-1}. *L. minor* removed up to 10 % of the initial salinity. Removal of NO_3 decreased significantly with salinity increase for both temperatures 25 and 35 ºC. The highest growth and nitrate accumulation was achieved at temperature 25 ºC. The outdoor experiment showed that N and P accumulation in duckweed tissue decreased at higher salinity. The evapotranspiration losses over the duckweed-covered tanks were less than the evaporation losses over the open-water tanks. This study proves that detention ponds combined with duckweeds can be used efficiently in saline conditions, since duckweeds were found salinity tolerant, adapt with time to high salinity, remove salinity, and reduce evaporation losses.

Genetic characterization of *Daphnia magna* populations in new and recently restored ponds

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Keywords: cladocera, clones, colonization, genetic diversity, restoration

The creation of new habitats affects not only biological diversity causing changes in species composition and interspecific interactions but also genetic diversity, causing changes in allele frequencies and population structure. Newly created habitats represent thus a unique opportunity to understand how populations settle and develop with time. Moreover, they offer the possibility to study the impact of founder effects and interactions among genotypes on population genetic structure from the moment of population founding. In the case of cyclical parthenogens such as the cladoceran *Daphnia*, it is possible to monitor these changes. Due to their peculiar life cycle, the number of clones in the pond before sexual reproduction is a good indicator of the number of individuals that colonized the habitat and settled successfully. The system of "malladas" near Albufera de Valencia (Eastern Spain) contains several newly created ponds together with others from previous restorations. They serve as a model to explore hypothesis on dispersal and colonization patterns and the key role of these processes in community structure and ecosystem functioning. By comparing populations of *Daphnia magna* from ponds restored in different years we want to assess the process and progress of genetic diversity in natural conditions. Using seven highly polymorphic microsatellite markers on populations from consecutive growing seasons we want to assess the successful establishment of genotypes and, to explore the levels of genetic differentiation among populations during the course of time. Results are strongly dependent on dispersal, interspecific competition, and regional genetic diversity and show a strong relevance of each isolated pond for the maintenance of levels of genetic diversity.

Spatio-termporal sampling frame for the invertebrate fauna of a temporary pond ("Los Tollos", Sevilla, Spain)

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Keywords: rotifers, micro-crustaceans, macro-invertebrates, hydrology

Aquatic invertebrates (rotifers, copepods, branquiopods, ostracods, dipterans, tubificids, coleopterans, odonata, decapods) were sampled weekly at four stations (littoral and open-water) within a temporary pond located in Sevilla province (Spain) during a two-year study (1996-97). This pond has been partially transformed to be used as a pit for the extraction of sand and other dry materials. Our aim was to establish a sampling periodicity that achieved the same taxa richness for invertebrates as that accumulated through the weeks at a lower frequency (such as fortnights, months, seasons, etc) and with a different combination of sampling stations. Analyses were carried out separately for rotifers, micro-crustaceans, and macro-invertebrates during each hydrologic cycle. A hydrological pattern was identified according to water level fluctuations throughout both years which produced 4 main phases: filling, flooding, drying and an artificially maintained water level during summer. In the case of micro-crustaceans, 4 sampling stations at weekly intervals resulted in 80 samples during 1996, and in 90 samples during 1997. A selection of 2 sampling stations at both the littoral and deeper areas (total samples = 8) accumulated the same number of species (cumulative S_{micro} = 11) in 1997 when the sampling frequency was distributed according to the hydrological pattern. In 1996, only 3 samples collected in each main hydrological phase from the littoral area were enough to reach the cumulative species richness of microcrustaceans. In contrast, the cumulative taxon richness of the macro-invertebrates (cumulative S_{macro} = 14) was not related to the main hydrological phases probably due to a higher affinity for substrate features than for changes in the water level. In the case of rotifers, a lower sampling frequency resulted in a loss of the cumulative taxa richness (S_{roti} = 8) probably due to the more erratic occurrence of these organisms during the study period.

Small water reservoirs: new source of macroinvertebrate diversity

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Keywords: macroinvertebrates, small water reservoir, catchment, inlet, outlet

Small water reservoirs are very important landscape elements for effective water management and other economic purposes, however they also offer environment for broad scale of aquatic organisms. Concerning this, diversity of macroinvertebrate communities of six West Slovakian reservoirs in two different river catchments (Morava and Váh rivers) was analysed in 2008-2009.

Regarding taxonomic structure, every studied pond littoral was represented by its own benthic assemblage, with almost one-third of total taxa number unique for respective reservoir. Measure of similarity among ponds was very low. The taxa number of ponds ranged from 50 to about 70. Only five taxa were common for all six ponds: *Gyraulus parvus/laevis* (Mollusca), *Caenis luctuosa*, *Cloeon dipterum* (Ephemeroptera), *Micronecta* sp. (Heteroptera), *Cladotanytarsus* gr. *mancus* (Chironomidae) and *Helochares lividus* (Coleoptera). Benthic assemblages of ponds did not show any significant differences between both catchments divided by the heights Small Carpathians. There were no taxa found exclusively in the Váh river catchment, and only two taxa (*Ablabesmyia monilis* and *Endochironomus tendens*) were found only in the Morava river catchment. It appears that affiliation to catchment does not play an important role here. The most important gradient represents variables related to nutrient content (P content, BOD_5, chlorophyll_a). Driving forces of these artificial ponds are evidently related to agricultural management and fish farming. They overrode the natural gradients of studied ponds, such as altitude, prevailing substrate, and catchment.

Adjacent inlets and outlets of these ponds enhance markedly the biodiversity and species richness of particular locations (up to at least 380 taxa in total). In comparison with pond littorals, inlets reflect natural conditions of catchments. Outlets are more influenced by human intervention – regulation and settlements. Moreover, outlet of the Vývrat reservoir has special character due to beaver activity.

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Biodiversity of aquatic macrophytes in kettle holes considering essential site factors

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Keywords: kettle holes, macrophytes, biodiversity, bioindication, North-East Germany

Kettle holes are important small wetlands in the young moraine landscape of North-East Germany. There were already some research projects to investigate their abiotic and biotic characteristics. But so far none has succeeded to compile and to exploit enough information for effective conservation and management of kettle holes.

The poster presents the results of a meta-analysis summarising the state of knowledge. In order to contribute to a decision support system for conservation and management of kettle holes, data got compiled of five study areas over the past 17 years. Statistical analysis is used to make statements about macrophyte diversity of kettle holes and their subtypes, about the influence of different regions, kettle hole subtypes and site factors on biodiversity as well as to the indicator potential of macrophytes.

Examination of different regions shows a higher number of species than in consideration of only one region. In total 55 aquatic macrophytes are counted. Analysis hardly reveals a difference between the regions respectively plant composition and species number. Similar results were obtained between kettle hole subtypes. 10 site factors that have basic influence on biodiversity are determined, including carbonate hardness, conductivity, annual water level, ammoniacal nitrogen, pH-value, oxygen content, shore width, depth, regions and hydrogeomorphic types. Finally it is possible to identify aquatic macrophytes as indicators for hydrogeomorphic types.

Despite some uncertainties, the results present informative findings about biodiversity and bioindication of kettle holes. Nevertheless further studies are essential.

Biodiversity of zooplankton and its indicative role in a shallow macrophytes water body

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Keywords: Lake Łuknajno, zooplankton biodiversity, biocenotic indicators

The study of biodiversity of zooplankton was carried out in the shallow macrophyte Lake Łuknajno in years 2006-2007. On the grounds of species composition, abundance, biomass and biocenotic indicators there was ascertained large diversification of zooplankton group, dependent on habitat trophy, macrophytes and environmental conditions. In 2006 – 20 species and in 2007 – 19 were identified. Average abundance and biomass in 2006 and 2007 was 546 ind dm^{-3}; 0.3085 mg dm^{-3} and 385 ind dm^{-3}; 0.6113 mg dm^{-3}, respectively. Rotifera decided about the abundance (75 % in 2006 and 70.26 % in 2007). Biomass was formed by Crustacea (approx. 80 % in 2006 and over 70 % in 2007). During examinations, high trophy level species were noted. From Rotifera there were: *Anuraeopsis fissa, Keratella cochlearis var. tecta* and *Keratella quadrata quadrata*. From among Crustacea there were: *Bosmina longirostris, Chydorus sphaericius, Diaphanosoma brachyurum* and *Mesocyclops leuckarti*. Biocenotic indicators did not demonstrate domination relativenesses in zooplankton group. On the ground of the Shannon-Weaver coefficient in respect of abundance, statistically significant differences ($p < 0.05$) between habitats were ascertained.

Biodiversity and physical-chemical parameters relations in the model area of small water reservoirs

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Keywords: macrozoobenthos, fishes, plankton, redundancy analysis, chlorophyll_a

Small water reservoirs are the very important landscape elements for effective water management. Although these man-made artificial biotopes change the proportion of lotic and lenitic habitats and thus influence the species community structure, they secondarily offer a broader scale of microhabitats and, in general, can significantly influence the fauna sustainable development. The evaluation of the function and importance of small water reservoirs on the biodiversity development on all levels is still unappreciated. In this case, preliminary results of the biodiversity and environmental parameters relations on 6 small water reservoirs in Western Slovakia are presented.

The diversity (number of taxa) of selected higher taxonomical groups (Cladocera, Copepoda, Turbellaria, Mollusca, Oligochaeta, Hirudinea, Isopoda, Amphipoda, Ephemeroptera, Odonata, Plecoptera, Heteroptera, Megaloptera, Coeloptera, Trichoptera, Diptera, Osteichthyes) and 15 physical-chemical parameters of the reservoirs (CPOM, FPOM, water temperature, pH, ORP, DO %, DO mg l^{-1}, conductivity, BOD_5, $N\text{-}NH_4$, $N\text{-}NO_3$, N, $P\text{-}PO_4$, P, chlorophyll_a) were analysed. Only six variables were selected for the analyses in the case of strong correlations between the variables.

Redundancy analysis (RDA) was selected to uncover the major correlations between the biodiversity of model groups and selected variables (water temperature, chlorophyll_a, FPOM, pH, ORP, $P\text{-}PO_4$). The first two axes explained 76.14 % (59.12 + 17.02) of the model variability. Running the AIC statistics under the proposed model, only the chlorophyll_a significantly contributes ($p < 0.01$) to the model variability explanation. Following the correlations with chlorophyll_a, also P, $N\text{-}NO_3$, N, and BOD_5 are the key factors that influence the diversity in the model area. Based on these results, the diversity of the selected groups seems to be influenced by basic nutrition components.

The study is founded by the EAA project SAV-FM-EHP-2008-03-04.

Fish species diversity of the artificial waterbodies in the Eastern Slovakian floodplain area of lowland rivers

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Keywords: fishes, artificial habitats, borrow pits, diversity, non-native species

In the period between the years 1986 and 2009 the fish communities inhabiting borrow pits along the rivers Latorica, Laborec, Ondava, Bodrog and Tisa were investigated. The habitat of borrow pit represents an artificial (man-made) waterbody that originated during the mining of clay or sand that were used for levees construction. Borrow pits are situated in the floodplain area of these rivers and they are flooded at least once per year.

Fishes were sampled using electrofishing mainly by wading or by boat. Altogether 33 species were sampled during the study. Based on the results, *Rutilus rutilus, Perca fluviatilis, Scardinius erythrophthalmus, Carassius auratus* and *Lepomis gibbosus* are characteristic components of fish communities inhabiting borrow pits. On the other hand, some species frequent in the past, *Tinca tinca, Carassius carassius* and especially *Umbra krameri*, were recorded only occasionally. Six non-native species, *C. auratus, Pseudorasbora parva, Ameiurus nebulosus, Ameiurus melas, L. gibbosus and Perccottus glenii* form stable and permanent populations and the remaining four non-native species *Ctenopharyngodon idella, Hypopthalmichthys molitrix, Hypopthalmichthys nobilis* and *Anguilla anguilla* depend on stocking. Many species (eurytopic and limnophylous) occur there permanently, several species only during the particular life stages (rheophylic B) and many of them do not enter these habitats or occur very occasionally (rheophylic A).

Generally, borrow pits are very important habitats for many permanently occurring species including endangered species and for young-of-the-year specimens of many other species. On the other hand, they are suitable for invasive species that can occur in very high density there. Natural regular flooding is the most important factor that determines fish assemblages in borrow pits. Obtained data indicate that artificial permanent pools can compensate the elimination of former natural aquatic habitats that had developed naturally by the river fluvial activity in the past.

The study was supported by the projects of Slovak Grant Agencies, APVV no. 0154-07 and VEGA no. 1/0352/08.

Proposed IAP (pIAP) areas in Andalusia (South of Spain). The importance of farm ponds

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Keywords: IAP area, amphibians, farm pond

We present three proposals for the inclusion in the IAP project (Important Areas for Ponds), including the Alpine Arc and the Mediterranean biogeographical regions. These all are in Andalusia (South of Spain), a Mediterranean representative area, with many farm ponds in agriculture or farming use which have been monitored since 2007. Two of them are in the mountain region (Sierra Morena range), where not inventoried natural wetlands exist, and the rest is in a steppe zone, near an aquatic protected area. The species lists include many protected by European or international legislation, even endemic species of reptilians and amphibians. Moreover, there are threatened species listed on the IUCN and European Red List.

We think these sites should be recognized as important for preservation of biodiversity, in the proposal of good practice and management use in areas of socioeconomic value, and their link to natural areas.

Assessment of the risk of cyanobacterial bloom occurrence in urban ponds: probabilistic approach

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Keywords: cyanobacteria, eutrophication, threshold relationship, conditional probability

Blooms of toxic cyanobacteria became a common feature of eutrophic temperate lakes and ponds owing to human induced eutrophication. Occurrence of cyanobacterial blooms in an urban context may pose serious health concerns. This necessitates the development of tools for assessment of the risk of noxious bloom occurrence. A five year study of 42 Brussels ponds showed that cyanobacteria have threshold rather than linear relationships with environmental variables controlling them. Hence, linear relationships have limited predictive capacity for cyanobacterial blooms. A probabilistic approach to prediction of bloom occurrence using environmental thresholds as conditions in conditional probability calculation proved to be more useful. It permitted to quantify the risk of cyanobacterial bloom occurrence and thus to single out the conditions and thence the ponds the most prone to cyanobacterial bloom development. This approach can be applied for the assessment of the risk of cyanobacterial bloom occurrence in urban ponds and thus can facilitate monitoring planning and setting restoration priorities.

Diversity of functional groups of ground beetles (Col.: Carabidae) and spiders (Arach.: Araneae) in different types of kettle holes in Brandenburg/Germany

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Keywords: agrarian landscape, functional groups, landscape ecology

Eight different kettle holes, one set aside and one field of winter wheat were investigated for ground beetle and spider assemblages, respectively. Five pitfall traps were operated from the end of April to the end of July 2005 in each of the plots. The two species groups were analyzed for functional groups, i. e. abiotic requirements, preferred habitat types, overwintering habits, potential flight ability, annual activity patterns, as well as individual body mass. The ground beetles revealed only minor differences in the distribution of the functional groups, but partial great differences in patterns of activity and biomass dominance, respectively. In opposite, spiders displayed only a few differences between activity and biomass dominance, and a great variation of functional groups in the different kettle holes. From these patterns, the great importance of kettle holes for the augmentation of different aspects of species diversity in the agrarian landscape is emphasized and consequences for nature conservation measures are deviated.

Importance of spatial and temporal variability for monitoring of turlough macroinvertebrate communities

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Keywords: turloughs, macroinvertebrates, temporal variability, spatial variability, monitoring

Turloughs are recognised as habitats of national and international conservation importance, listed as priority habitats under the European Habitats Directive (92/43/EEC) and designated as groundwater dependent terrestrial ecosystems (GWDTE) under the Water Framework Directive (2000/60/EC). Sampling to meet the objectives of either Directive requires discrimination of inherent natural variation from anthropogenically induced disturbances and accounting for both spatial and seasonal patterns of biotic distribution.

We examined spatial and temporal variability of macroinvertebrate communities in turloughs with varying hydrological and nutrient regimes and tested the influence of different disturbance regimes and habitat characteristics on community dynamics. A two-phased hydrocycle was identified with permanent residents dominating during the start of the hydrocycle, with an increase of ephemeral taxa over time. Disturbance had an important effect on macroinvertebrate community structures, with high disturbance generally supporting lower faunal diversity. While habitat specific preferences were found for some taxa of conservation concern, variability of macroinvertebrates within turloughs was nevertheless identified to be smaller than among turloughs. Macroinvertebrate samples collected in any location of the dominant turlough habitat (submerged grassland) were identified as reliable indicators of ecological change.

Turlough macroinvertebrate communities are highly distinct and conducive to time and cost-effective monitoring. Collection of a single submerged grassland sample reduces inherent 'noise' and is suited for the detection of pressure gradients. The number of habitats sampled should, however, depend on the objective of the sampling. Sampling for more holistic purposes should be carried out using a multi-habitat sampling approach to obtain a more comprehensive survey of turlough biodiversity. Season had an important influence on macroinvertebrate community structures. Turlough sampling regimes need a flexible approach with timing and frequency of sampling depending on sampling protocol objectives and should be geared towards the start of the flooding season and variable hydrocycles and macroinvertebrate life stages taken into consideration.

Characteristics of ponds of *Bombina bombina* (Amphibia: Anura: Archaeobatrachia: Bombinatoridae) on the north edge of its distribution in Latvia

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Keywords: Bombina bombina, ponds, key factors, conservation, Latvia

Populations of rare and preserved fire-bellied toad *Bombina bombina* existing in the territory of Latvia live on the northern border of this species' area. 46 *Bombina bombina* pond biotopes were investigated in the research. The habitats were characterized according to 40 abiotic and biotic characteristics. *Bombina bombina* habitats were divided into 3 categories in the programme *Analyze Key Influencers SQL Server2005 Microsoft* for determination of key factors. In the complex analysis of this research the determined characteristic features of habitats are indicators of factors impacting *B. bombina* habitats.

According to the received data, the littoral plants species determine individuality of pond: *Alisma plantago-aquatica, Acorus calamus, Carex vesicaria, Scirpus sylvaticus, Polygonum amphibium f. aquaticus & f. terrestre, Callitriche spp., Lemna trisulca, Spirogyra sp., Sparganium sp., Phragmites australis, Typha spp., Juncus spp.*

Chi-square test shows connection of category of biotope with *B. bombina* eggs in biotope ($p < 0.05 = 0.001$). The factors defining the categories have been identified: the 1st category is defined by clayey muddy base of the reservoir; the 2nd category is defined by the distance to the nearest house (till 50 m); the 3rd category is defined by the presence of *Pelobates fuscus* tadpoles' population.

The analysis of relation between pond characteristics and 3 reproductive expressions (vocalization, eggs, tadpoles) of *B. bombina* disclosed that the width of littoral zone is the only determining abiotic factor; vegetation, especially rush (*Juncus sp*.) is the only biotic factor in the habitats of fire-bellied toads vocalization. Presence of *Mollusca, Spirogyra, Pelobates fuscus* tadpoles is determining key factor in the habitats, where *B. bombina* eggs were found. Presence of water beetles, esp. *Dytiscus spp*. and tadpoles of *Pelobates fuscus* is determining key factor in the habitats with population of *B. bombina* tadpoles. The optimal *B. bombina* habitats are more significantly determined by biotic key factors than by abiotic.

Characteristics of water biotopes of *Emys orbicularis* (Reptilia: Testudines: Emydidae) and role of ponds on the north edge of its distribution in Latvia

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Keywords: water biotopes, Emys orbicularis, ponds, conservation, Latvia

Ponds are important type of biotopes of European pond turtle *Emys orbicularis* (Linnaes, 1758). The species is very rare and preserved in Latvia on the northern edge of its distribution. The main aim of the study was investigation of water biotopes of *E. orbicularis* in Latvia.

The water biotopes of findings of *E. orbicularis* were characterized according to 30 abiotic and biotic characteristics: the type of biotope, area, length of coastal line, the depth, distance to another basin, the overgrowth of the coastal water zone, distance to the nearest house and others. Some parameters (urbanization, overgrowing, pollution etc.) were estimated by the points scale from "0" (not found) to "4" (the highest grade, dominated).

The water biotopes (n = 59) of findings of *E. orbicularis* in Latvia were: lakes (41 %), all types of ponds (34 %); small overgrown rivers (12 %), marshes (8 %); ameliorative channels (5 %). Examined water biotopes (n = 17) have average distance to another basin 867 m; overgrowth of the coastal water zone is 3 points in 50 % of basins; the overgrowing of the 20 m wide coastal zone of land by bushes is 4 points in 33 % of biotopes. The average distance to the nearest house is 396 m, to the road is 389 m. The intensity of reservoir use by people was 0 points in 6 % of biotopes; 2 points in 50 % of biotopes; 3 points in 22 % of biotopes, 4 points in 11 %. Other characteristics were analyzed also. The examined ponds by origin were: natural ponds 45 %, artifical ponds 55 %. The types of artifical ponds are: fish ponds 23 %, home ponds 18 %, technical ponds 14 %.

The research, preservation and optimization of ponds is an important part of realization of the official "Plan of conservation of European pond turtle *Emys orbicularis* in Latvia", approved by Latvian Ministry of Environment in 2008.

Relationship between plants' communities' succession and amphibians species occurrence in the in-wood ponds in Goleniowska Forest District near Szczecin in Poland

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Keywords: in-wood ponds, amphibians, plants' communities, forest

In 1999 and 2009 there were headed the fauna and flora researches in thirty three in-wood ponds surface in Goleniowska Forest District near Szczecin (West Pomeranian Region) in Poland. There were found 48 plants' communities with 323 flora species and 10 species of amphibians. Changes in plants' communities have an impact into amphibians' population. Possibilities of fauna species migrations depend not only on the distance between the ponds, but also on the plants' communities. Researches in the forested area are one of the first from the Goleniowska Forest District, which compare data from 10 years studies and include flora and fauna populations in connection to the forestry management. Surprising results show the relationship between forestry management rules, changes in the in-wood waterholes chemistry and their impact into plants' communities and amphibians' populations.

Grass communities situated around the in-wood waterholes surface in Beech Forest near Szczecin as the amphibians' site

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Keywords: in-wood ponds, amphibians, grass' communities, forest

In 2000 and 2001 there were headed the fauna and flora researches in six in-wood waterholes surface in Beech Forest near Szczecin (West Pomeranian region) in Poland. There were found six grass communities (connected also to the surrounding forest) on the slopes around the water surface in in-wood waterholes. There were found communities with: *Bromus mollis, Lolium perenne, Deschampsia flexuosa, Poa nemoralis, Poa sylvatica*, which made possible the hibernation to the amphibians in these places. Waterholes situated in the South part of the forest were less rich in the amphibians species (two species) than the once situated in the central part of the Beech Forest (six species: *Bombina bombina, Bufo bufo, Hyla arborea, Rana arvalis, R. esculenta* and *R. ridibunda*). Less number of the amphibian's species was caused by high percentage of covering the water surface by the plants similar to the height land slope.

The assessment of "trophic state" in shallow aquatic systems

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Keywords: eutrophy, anthropic eutrophication, sediment

It is about time the assessment of trophic state in shallow aquatic systems is no longer estimated through the regressions and thresholds modelled for lakes (OECD, 1982). Firstly, because it was so recommended by the authors of the OECD report and by other experts due to the importance of sediment-water interactions in shallow systems (Golterman & Kouwe, 1980; Golterman, 1991). Secondly, because eutrophication has increased dramatically since lake data was collected in the 60's and 70's. The recent use of biological communities (macro-invertebrates, diatoms, etc) for the evaluation of the "ecological state" of a water body also requires the assessment of its "trophic state". Therefore this assessment should fit both purposes: as a reference of the system state variables to set biological indicators for the evaluation of the "ecological state", and as a reference of nutrient status for the study of eutrophication processes. Primary production in clear shallow systems can be modelled as a function of nutrient availability because light might not be limiting during spring growth, whereas it may be limiting in turbid waters. But in both cases, sediment plays an important role in the availability of dissolved inorganic phosphate depending on the sediment capacity for adsorption and release. Dissolved inorganic nitrogen can also limit primary production whenever denitrification processes dominate the N-cycle. Production in shallow systems is also related to other factors, such as latitude, hydrology and land use so our model ought to be verified across a wider area. All in all, this sediment approach changes the concept of "trophic state" in shallow systems from that currently used in lakes because it takes into account that productivity is generally higher in shallow systems compared to lakes within the same area. Therefore, the model ought to distinguish, first, between natural eutrophy and anthropic eutrophication.

The sediment as a tool for the classification of temporary aquatic systems in the Doñana region (SW Spain)

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Keywords: ponds, marshes, sediment, phosphorus

The Doñana region includes a wide range of natural wetlands according to the Ramsar proposal in 1982, most of them temporary, such as humid dune slacks, freshwater ponds, brackish pools, and intertidal freshwater and brackish marshes. The variability of the Mediterranean climate has a strong effect on the physico-chemical features of the water in these wetlands, and so former classifications have produced several descriptive typologies that tend to oversimplify the actual diversity. A quantitative classification was attempted before (Espinar & Serrano, 2009) that arrived to a global segregation between freshwater ponds and brackish marshes during floods, but it could not make further classifications within the ponds. The present work includes data from several sources: 20 ponds studied monthly within the Doñana Biological Reserve (2006-2007), a survey of 90 other ponds scattered over the National Park (spring 2006), and some earlier data gathered from ponds, marshes and artificial fish-ponds. Pond sediment rather than water chemistry proved more successful when predicting the degree of temporality of ponds. Total iron concentration of surface sediment significantly segregated long-hydroperiod ponds from the rest of ponds above a threshold value of 5 mg g^{-1} d.w., whereas a threshold value of about 10 % of organic matter segregated short-hydroperiod ponds from the rest of ponds. Additionally, the concentration of calcium in the surface sediment explained the segregation of those ponds fringing the marshland from the rest of ponds. Sites on the Doñana marshland showed a very poor correlation between Tot-P and organic matter in the surface sediment due to a larger influence of calcium carbonate on the adsorption of P in this kind of substrate.

The temporary pools of the western Morocco: issues of conservation and spatio-temporal dynamic by remote sensing

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Keywords: temporary pool, flora, pool species, rare species, Morocco

In the Mediterranean basin, Morocco is acknowledged for its richness in temporary pools which are found over large areas of the territory, from the Atlantic plains until the Eastern "Hauts Plateaux" and mountain ranges. They are met at higher densities in Western Morocco where they show a large diversity of size, shape, depth, substrate and ecological characters.

The changes in the number and surface areas of pools in the Province of Benslimane (western Morocco) were analysed for the period 1955-2001 using 1 : 25000 maps and satellite data (Landsat). In the same area, the species composition of the vegetation has been studied in a selection of 50 temporary pools using a phytosociological approach. For each pool the following environmental variables were measured: maximum water level (in winter), size of the pool and the land use (forest or agro-pastoral) in the nearby catchments. Each species was characterized by attributes (Raunkiaer growth form, specialist of pools/opportunistic, rarity and biogeographical domain).

The results showed a rich flora (200 species) made of mainly therophytes (69 %) with a predominance of the Mediterranean taxa (*Elatine, Isoetes, Kickxia, Lythrum, Lotus*…) followed by Atlantic (*Illecebrum, Cicendia, Juncus, Exaculum*…) and tropical taxa (*Oldenlandia, Marsilea*...). The pool-specialist species constituted 30 % of the total flora (30 %) including 14 very rare or rare species. The opportunistic species of the pools (60 % of the total flora) are mainly agricultural weeds and the terrestrial forest species which develop during the dry phase of the hydrological cycle of the pool; these species are abundant in the habitats surrounding the pool.

In the whole province (255,000 ha), a total number of 871 pools was found in 1955 with a cumulated surface area of 5,086 ha. A decline of the number and surface area of the pools has been shown in the Province. In 2001 the number of pools had declined to 652: 219 pools had disappeared all localized in agricultural environment. In contrast, the pools did not show any decline when located in forest. These results demonstrate the need for the conservation of these habitats which should be taken into account in Moroccan programmes of conservation of the biotopes and biodiversity. Important pool complexes should be listed as Ramsar sites which should attract attention of public and decision makers on the international importance of the temporary pools of Morocco.

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Passive restoration of the populations of *Isoetes setacea*, a rare fern of the Mediterranean temporary pools

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Keywords: temporary pool, France, Isoetes setacea, colonization, passive restoration

The success of the passive restoration of populations of *Isoetes setacea*, a rare and protected species in France, has been assessed in 6 temporary pools in the South of the country. These pools were invaded by shrubs (*Ulmus minor* and *Fraxinus angustifolia*) after exclusion of grazing since 50 years, resulting in the regression of the population of *I. setacea*. In each pool 2 experimental zones were delineated: a control zone and a cleared zone (cut of the shrubs and export of the litter). Both zones were monitored during 1 year for assessing initial conditions. The vegetation was monitored during 3 years after the clearing of shrubs. Clearing of the shrubs and removal of the litter led to an increase in the populations of *I. setacea* only in 3 pools. This partial success obtained in half of the pools highlighted the important role of 3 factors: the spore-bank, the characteristics of the populations at the start of the experiment and the increase of light availability after clearing the shrubs. In the 3 other pools the shrubs colonized the peripheral parts of the pools, non favourable to *Isoetes setacea*.

Shrub clearing and removal of the litter were efficient for restoring populations of *I. setacea*; on longer term the reintroduction of domestic grazing could substitute mechanical clearing of shrubs.

Water budget analyses for selected kettle holes in eastern Brandenburg, Germany

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Keywords: kettle hole, pond, water budget, infiltration, evapotranspiration, interflow

Quantitative analyses about the water budget components of kettle holes (glacial pond-like depressions) were rarely undertaken in Germany. This is due to the necessary investment and installation of process-related measuring equipment, as well as the considerable operating expenses required for long-term and multi-object studies. As a compromise, extensive and low-cost visual water table monitoring of a substantial number of kettle holes has been performed in eastern Brandenburg during the last two decades (1992 et sqq.). Based on these data and complemented by day-by-day climatologic records from the near ZALF station for the same period, we aimed at the sequenced quantification of infiltration, evapotranspiration, and episodic interflow for a set of 6 selected kettle holes.

The investigated 320 ha agricultural area underlain by glacial till and containing 9 kettle holes per 100 ha is characterised by gently undulating terrain rising in southern direction, relatively low precipitation (P_{meas} = 549 mm yr^{-1}, P_{corr} = 633 mm yr^{-1}), high grass reference evapotranspiration (E_{pot} = 706 mm yr^{-1}), and intensive agricultural use. Following the hydrogeomorphic (HGM) classification, the examined kettle holes pertain to the types SSO (Small Shallow Shore Overflow) and SSS (Small Shallow Storage). Their catchment areas range between 0.93 and 2.63 ha.

The methodology of sequenced quantification of the main water budget components, exploiting information from characteristic periods with well-defined hydrologic conditions, revealed feasible and useful. Even though there exists considerable uncertainty of the single extracted value (especially the volume of interflow), a very sound overall picture of the main water budget quantities evolves from analysing those long-term records. Nevertheless, insight was reconfirmed that each kettle hole is unique in its hydrological behaviour originating from the set of HGM parameters, the catchment characteristics, and the hydro-meteorologic conditions. The role of vegetation (aquatic and shore zones) and management measures such as (partial) mud clearance is discussed.

Dragonflies as indicators of biodiversity and environmental integrity: a case study

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Keywords: dragonflies, biodiversity, indicators, conservation

The purpose of this study is the investigation of the ecology of Odonata, and their possible use as indicators of biodiversity and environmental integrity. Surveys have been carried out in thirty-six NATURA 2000 sites in Piedmont (NW Italy), with the main purpose of evaluating habitats preferences of the different species and their relation with human disturbance. Overall we found 43 species, ranging from 21 in Laghi di Avigliana site to 1 in heavy disturbed sites like Lago di Candia. In each sampling station we examined adult microhabitat by standardized sampling techniques; macrohabitat characterization was done by analyzing digital maps of habitat use using a GIS. Environmental preferences of each species were investigated by means of logistic regressions. Implications for conservation Odonatofauna of Piedmont are discussed.

Phytoplankton as a trophic index for small waterbodies and its relation with selected taxonomic groups

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Keywords: chlorophyll a, bioindication, trophic status, shallow lakes

Phytoplankton is often considered as an inhibitor for the development of biodiversity in aquatic ecosystems. The high turbidity and the competition for light and nutrients caused by the increase of phytoplankton biomass can limit the development of other primary producers, especially submerged macrophytes, and so can have negative effects on the food web.

From 2007 to 2009, a study on 100 shallow water bodies in the Dombes region, France, was conducted in order to elaborate a bioindication tool. Water was analysed weekly or each two weeks from April to October for the parameters total N, total P, NO_3, PO_4 and chlorophyll-a.

Our results suggest that chlorophyll-a is a good indicator for the evaluation of the trophic status of these systems. High correlations were found for chlorophyll-a with total N and total P. Based on our results, we propose new trophic thresholds for non-stratified shallow water bodies as the generally used trophic levels are not adapted to this type of aquatic systems. A large confrontation with literature data is proposed.

A statistical analysis of interrelations with different biodiversity index based on Odonata, Macrophytes, and Invertebrates showed that chlorophyll-a can be also a relevant indicator for species abundance or diversity of selected taxonomic groups. The combination of the chlorophyll-a parameter with the occurrence of particular genus of phytoplankton communities could provide even a more precise bioindication for estimating the potential impact of the trophic level and the phytoplankton development on α-biodiversity. For this, we propose a "first step" calibration with the purpose of a validation of a new tool for ecological evaluation of small shallow waterbodies.

Ecology of algae in some peridunal Mediterranean ponds

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Keywords: Mediterranean, peridunal ponds, species, algae, size

Peridunal ponds are frequently found in some of the most important Natural Parks along the Spanish Mediterranean coast. Studies on their ecology have been carried out recently, however. In the Natural Park of the Albufera (Valencia, Spain) several peridunal ponds have been restored since 1997 and monitoring of these temporary and semi-permanent ponds was carried out during several years to assess species biodiversity, colonization and population dynamics.

In this study, we will focus on the ecology of phytoplankton and benthic primary producers. To study species colonization nine ponds were selected with similar size and hydroperiod but different age since restored. All of them were oligohaline and temporary ponds which dry during summer and are closely located in the dune system of the Albufera Natural Park. Three of these ponds were restored in 1997-1998, other three were restored in 2001-2003 and the last selected group of three were restored in 2007. In October 2009, during the first days of the annual hydroperiod after the summer dry period, colonization of the ponds by algae and main limnological variables were studied. Species composition differed between ponds but diversity was higher than expected, while algal size was kept in low ranges, which could influence the rapid grow of zooplankton. Nutrient levels and chlorophyll-a concentrations were low and water transparency drives biomass toward benthic producers. The results pointed out the rapid changes and colonization patterns of the organisms within these temporary ponds. Connectivity of these systems and easy transport of individuals between ponds seems to mainly affect biodiversity and colonization. Human impact on these ponds should be kept low for the conservation of these fragile systems, especially taken into account the rapid pollution and transformation of water bodies and wetlands in the Spanish Mediterranean coast.

Primary producers in some Mediterranean ponds

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Keywords: Mediterranean ponds, coastal, plants, epiphytes, phytoplankton

Mediterranean temporary ponds are scarcely studied, especially regarding their primary producers. The relative importance and biomass attained for aquatic primary producers depend, among some of the main factors, on hydroperiod, light, nutrients and predators. When plants can establish in temporary ponds planktonic algae and epiphytes can cause a strong light attenuation for submerged macrophytes, which in some cases can drive plants to extinction. The presence or absence of submerged plants, clearly affects the whole planktonic and benthic food web structure and biodiversity.

We studied the ecology of primary producers in five ponds located in the Mediterranean coast (Valencia, Spain). The selected ponds had differences in salinity and trophic state. Biodiversity, biomass, water nutrients, turbidity and predators were studied. Species composition between phytoplankton and epiphytes was similar between plant species, and differences mainly related to pond typology and salinity. Nutrient concentration mainly determined algal biomass and underwater light conditions, which balanced planktonic or benthic primary producers. The results pointed out the sensibility of these ponds to human impact by nutrient loading and catchment uses and revealed the relevance of their conservation. It is needed further researches on the ecology of aquatic plants in ponds to ascertain their role to sustain water quality and biodiversity in high isolated and transformed wetlands in the Spanish Mediterranean coast.

How climate change could affect the biodiversity of stagnant waterbodies: a case-study with eutrophic to hypertrophic ponds (Dombes, France)

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Keywords: climate change, productivity, hydroperiod, resilience to perturbations, extinction and colonisation

Climate change has a major influence on freshwater biodiversity. Its effects on waterbodies are both direct (rising temperature) and indirect (e. g. productivity, hydroperiod length). Ponds constitute good models for exploring such issues.

We investigated first the relationship between local species richness (ecosystem level) and productivity in 100 ponds from a network of 1000 highly-connected eutrophic to hypertrophic fishponds (Dombes, France) for Odonata (adults), aquatic macroinvertebrates and amphibians. Then, we tested the effects of climate change on pond species richness due to (i) a productivity increase and (ii) a drying out of the shallowest ponds. We also investigated the resilience of species to perturbations induced by climate change through several criteria such as temperature preference, dispersal ability, or distribution south of the studied area.

For Odonata, no significant relationship was evidenced between local species richness and trophic level, and simulating an increase in productivity did not impact markedly the regional richness. If a complete drying out will impact local richness, it nevertheless, did not impact strongly the regional richness. The investigation of species' resilience to perturbations enabled to classify Odonata species along a gradient of sensitivity to climate change. It evidenced some species whose geographical distribution in Europe is shifting and will shift, and therefore which are potentially at risk of extinction in the studied network (e. g. *Leucorrhinia pectoralis*). The response of biodiversity to climate change showed the same patterns for macroinvertebrates and Amphibians than for Odonata, even if highlighting some discrepancies.

Therefore, on short-term, the changes in the regional biodiversity of this pond network will probably depend more on global processes such as shifts in species geographical distributions in Europe than on local changes such as changes in productivity or water availability. This has now to be corroborated by further investigations, also in other geographical areas.

Macrofaunal succession in a 13-year-old wetland in South-eastern Sweden

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Keywords: succession, macroinvertebrates, constructed wetland, functional traits, Sweden

The benthic macrofauna community of Kalmar Dämme, a constructed wetland situated in South eastern Sweden, was studied from early 1997 (the year after construction of the system) until 2009, during five different periods that reflect progressive stages of the macroinvertebrate community along the succession process: the first year, when only the pioneer assemblage was established; the second and third year, with a short-term macroinvertebrate community; the seventh year, with a mid-term community; and after 13 years, with a much more mature assemblage. The changes between these assemblages have been analysed by means of community parameters – such as species richness or taxonomic distinctness – and through composition, both from a taxonomical and a functional approach. On one hand, there has been a change in the species composition combined with an increase in the species richness and an increase in the taxonomic distinctness of the found taxa. On the other hand, various analysed biological traits – selected for being related to succession: the number of generations per year, the dispersal strategy and the feeding typology – have also experienced changes along time. All these changes imply that not only the initial colonization but also some orderly and predictable subsequent changes in the composition and structure of the community have taken place. Thus, a succession process has been observed in this 13 year old constructed wetland.

Evaluation of the amphibian colonization success of two temporary recently created ponds in the Mediterranean region

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Keywords: amphibians, colonization, newly created, temporary ponds

During the last decades, wetlands in the Iberian Peninsula have experienced a serious decline in number, size and ecological status, and a drastic fragmentation mostly due to tourism and agricultural impacts. In order to reverse this situation, in two different areas (*Selva* and *Baix Ter* lowlands) and thanks to different conservation projects, new ponds were created in summer 2006. During 2007 and 2008 springs, the efficiency of these ponds to enhance amphibian populations was assessed by means of the number of species and abundance of amphibians entering the pond to reproduce, the numerical abundance of the individuals in metamorphic stage (after reproduction) and the productivity of juveniles per adult females. This data was related to water, pond, landscape and meteorological variables. The results show that (1) temporary wetlands are a valuable habitat for at least a subset of the amphibian fauna of the region already in the first year of life of newly created ponds; (2) several environmental factors affect the colonization of the two main species in those areas – *Bufo calamita* and *Discoglossus pictus* –; and (3) there is an interannual and intraannual variability that should be taken into account when evaluating the success or fail of these systems, regarding the benefits for the amphibian community.

Physical, chemical and biological characteristics of ponds in a Mediterranean area in relation to water supply, hydroperiod and land uses

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Keywords: Mediterranean ponds, nutrients, TN/TP, eutrophy, livestock, conservation

Between 2006 and 2009, 149 Mediterranean ponds were sampled in Eastern Spain and main morphological and limnological variables were determined. The region is under Mediterranean climate with pronounced variation from sub-arid to sub-humid and climate determines land uses. Study ponds are small and shallow but differ in water supply (rainfall, surface waters or ground waters) and hydroperiod (from ephemeral isolated rain ponds to permanent ponds with an outflow). PCA and other statistical analyses have been applied to the data. Water mineral contents was related to water sources; rain ponds had low conductivity but high turbidity and ponds fed by ground waters showed higher conductivities and clearer waters. However, we have detected unusually high conductivities due to the effect of road de-icing with salt, conductivity peaking in winter, just when snowfall occurs.

Water nutrients (TP, TN) were related to land uses. Ponds fed by springs had higher TN, increasing with intensive agriculture in lowland areas. Rain ponds had in average, a higher TP but showed high variability, 61 % of them had concentrations above 0.1 mg TP l^{-1} (thus considered eutrophic), but TP is not well correlated with chlorophyll. Rain pond waters presented low TN/TP mass ratios, usually below 14, value considered to indicate N limitation. Most ponds in subhumid mountains showed a strong impact of kine, indicated by high increases in ammonia and in chlorophyll and a decrease in dissolved oxygen; while in more arid areas where extensive ovine livestock is usual ponds showed higher TP means increasing with trampling. On the other hand, nutrients and organic matter in sediment were related to depth.

As other studies showed, ponds commonly have small catchment areas thus the most important impacts are located relatively close. This has the advantage that impacts could be easily identified for improving management.

Crustacean communities in Mediterranean ponds in relation to environmental factors

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Keywords: Mediterranean pond typologies, climate, hydroperiod, turbidity, diaptomids, cladocerans

Crustacean communities were studied in 140 Mediterranean ponds in Eastern Spain with different hydroperiods, from ephemeral closed rain ponds to permanent ponds with flowing water. Multivariate indirect analyses, such as CA, CCA and Multivariate regression trees (MRT), were performed to typify crustacean communities and relate them to specific limnological features. We detected five groups of pond communities. A first group of ponds was clearly separated by CA. It was composed only by three ponds and their very specific and uncommon community composition was not related with any of the environmental variables measured suggesting that historical factors play a more important role than the current limnological or environmental local factors.

MRT applied to the rest of sites showed 4 different groups of crustacean communities and hierarchically identified as main defining environmental variables: hydroperiod, turbidity and water flow. Hydroperiod and depth as related variable separated true temporary ponds with a recurrent annual dry phase, from those semi-permanents or permanents. Temporary ponds were then separated by turbidity in two groups with a threshold of 6.5 NTU. Permanent ponds were also separated in two groups according to water flow giving a compact group of spring pools located in lowland areas. The crustacean communities within the groups separated by MRT analysis presented a high degree of nestedness. INDVAL analysis showed that in temporary ponds diaptomids were the most characteristic organisms defining the types: *Hemidiaptomus ingens* distinctive of special long-established ponds, *Neolovenulla alluadi* typical of clay turbid ponds in semiarid areas and *Mixodiaptomus incrassatus* in clear ponds indicator of wetter areas. Community structure also differed in relation to hydroperiod high densities and biomass and a dominance of large-sized, pelagic crustaceans were characteristic of temporary waters whereas low densities and biomass, and a dominance of plant associated crustaceans were normal in permanent waters. The pronounced climate variation in this Mediterranean region determining land uses are also important factors in crustacean distributions.

Updating the distribution and conservation status of large branchiopods in the Iberian Peninsula and Balearic Islands

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Keywords: temporary ponds, large branchiopods, checklist, distribution, conservation

The distribution of the large branchiopod fauna in the Iberian Peninsula and Balearic Islands is updated based on bibliographical and recent records. The checklist includes 16 anostracans, 3 notostracans and 4 spinicaudatans. This review identified common species in the studied area such as *Chirocephalus diaphanus, Branchipus schaefferi,* and *Triops mauritanicus*. Rare species were also detected (*Branchinecta ferox, Branchinecta orientalis, Linderiella baetica, Linderiella sp., Tanymastigites sp., Phallocryptus spinosa, Lepidurus apus, Leptestheria mayeti* and *Cyzicus tetracerus*). A maximum of 6 species were found co-occurring together. *Artemia salina, Artemia franciscana, parthenogenetic Artemia, Branchinectella media, Branchipus schaefferi* and *Tanymastigites* sp. were the species most usually found alone. Less common species (*Branchinecta ferox, Linderiella baetica, Linderiella sp., Cyzicus tetracerus, Maghrebestheria maroccana and Leptestheria mayeti*) were also those that were never found alone. The identification of UTM grid squares as hotspots of biodiversity of large branchiopods in the Iberian Peninsula and Balearic Islands based on 3 different criteria is proposed: (1) UTM grid squares with high number of water bodies with large branchiopods; (2) UTM grid squares with waterbodies with co-occurrence of more than 3 species; and (3) UTM grid squares with presence of rare species.

Zooplankton as indicator for sustainable pond management

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Keywords: pond management, zooplankton, Daphnia, feeding

The key to sustainability in the farming of common carp (*Cyprinus carpio* L.) is the management of natural resources, namely the zooplankton which is an important feed for carp in a near-natural production. It can be shown, that large Cladocera (*Daphnia sp.*) > 1 mm are a suitable indicator organism for an environmentally as well as economically viable carp production.

Carp farmers should seek to cultivate an optimal population density of Daphnia during the growing season. This can be achieved by adjusting additional feeding with cereals to the abundance of large Daphnia. Feeding has to be increased when the abundance of Daphnia is low to reduce predation by carp and avoid a collapse of the Daphnia population. On the other hand feeding has to be reduced when the abundance of Daphnia is high to increase predation by carp. This adjusted feeding strategy and management of zooplankton results in an optimal non-depleting use of natural resources by the carp and a minimized use of additional feed. This approach is both environmentally and economically sustainable. Water quality, fish health and meat quality can be improved. Moreover, fist trials showed that this method works not only in controlled experiments but also under farm conditions. However, the crucial precondition for this approach is an adjusted stocking density. This means also to control the population of other planctivorous fish (rudd, roach, ...) thoroughly. Beside this, the carp farmer is asked to reject conventional temperature dependent feeding plans and to get familiar with the principles of zooplankton adjusted feeding.

Risk assessment and recovery potential of pondsapplying the model $BERN_{aqua}$

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Keywords: bioindication, critical limits/loads, modelling physiologic reactions, database, climate change

The BERN-Model (Bioindication for Ecosystem Regeneration towards Natural conditions) was designed to integrate ecological conditions into environmental cause-effect relationships and critical load values. A database with a large number of empirical surveys of terrestrial and aquatic ecosystems is the basis of the BERN-Model. Since nearly all biological components in a natural or semi-natural ecosystem are adapted to a long term evolutionary evolved status of relations between biotic and abiotic parameters (e. g. essential nutrients, base cations, as well as water supply and temperature conditions) changes in vegetation structure may serve as an indicator for endogenic alterations of these parameters. The modelling of physiological reactions of plant communities begins on a plant species level. At first, the fundamental niches of aquatic plant species with their fuzzy thresholds of the suitable site variables are included in the $BERN_{aqua}$ database. In a second step the real niches of plant communities (104 aquatic communities) are integrated by combining the fuzzy fundamental niches of the consistent plant species by using fuzzy logic. The real existing combinations of undisturbed site variables are classified to reference site types.

This database enables the user of the $BERN_{aqua}$-Model to assess the current regeneration ability, to quantify the critical limits and critical loads of natural aquatic plant communities for eutrophying and acidifying depositions and climate change, to determine the dynamic change of vegetation structure and biodiversity in the past and future depending on history and future scenarios of utilization, depositions and climate change considering the hysteresis effect. Furthermore the users may evaluate future options for potential regeneration targets.

Genetic survey of relict and man-made populations of the highly endangered fire-bellied toad Bombina bombina to guide further habitat and population management

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Keywords: population management, MHC, control region, microsatellites

The European fire-bellied toad (*Bombina bombina*) is a highly endangered pond breeding amphibian with its northern range edge in the Baltic. Especially in these areas both the number and the size of populations increased dramatically over the last decades. This is mainly caused by habitat degradation, habitat loss and habitat fragmentation.

But how could small relict populations be sustainably saved with a maximum of genetic diversity and without loss of local adaptation?

We established a mitochondrial gene fragment (control region), 17 microsatellites, and a part of the major histocompatibility complex (MHC II exon 2) as genetic markers to investigate different levels of genetic diversity and local adaptation in the toads.

As part of an EU LIFE-project (LIFE04NAT/DE/000028) we accompanied the extensive habitat restoration and appropriate population management with a genetic survey. We analysed 793 of 39 populations mainly from Denmark, Sweden, and northern Germany to evaluate the efficiency of different translocation strategies, to reveal remarkable threatened populations and detect suitable areas for metapopulations.

Modelling population dynamics of Great Crested Newts (*Triturus cristatus*) in agricultural landscapes

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Keywords: individual-based modelling, arable land, pond rich landscapes, climate change

Agricultural land use in pond rich landscapes can affect amphibian populations directly (application of fertilizers and pesticides and tillage operations during migration periods) and indirectly (fertilizer and pesticide runoff into ponds). Additionally climate change is considered to have an impact directly on population development (e. g. earlier pond desiccation), and indirectly by affecting agricultural production.

The study aims to construct an individual based population model for the Crested Newt to make predictions about the long-term viability of populations with changing agricultural land use and climate change.

The project will be carried out from 2010 until 2012.

Improving landscape connectivity in agricultural landscapes for *Triturus cristatus*

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Keywords: newts, migration distance, habitat patch composition

Fragmentation and agricultural intensification lead to habitat loss and isolation for many amphibian species. *Triturus cristatus* depends like most amphibians on both aquatic and terrestrial habitats for development and thus suffers from loss of local connectivity between habitats. In low structured agricultural landscapes more suitable habitats should be created for higher connectivity, with respect to a still effective agricultural production.

The study presents an approach to identify suitable areas based on capture-recapture data for integrating new habitat patches in an agricultural landscape for connectivity improvement. New habitat patch compositions were developed with a) new linear structures, b) buffer areas around ponds and c) both, linear structures and buffer areas.

Results showed an increased landscape connectivity index of nearly 60 % when creating c) new linear structures and buffer areas. This comes along with a field area minimisation by only 4 % and a tillage length shortened by 2 %, which is not considered to have an impact on agricultural productivity.

Additionally importances of each new habitat for overall landscape connectivity were calculated. A ranking of the most important new habitats provides a decision support for integrating nature protection aims into landscape planning when funds are limited.

Ecological intensification of fish farming: PISCEnLIT

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Keywords: ecosystem services, ecological intensification, fish farming, ponds

The PISCEnLIT project comes from the global context of aquatic productions in which fishing has achieved a limit and fish farming has a regular development and produces as important volume as fisheries. However, this development should solve several bottlenecks such as environmental and societal problems which question its sustainability. PISCEnLIT is mainly concerned by the ecological intensification of fish culture ponds and their territorial insertion using an ecosystemic approach. According to the Millenium Ecosystem Assessment, an interdisciplinary approach (including technical, social, biological, environmental, economic and organizational expertises) is developed to analyse 3 geographical and socio-economical contexts (Brazil, France, Indonesia) in order to illustrate the diversity of fish pond farming systems with a gradient of productivity.

The objectives of the project are (i) to assess the ecosystemic services related to pond culture system (surveys / fish farmers, local populations, governance) and (ii) to define the conditions of an ecological intensification's implementation. The main tools used will be life cycle assessment, emergy analysis and ecosystem services assessment. The project is divided into six stages.

The first stage is to elaborate an ecosystem approach by listing services from aquacultural ponds and to make an inventory of stakeholders' perceptions of them. The results will allow, in the second stage, to make a diagnostic related to the different contexts and to create a specific tool to characterize the level of ecological intensification. The last stages (3-6) will develop, test and evaluate different scenarios of ecological intensification of pond culture. The final objective is to publish a methodological guide.

The PISCEnLIT project (3 years) is led by the French National Research Agency and began on January 2010.

Nutrient retention from agricultural drainage effluents by retention ponds

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Keywords: nutrient retention, nitrogen, phosphorus, pond, drainage

Tile drainage systems are used in Germany at about 2 million hectares to improve farming conditions at waterlogged sites. They are both precondition for intensive arable farming and sources of nitrogen and phosphorus entries towards downstream receiving water bodies. Among suitable mitigation measures for such ecologically negative effects, technical solutions for controlled drainage solutions could be used. However, existing solutions mostly are not efficiently applicable on sloping waterlogged sites because they affect often a very small area only and need high financial inputs. It seems appropriate to retain water and nutrient fluxes from drainage systems by retention ponds which are placed between drainage outlets and downstream receiving waters, and thus to mitigate eutrophication of these waters.

Since 2006, four site-adapted retention ponds have been investigated to provide evidence for their functioning for nutrient retention from drainage effluents under the climatical conditions of Northeast Germany. The retention function of the ponds was proved by hydrological and chemical measurements at the inlet and outlet. Mass balances were calculated to quantify the retention function of the ponds. Additionally, season-dependent investigations of nutrient turnover by sedimentation, sediment-water-interaction, gas emissions and accumulation in macrophyte biomass have been conducted in aquatic and amphibian zones of the ponds. Rates and percentages of the transformation processes have been calculated to interprete their effects for nutrient retention.

All investigated ponds reduced the nitrogen loads imported from drainage systems in a range comparable to the data found from literature. In case of phosphorus it was different. Caused by temporary release of phosphorus from the organic pond sediments, in two ponds the phosphorus concentrations sometimes were higher at the outlet than at the inlet. After the removal of these sediments the phosphorus load at the outlet was always smaller than at the inlet.

Nutrient retention of ponds I and III was always higher compared to pond II. The differences in the nutrient removal between the ponds are influenced by the specific pond characteristics (hydraulic load, water depth, percentage and arrangement of aquatic and amphibian zones, water depth, shadowing, etc.). The primary sustainable component of nitrogen removal was the denitrification process. N-storage in macrophyte biomass was much higher than removal by denitrification, but it is only highly relevant for the nutrient retention if a part of the biomass can be removed at the end of the vegetation period.

Dragonflies in pond ecosystems: a review

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Keywords: dragonfly, predation, food web, larvae, fish, pond community

Dragonflies are typical members of pond communities. Being obligate predators, dragonflies may be top-consumers in the pond food web or, if fish are present, occupy an intermediate position. Dragonfly larvae can make up a huge proportion of the macroinvertebrate community. For instance, in temporary ponds in Namibia dragonfly larvae contributed up to 40 % of the whole macroinvertebrate abundance as well as 40 % of the species diversity. Due to their ontogenetic habitat shifts dragonflies form a crucial part of cascading trophic effects created by predation across ecosystem boundaries. It has been demonstrated that the strength of fish predation on dragonflies affects the pollination of terrestrial plants (Knight et al. 2005: Nature 437). In my presentation I will try to present an overview on the knowledge about dragonflies in pond ecosystems. I will stress the following questions:

- Are there typical pond-dwellers among dragonflies?
- What is the role of dispersal and migration in the ecology of pond dragonflies?
- How are the life cycles adapted to pond dwelling?
- Which other specific traits promote pond dwelling?
- How do dragonflies interact with the pond communities?

For this I will consider information on dragonfly communities of pond ecosystems from different parts of the world, with some special regard to my own studies from Germany, the Mediterranean and southern Africa.

New knowledge about distribution and ecology of threatened wetland plant species *Tillaea aquatica* in the Czech Republic

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Keywords: ephemeral wetland vegetation, fishpond management, herbicides, land use changes, seed dispersal

Tillaea aquatica is an annual wetland plant species listed as critically endangered in the Czech Republic. In the past, it was quite common on the sandy fishpond margins in moderately warm and humid regions. During the 2nd half of the 20th century considerable decline of the species was documented. It is given into relationship with the changes in the fishpond management, which include fertilisation, liming and restriction of summer drainage of the fishponds. In the end of 20th century, the only locality of this species was known.

We studied flora and vegetation of periodically flooded and exposed bottoms of various types of ponds. To explain the species diversity of ponds, we recorded the data about environmental factors, management, propagule bank and propagule dispersal.

We acquired new data of many endangered plant species, including *Tillaea aquatica*. This species recently occurs in two types of ponds, fingerling ponds (= ponds used for breeding of carp fingerling) and fish storage ponds (= small ponds used for storage of marketable fish between the fishing out of fishponds and the sale). About 15 localities currently exist in the Czech Republic. From the analysis of our data we conclude that among wetland annuals *Tillaea aquatica* is a slowly growing species with quite long life cycles. Therefore it is extremely competitively poor, especially in the conditions of long bottom exposure combined with eutrophic conditions and absence of disturbances. However, the species is herbicide resistant, survives well grazing and shallow flooding. The largest populations of *Tillaea aquatica* were found in ponds with about 4 months bottom exposure and in ponds with long bottom exposure (i. e. 8-10 months) and extensive grazing or herbicide spraying. We detected dispersal of seeds (anthropochory – on vehicles) of the whole plants with mature seeds (hydrochory). Thus the species can be easily dispersed on new habitats.

Flora and vegetation diversity of special types of ponds in the Czech Republic

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Keywords: aquatic macrophytes, fishpond management, periodically flooded habitats, threatened plant species, wetlands

The fishpond management has more than 500 years old tradition in the Czech Republic. Several pond types differentiated during this period. Besides the most common fishponds used for carp breeding there are also various special ponds. They are used e. g. for storage of marketable fish between the fishing out of fishponds and the sale (= fish storage ponds), breeding of trout and other salmonids (= trout ponds) or breeding of small number of fish fingerling, brood fish or rare fish species (= special ponds).

We studied flora and vegetation of various types of special ponds throughout the Czech Republic. The major attention has been paid to species and plant communities of periodically flooded pond bottoms and aquatic macrophytes. Data about the type and management of the ponds and environmental factors were collected too.

The species composition in the ponds was dependent on water level (fully flooded, partly flooded, fully exposed bottom), flood and exposure periodicity, way of vegetation elimination during the bottom exposure (herbicides, mowing or grazing), age of ponds, water source (watercourse or fishpond) and location. The richest on species and vegetation types were old complexes of fish storage ponds in moderately warm and humid regions, e. g. South Bohemia. They are characterised by high variability in flood and exposure periodicity and management practices. There occurred aquatic, wetland ephemeral and perennial marshland species and communities. Among the plant communities, *Potametum pusilli, Cypero-Juncetum bufonii, Eleocharitetum palustris* and *Leersietum oryzoidis* were the most typical. Rare communities, e. g. *Potametum graminei, Najadetum minoris* and *Alismetum graminei,* were documented too. We found large populations of some threatened vascular species, e. g. *Tillaea aquatica, Lindernia procumbens, Cyperus flavescens* and *Pulicaria vulgaris*. Among bryophytes, vulnerable species *Riccia cavernosa* was quite common. The lowest diversity was detected in recently constructed or permanently flooded pond complexes.

Seasonal dynamics of rotifer (*Rotifera*) and crustacean (*Cladocera* and *Copepoda*) zooplankton of meteorite crater ponds in the nature reserve "Meteoryt Morasko" in Poznań, Poland

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Keywords: meteorite ponds, zooplankton, species diversity, small water bodies

Meteorite craters, located at the northern boundary of the city of Poznań, are situated within an area of oak-hornbeam forest (*Galio silvatici-Carpinetum*) and are protected as a nature reserve. They create one of the greatest sets of craters on earth, formed by a fall of iron meteorites. Out of seven ditches, three are permanently filled with water. These are shallow, out-flow ponds supplied by rain water. They are characterised by low pH values and frequent oxygen depletions. Due to such specific conditions, there are no fish observed in these water bodies, which results in a great variation of zooplankton communities of zooplankters, including species adapted to acidic water reaction.

The examination took place over four seasons of 2008. Significant differences in the zooplankton densities were recorded between particular water bodies and between particular seasons within the year. Zooplankton abundance and the taxonomical composition was related to the occurrence of invertebrate predators (larvae of *Culex* sp. and *Chaoborus* sp.), as well as to the densities of competitive filter-feeding representatives of *Ostracoda.*

The most varied species composition was observed during the spring months. A number of species that occurred at that time were characteristic of waters of low trophy, low pH and characteristic of temporary water bodies. Moreover, many representatives of the genus *Daphnia* possessed hemoglobin, possibly due to the reaction to oxygen depletion. Another phenomenon which was observed in the investigated ponds was the frequent occurrence of males in the populations of most cladoceran species, which also reflected specific environmental conditions, unfavourable to many organisms.

Strength of phytoplankton – nutrient relationship in ponds and lakes

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Keywords: phytoplankton, nutrient, biomanipulation, macrophyte, zooplankton

Phytoplankton biomass – nutrient relationship is widely used by lake managers to assess the risk of noxious bloom formation and subsequent water quality degradation. Submerged vegetation and large zooplankton grazing have long been identified as factors weakening the relationship by decoupling phytoplankton from nutrients. Proving it unambiguously is difficult because in natural systems many factors act together, blurring each other's effect. Here we present the results of continuous monitoring of 13 ponds where the effects of submerged vegetation and zooplankton grazing were enhanced by biomanipulation (fish removal). This allowed these effects to be assessed and compared with the pre-biomanipulation situations when phytoplankton biomass was mainly nutrient driven. The comparison showed a strong weakening effect. This has important implications for the restoration of eutrophic ponds and lakes as it shows that considerable degree of their ecological quality can be restored even when nutrient loading reduction is not feasible.

'Adopt a pond' – National educational campaign for pond exploration and conservation in Portugal

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Keywords: pond, educational program, management, conservation, activities

Ponds support high biodiversity and numerous rare species for different groups of organisms, including algae, aquatic plants, molluscs, crustaceans, insects, amphibians, reptiles and birds. However, ponds are in severe decline throughout Europe due to various human pressures, including the intensification of agriculture, the expansion of the urbanized area and exotic tree plantations, drainage, water pollution and deposition of waste.

From an educational standpoint, ponds are excellent models for environmental education activities, because they: i) have small dimensions, which facilitates the observation of the fauna and flora; ii) can be found near housing areas, allowing easy public contact, iii) very often present a variety of flagship species such as frogs and dragonflies, iv) allow the creation of numerous educational activities, often framed in various educational programs disciplines, such as observation of microscopic life or larval cycle of amphibians and dragonflies, and v) are easy to construct and maintain anywhere, including in schools.

In this communication we will present the Portuguese national campaign 'Adopt a pond', its functioning and educational products, which includes pond management, biodiversity monitoring, educational activities, scientific experiments, games, etc.

The macroinvertebrate communities and environment of urban ponds

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Keywords: urban, macroinvertebrates, biodiversity, function, connectivity

Research on the biodiversity of small water bodies is increasing but few studies consider ponds within urban areas, despite their susceptibility to urban pollution and significant amenity value. Urban ponds are exposed to pollution from a number of sources, notably impermeable surface run off, which often degrades water quality, with consequences for biota. Our study assessed the conservation and functional value of ponds across the patchy environments of the West Midlands conurbation, UK. A key objective was to characterise spatial and temporal variation in physicochemical quality across a series of urban ponds and relate this to macroinvertebrate biodiversity.

A field survey of 30 ponds spanning a gradient of urbanisation from suburban to densely urbanised was undertaken seasonally in 2008-2009. The pond sites were located within approximately 240 square km. At each site, samples were collected to determine water quality (18 determinands) and habitat heterogeneity. Macroinvertebrates were also collected using a modification of the National Pond Survey methodology. Preliminary data reveal that water quality varied markedly across the sites. Oxygen availability ranged from < 10 % saturation to super saturated > 150 % whereas pH ranged from pH 6.2 to 8.8. Conductivity varied across the sites from 191 to 1,525 $\mu S\ cm^{-1}$. Nitrate concentrations ranged from 0.1 to 117 $mg\ l^{-1}$, indicating nitrate limitation in some locations, and hypereutrophic conditions in others. Elevated chloride and sodium concentrations (up to 378 $mg\ l^{-1}$ and 243 $mg\ l^{-1}$ respectively) were recorded following prolonged salting of frozen surfaces in winter 2009.

For urban ponds to provide ecosystem services and support diverse macroinvertebrate communities, careful management is necessary on local and regional scales. Data collected suggests they are highly variable and often degraded. This may compromise the ability of ponds to support a diverse biota and their role as stepping stones across the urban landscape. Analysis of the macroinvertebrate data will enable us to determine the extent to which this applies.

Seasonal dynamics and composition of microcrustacean assemblages (Cladocera, Copepoda) in various waterbodies of a cutaway peatland (Öreg-turján, Ócsa, Hungary)

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Keywords: wetland, zooplankton, abundance, pond

The Öreg-turján is a Ramsar and a NATURA 2000 site with several shallow waterbodies situated in the Danube-Tisza Interfluve, Middle Hungary. The aquatic habitats of the peatland were poorly investigated with lack of information about microcrustaceans. Four permanent ponds and a channel with different vegetation were sampled at three-week intervals during 2008. Qualitative and semiquantitative zooplankton samples were collected and a set of abiotic variables (temperature, pH, conductivity, redoxpotential) were measured. Most of the identified 29 species were typical of small eutrophic lakes, nevertheless some taxa like *Ceriodaphnia setosa, Cyclops insignis* and *Macrocyclops distinctus* are rare species in Hungary. The PCA and UPGMA analysis of the five habitats resulted in two groups according to their crustacean assemblages. One demonstrated two microcrustacean abundance peaks during the year and was dominated by the cladoceran *Simocephalus exspinosus*. These waterbodies could be characterized by scanty submerged aquatic vegetation and dense Lemna cover. The other group with dense submerged macrophyte vegetation represented summer plankton peak and the dominant cladoceran species were *Daphnia curvirostris* and *Ceriodaphnia* spp. As the measured abiotic factors did not correlate significantly with the zooplankton composition (only temperature in some cases), it also suggests that the local biotic environment could have a stronger effect on the microcrustacean assemblages.

Macrophyte propagule banks in ponds subject to ecological restoration management in Brussels, Belgium

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Keywords: macrophyte germination, oospores, sediment, biomanipulation

Seed banks are an important feature of the survival strategies and regenerative capabilities of the vegetation. Macrophytes deliver various types of vegetative and sexually produced propagules to the sediment. Although the composition of the submerged propagule bank does not necessarily correspond to the standing vegetation, it forms the basis for emergence after the unfavorable season. It is especially valuable for spontaneous recovery of macrophytic vegetation after restoration of turbid shallow lakes and ponds.

In the Brussels-Capital Region, many ponds underwent an ecological restoration through biomanipulation. Fifteen eutrophic ponds with variable management histories and present-day turbidity levels were selected for the analysis of the propagule bank. Sediment was collected in early spring. Each core was divided into an upper and lower layer. Fine particles were removed and the remaining fraction was spread out as a thin layer on a submerged mixture of sand and potting soil. All macrophyte seedlings were identified and counted during six months.

Large differences in presence and densities of species were observed between ponds. There was a decrease in number of viable propagules with depth in half of the ponds. The strength of similarity between propagule bank and vegetation cover of the next season varies from one pond to the other, and highlights the importance of environmental and biological conditions during growth in determining the establishment of vegetation.

Knowing the potential of the propagule banks has implications for the management of ponds. It helps to predict the timing and extent of macrophyte reappearance after biomanipulation as well as the persistence of the clear-water equilibrium, and partly explains some of the restoration failures.

Space, time travel and metacommunity dynamics: temporary pools as models for ecology and evolution in metacommunities

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Keywords: metacommunity concept, dispersal, temporary pools

The general recognition of the importance of dispersal and spatial interactions between communities and populations resulted in a paradigm shift both in community ecology (metacommunity concept) and evolutionary biology (geographic mosaic of coevolution). As a result, recently, also evolutionary processes such as local adaptation are studied within the metacommunity paradigm. These developments provide a platform for the study of parallels and interactions between ecology and evolution in a spatial context. Recent progress in metacommunity theory has made a substantial contribution to this emerging field, however, good empirical data in support of available theories are still relatively scarce. In this talk I will highlight some of the unique features of temporary pool systems that make them suitable as model systems for ecological and evolutionary research in a metacommunity framework. I will illustrate this with examples from our own research. Here, I will specifically focus on the importance of patch disturbance and discuss how dispersal in space and time interacts with disturbance and is reflected in community structure and diversity and patterns of local adaptation.

Finally, I will discuss a number of challenges and opportunities for future work and the role small aquatic systems might play in better understanding how communities work in space.

Phytocenotical function of the little ponds in Krajeńskie Lakeland in North-West part of Poland

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Keywords: little ponds, ecological islands, flora, plants' communities, Pojezierze Krajenskie, types of landscape, meadows ponds, in-wood ponds

Small water ponds are among the most precious natural components of the transformed landscape which has been for ages a subject of a human pressure. In the Krajeńskie Lakeland they cover the total area of about 162 ha. Most water ponds are concentrated within farmlands (83 %).

An inventory of vascular flora of 450 chosen water reservoirs, of the area up to 1 ha, was made. Depending on their surroundings, the following groups of ponds were distinguished: (1) ponds situated within forests, (2) within meadows, (3) in inhabited areas (within human settlements) and (4) between arable fields. Among the last ones, additionally, water basins with wide, well developed ecotone zones and ponds with narrow or disturbed contact zones were defined.

Methods typically used in geobotanical field research and in flora and vegetation analyses were applied in the present study. The data obtained were analysed statistically. The zonation and structure of vegetation of chosen reservoirs was presented.

Within investigated small reservoirs of the Krajeńskie Lakeland 576 species of vascular plants were recorded. About 76 % of them were native species, and 34 taxa were legally protected in Poland or endangered in the region (Western Pomerania) or in the whole country; 165 species were acknowledged as locally endangered. There were found 201 plant communities, including 128 associations. Many of them developed as rump communities. Most of the communities belonged to *Phragmitetea australis, Artemisietea vulgaris* and *Molinio-Arrhenatheretea*. The communities investigated were mostly natural (62.6 %), and natural auxochoric communities dominated (46.7 %). 67 communities were recognized as locally endangered.

The thesis that differentiation and richness of small reservoirs' vegetation depended on the type of landscape was proved. The richest ponds, regarding their flora and vegetation, were the field ones, but isolated from the surrounding with a natural belt of bushes or trees. The forest reservoirs had the least differentiated vegetation, but the most natural one, with the biggest share of spontaneophytes and natural perdochoric communities.

Community structuring processes in Mediterranean temporary wetlands

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Keywords: Mediterranean temporary wetlands, invertebrate community, salinity, hydroregime, dispersal

Despite the recognized importance of Mediterranean temporary wetlands as priority habitat for biodiversity conservation and ecosystem services (Habitat Directive), our current understanding of diversity patterns, ecosystem functioning and community structuring processes in this habitat is still incomplete. We studied key environmental factors, biotic interactions and dispersal dynamics shaping invertebrate communities in temporary wetlands of the Camargue (Southern France). Since these habitats are particularly susceptible to changes in the quantity and quality of their water supply, we discuss our results in the light of predicted scenarios of climate change and intensive water management.

Results from a field survey of 30 Camargue temporary wetlands showed that salinity and hydroperiod were the most important community structuring factors (species sorting) and that dispersal was probably not limiting (high abundance of vectors: water connections, wind, birds, mammals and humans). We then investigated the interacting and long term effects of salinity and hydroregime on active and dormant crustacean communities using a large scale outdoor mesocosm experiment. The interacting effects of both stressors significantly influenced diversity, density, reproduction, succession and overall community structure. Although the presence of resting egg banks can temporarily buffer against unfavorable conditions, our results suggested that persisting bad conditions may lead to their exhaustion within four to ten years. Based on our results we conclude that predicted aridification (leading to shortening of hydroregimes) may lead the loss of species that come late in the succession (such as cladocerans and ostracods), while salinisation may lead to the loss of already fragile freshwater species (such as large branchiopods). We also argue that predicting the effects of changing environmental factors is not always straightforward, since they are often complicated by unknown sublethal effects, indirect abiotic effects or changed biotic interactions, such as the strong interactions between large branchiopods and zooplankton.

Influence of land use and lake management on water and sediment parameters of shallow lakes with fish production in the Dombes region, France

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Keywords: agricultural land use, catchment, fish ponds, nutrient transfer, water quality

Agricultural land use in the surrounding of ponds and shallow lakes is generally considered to increase the nutrient status of lake/pond water and sediments. This was analysed in a region in France, where 1,100 shallow lakes with fish production are located in a heterogeneous agricultural landscape with cropping, animal husbandry and forestry. The analysis included also potential influences from lake management practices on the nutrient status of lake water and sediments.

In total, 57 lakes were studied in 2007 and 2008 in the Dombes region, France. Different water parameters (PO_4, NO_3, total P, total N, Chlorophyll-a) were analysed from end-April to beginning-October in each year. Sediments were sampled in October of the respective year and analysed for available P, total N, organic matter and calcium concentration. Land use was studied in the 100 m adjacent area of the lakes shoreline and in the primary catchment of the lakes. Data about agricultural land use practices as well as lake management were collected by interviewing farmers and lake managers.

The main results found are that i) increasing cropping areas in the primary catchment of the lake and fertilisation of lake ground during a year when lakes are emptied increase PO_4 concentration of lake water, and ii) increasing farm/building area in the catchment as well as fertilisation of lakes with manure, feed supplements and $CaCO_3$ application on lake grounds during a year when lakes are emptied increases available P in sediments. For the other parameters limited correlations were found, e. g. total N and calcium concentration of sediments is positively correlated to building/farm area. Only land use in the catchment area was related to certain water and sediments parameters, indicating that a catchment-based approach is more useful than a circular-area based approach.

Pond quality decline in the UK and what to do about it

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Keywords: quality decline, presence of wetlands, new ponds, pond conservation

Recent data from Britain's Countryside Survey shows that, based on plant data, 80 % of ponds in England and Wales are in poor or very poor condition, and quality has declined over the last decade.

Factors implicated in the decline are broadly related to landuse intensity including high nitrogen levels in pond water, the presence of road runoff, the presence of stream inflows and increasing tree shade.

However there is some evidence that the presence of other wetlands and waterbodies close to ponds helps to ameliorate decline.

Interestingly, new ponds were slightly more species-rich than other ponds, although because most had relatively intensive surrounds, they are not expected to maintain their value in the long term.

Over the last two years, Pond Conservation has begun the Million Ponds Project to try to reverse Britain's decline in pond quality and biodiversity. The project is a partnership of 10 government and NGO organisations, and its first four year phase aims to create 5,000 new clean water ponds across England and Wales, with 1,000 of these ponds specifically targeted to protect uncommon and declining species.

Important Pond Areas in the Netherlands related to biodiversity and metapopulation structures of species

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Keywords: ponds, biodiversity, metapopulation structure, conservation, Nature 2000

The loss of ponds in the Netherlands was tremendous (90 %) in the last century. From 1990 onwards habitat restoration projects focussed also on ponds, often in relation to specific threatened plant and animal species. In 2008 RAVON started the pond conservation project "Oases of Biodiversity" together with a variety of partners. One of the goals was to determine hotspots of biodiversity related to small waterbodies. More than 100 endangered species were selected of which bats (3 species), amphibians (7), reptiles (3), dragonflies (18), water beetles (8), Caddis-flies (10), grasshoppers (3), plants (53) and some other species. Hotspot maps formed the basis for the selection of Important Pond Areas (IPA). Large clusters of IPA's are situated in the north (provinces Drenthe, Friesland, Overijssel) in wet heathlands, bogs and fens. Also in the central and south-eastern parts clusters can be identified. These outcomes will be discussed in relation to the necessity of creating metapopulations and its spatial distribution; also in respect to the protection and designation of pond areas (Nature 2000).

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